BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

B.Tech. – R21 COURSE STRUCTURE
(Applicable from the batch admitted during 2021-22 and onwards)

Department of Electrical & Electronics Engineering

I-Year I–Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21MA101BS	Linear Algebra and Calculus	3	1	0	4
2	21CH101BS	Chemistry	3	1	0	4
3	21EE101ES	Basic Electrical Engineering	3	0	0	3
4	21ME102ES	Engineering Workshop	1	0	3	2.5
5	21EN101HS	English	2	0	0	2
6	21CH102BS	Engineering Chemistry Lab	0	0	3	1.5
7	21EN102HS	English Language and Communication Skills Lab	0	0	2	1
8	21EE102ES	Basic Electrical Engineering Lab	0	0	2	1
		TOTAL	**12**	**2**	**10**	**19**

I-Year II–Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21MA202BS	Advanced Calculus	3	1	0	4
2	21PH201BS	Applied Physics	3	1	0	4
3	21CS201ES	Programming for Problem Solving	3	1	0	4
4	21ME203ES	Engineering Graphics	1	0	4	4
5	21PH202BS	Applied Physics Lab	0	0	3	1.5
6	21CS202ES	Programming for Problem Solving Lab	0	0	3	1.5
TOTAL			**10**	**3**	**10**	**19**
Mandatory Course (Non-Credit)						
7	21MC201ES	Environmental Science	2	0	0	0

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II-Year I–Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21MA304BS	Numerical Methods and Complex Variables	3	1	0	4
2	21EE305PC	Electrical Circuit Analysis	3	0	0	3
3	21EE307PC	Electro Magnetic Fields	3	0	0	3
4	21EE308PC	Electrical Machines-I	3	0	0	3
5	21ME312PC	Fluid Mechanics and hydraulic Machines	3	0	0	3
6	21EC308PC	Electronic Devices & Circuits	3	0	0	3
7	21EC309PC	Electronic Devices & Circuits lab	0	0	2	1
8	21ME313PC	Fluid Mechanics and hydraulic Machines-Lab	0	0	2	1
TOTAL			**18**	**1**	**4**	**21**
Mandatory Course (Non-Credit)						
9	21MC303	Constitution of India	0	0	2	0

II-Year II–Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21CS405PC	Data Base Management Systems	3	0	0	3
2	21EE410PC	Electrical Machines-II	3	0	0	3
3	21EE412PC	Power Systems-I	3	0	0	3
4	21EE414PC	Control Systems	3	0	0	3
5	21EC403PC	Switching Theory and Logic Design	3	0	0	3
6	21EE406PC	Electrical Circuits lab	0	0	3	1.5
7	21EE409PC	Electrical Machines-I Lab	0	0	3	1.5
8	21HS401	Social Innovation in Practice	0	0	3	1.5
9	21MA408BS	Aptitude and Critical Thinking Skills Lab	0	0	3	1.5
TOTAL			**15**	**0**	**12**	**21**
Mandatory Course (Non-Credit)						
10	21MC402	Gender Sensitization Lab	0	0	2	0

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III-Year I–Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	21EE516PC	Electrical Measurements and Instrumentation	3	0	0	3
2	21EE518PC	Power Systems-II	3	0	0	3
3	21EE519PC	Power Electronics	3	0	0	3
4	21EE521PC	Switch Gear and Protection	3	0	0	3
5		**Professional Elective – I**	3	0	0	3
6	21EE511PC	Electrical Machines-II Lab	0	0	3	1.5
7	21EE515PC	Control Systems & Simulation Lab	0	0	3	1.5
8	21EE513PC	Power System & Simulation Lab	1	0	2	2
9	21EE544PR	Summer Internship-I	0	0	0	1
		TOTAL	**16**	**0**	**8**	**21**
Mandatory Course (Non-Credit)						
10	*21MC505	Environmental Science	2	0	0	**0**
11	21MC507	Artificial Intelligence	3	0	0	0

III-Year II–Semester						
S. No.	Subject Code	Subject	Hours Per Week			Credits
			L	T	P	
1	**21SM601MS**	Business Economics And Financial Analysis	3	0	0	3
2	**21EE622PC**	Computer Methods in Power Systems	3	0	0	3
3	**21EC624PC**	Micro Processor and Micro Controller	3	0	0	3
4		**Open Elective – I**	3	0	0	3
5		**Professional Elective – II**	3	0	0	3
6	**21EN603HS**	Advanced English Communication Skills Lab	0	0	3	1.5
7	**21EE620PC**	Power Electronics & Simulation Lab	0	0	3	1.5
8	**21EE617PC**	Electrical Measurements Lab	0	0	3	1.5
9	**21EE625PC**	Electrical and Electronics Design Lab	0	0	3	1.5
		TOTAL	**15**	**0**	**12**	**21**
Mandatory Course (Non-Credit)						
9	21MC604	Intellectual Property Rights	2	0	0	0
10	21MC606	Cyber Security	3	0	0	0

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IV-Year I–Semester						
S. No.	**Subject Code**	**Subject**	**Hours Per Week**			**Credits**
			L	**T**	**P**	
1	**21EE723PC**	Power System Operation and Control	3	0	0	3
2	**21EE724PC**	HVDC and FACTS Controllers	3	0	0	3
3		**Professional Elective – III**	3	0	0	3
4		**Professional Elective – IV**	3	0	0	3
5		Open Elective – II	3	0	0	3
6	**21EC725PC**	Micro Processor & Micro Controllers Lab	0	0	2	1
7	**21EE745PR**	Summer Internship-II	0	0	0	1
8	**21EE746PR**	Project Stage-I	0	0	6	4
TOTAL			**15**	**0**	**8**	**21**

IV-Year II–Semester						
S. No.	**Subject Code**	**Subject**	**Hours Per Week**			**Credits**
			L	**T**	**P**	
1		Open Elective – III	3	0	0	3
2		**Professional Elective – V**	3	0	0	3
3		**Professional Elective – VI**	3	0	0	3
4	**21EE847PR**	Project Stage-II	0	0	16	8
TOTAL			**9**	**0**	**16**	**17**

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List of Subjects

Sl.No	Name of The Subject
1	Basic Electrical Engineering
2	Basic Electrical Engineering Lab
3	Basic Electrical &Electronics Engineering
4	Basic Electrical &Electronics Engineering Lab
5	Electrical Circuit Analysis
6	Electrical Circuits &Simulation lab
7	Electro Magnetic Fields
8	Electrical Machines-I
9	Electrical Machines-I Lab
10	Electrical Machines-II
11	Electrical Machines-II Lab
12	Power Systems-I
13	Power System & Simulation Lab
14	Control Systems
15	Control Systems & Simulation Lab
16	Electrical Measurements and Instrumentation
17	Electrical Measurements Lab
18	Power Systems-II
19	Power Electronics
20	Power Electronics &Simulation Lab
21	Switch Gear and Protection
22	Computer Methods in Power Systems
23	Power System Operation and Control
24	HVDC And FACTS Controllers
25	Electrical and Electronics Design Lab
44	Summer Internship-I
45	Summer Internship-II
46	Project Stage-I
47	Project Stage-II

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List of Professional electives

Subject code	Professional Elective	Subject name
21EE526PE	**Professional Elective-1**	Electrical Machines-III
21EE527PE		Optimization Techniques
21EE528PE		Advanced Control Systems
21EE629PE	**Professional Elective-2**	Digital Control systems
21EE630PE		Electrical Drives and Control
21EE631PE		Utilization of Electrical Energy
21EE732PE	**Professional Elective-3**	Electrical And Hybrid Vehicles
21EE733PE		Switched Mode Power Supply
21EE734PE		High Voltage Engineering
21EE735PE	**Professional Elective-4**	Electrical Distribution Systems
21EE736PE		Power System Reliability Engineering
21EE737PE		AI Techniques in Electrical Engineering
21EE838PE	**Professional Elective-5**	Network Synthesis and Control
21EE839PE		Power Quality
21EE840PE		Neural Networks and Fuzzy Logic
21EE841PE	**Professional Elective-6**	Smart Grid Technology
21EE842PE		Renewable Energy Sources
21EE843PE		Restructured Power System

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21MA101BS: LINEAR ALGEBRA AND CALCULUS

B.Tech. I Year I Sem. **L T P C**
3 1 0 4

Course Objectives: To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigen values and eigenvectors and to reduce the quadratic form to canonical form
- Concept of Sequence.
- Concept of nature of the series.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.

Course Outcomes: After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigen values and Eigen vectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Analyse the nature of sequence and series.
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions
- Find the extreme values of functions of two variables with/ without constraints.

UNIT-I: Matrices

Matrices: Types of Matrices, Symmetric; Hermitian; Skew-symmetric; Skew-Hermitian; orthogonal matrices; Unitary Matrices; rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method; System of linear equations; solving system of Homogeneous and Non-Homogeneous equations. Gauss elimination method; Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values and Eigenvectors and their properties: Diagonalization of a matrix; Cayley-Hamilton Theorem (without proof); finding inverse and power of a matrix by Cayley-Hamilton Theorem; Quadratic forms and Nature of the Quadratic Forms; Reduction of Quadratic form to canonical forms by Orthogonal Transformation

UNIT-III: Sequences & Series

Sequence: Definition of a Sequence, limit; Convergent, Divergent and Oscillatory sequences.

Series: Convergent, Divergent and Oscillatory Series; Series of positive terms; Comparison test, p-test, D-Alembert's ratio test; Raabe's test; Cauchy's Integral test; Cauchy's root test; logarithmic test. Alternating series: Leibnitz test; Alternating Convergent series: Absolute and Conditionally Convergence.

UNIT-IV: Calculus

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem. Taylor's Series.

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT-V: Multivariable calculus (Partial Differentiation and applications)

Definitions of Limit and continuity.

Partial Differentiation; Euler's Theorem; Total derivative; Jacobian; Functional dependence & independence, Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.

REFERENCES:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.

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21CH101BS: CHEMISTRY

B.Tech. I Year I Sem. **L T P C**
3 1 0 4

Course Objectives:

- To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
- To impart the basic knowledge of atomic, molecular and electronic modifications which makes the student to understand the technology based on them.
- To acquire the knowledge of electrochemistry, corrosion and water treatment which are essential for the Engineers and in industry.
- To acquire the skills pertaining to spectroscopy and to apply them for medical and other fields.
- To impart the knowledge of stereochemistry and synthetic aspects useful for understanding reaction pathways

Course Outcomes: The basic concepts included in this course will help the student to gain:

- The knowledge of atomic, molecular and electronic changes, band theory related to conductivity.
- The required principles and concepts of electrochemistry, corrosion and in understanding the problem of water and its treatments.
- The required skills to get clear concepts on basic spectroscopy and application to medical and other fields.
- The knowledge of configurational and conformational analysis of molecules and reaction mechanisms.

UNIT - I:

Molecular structure and Theories of Bonding: Atomic and Molecular orbitals. Linear Combination of Atomic Orbitals (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N_2, O_2 and F_2 molecules. π molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT): Salient Features of CFT – Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids and effect of doping on conductance.

UNIT - II:

Water and its treatment: Introduction – hardness of water – Causes of hardness - Types of hardness: temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination and ozonization. Boiler feed water and its treatment – Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water – Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems.

UNIT - III:

Electrochemistry and corrosion: Electro chemical cells – electrode potential, standard electrode potential, types of electrodes – calomel, Quinhydrone and glass electrode. Nernst equation Determination of pH of a solution by using quinhydrone and glass electrode. Electrochemical series and its applications. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

Causes and effects of corrosion – theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion, Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application. Electroless plating of Nickel.

UNIT - IV:

Stereochemistry, Reaction Mechanism and synthesis of drug molecules: Introduction to representation of 3-dimensional structures, Structural and stereoisomers, configurations, symmetry and

chirality. Enantiomers, diastereomers, optical activity and Absolute configuration. Conformation alanalysis of n- butane.

Substitution reactions: Nucleophilic substitution reactions: Mechanism of SN1, SN2 reactions. Electrophilic and nucleophilic addition reactions: Addition of HBr to propene. Markownikoff and anti Markownikoff's additions. Grignard additions on carbonyl compounds. Elimination reactions: Dehydro halogenation of alkylhalides. Saytzeff rule. Oxidation reactions: Oxidation of alcohols using $KMnO_4$ andchromic acid.

Reduction reactions: reduction of carbonyl compounds using $LiAlH_4$ & $NaBH_4$. Hydroboration of olefins.Structure, synthesis and pharmaceutical applications of Paracetamol and Aspirin.

UNIT - V:

Spectroscopic techniques and applications: Principles of spectroscopy, selection rules and applications of electronic spectroscopy. vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance Spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

TEXT BOOKS:

1. Physical Chemistry, by P.W. Atkins
2. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
3. Fundamentals of Molecular Spectroscopy, by C.N. Banwell
4. Organic Chemistry: Structure and Function by K.P.C. Volhardt and N.E.Schore, 5^{th} Edition.
5. University Chemistry, by B.M. Mahan, Pearson IV Edition.
6. Engineering Chemistry (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan

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21EE101ES: BASIC ELECTRICAL ENGINEERING

B.Tech. I Year I Sem. **L T P C**
3 0 0 3

Course Objectives:

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To import the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

Course Outcomes:

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

UNIT-I: D.C. Circuits

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.
Time-domain analysis of first-order RL and RC circuits.

UNIT-II: A.C. Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit.
Three-phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-IV: Electrical Machines

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor.
Construction and working of synchronous generators.

UNIT-V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

TEXT BOOKS/ REFERENCE BOOKS:

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering”, Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

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21ME102ES: ENGINEERING WORKSHOP

B.Tech. I Year I Sem. **L T P C**
1 0 3 2.5

Pre-requisites: Practical skill

Course Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.

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

- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry – (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
II. Fitting – (V-Fit, Dovetail Fit & Semi-circular fit)
III. Tin-Smithy – (Square Tin, Rectangular Tray & Conical Funnel)
IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
V. Welding Practice – (Arc Welding & Gas Welding)
VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

TEXT BOOKS:

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.

REFERENCE BOOKS:

1. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
2. Workshop Manual / Venkat Reddy/ BSP

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21EN101HS: ENGLISH

B.Tech. I Year I Sem. **L T P C**
2 0 0 2

INTRODUCTION

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.*

Learning Objectives: The course will help to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.

Course Outcomes: Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

SYLLABUS

UNIT I

'The Raman Effect' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary Building: The Concept of Word Formation --The Use of Prefixes and Suffixes.

Grammar: Identifying Common Errors in Writing with Reference to Articles and Prepositions.

Reading: Reading and Its Importance- Techniques for Effective Reading.

Basic Writing Skills: Sentence Structures -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

UNIT –II

'Ancient Architecture in India' from the prescribed textbook 'English for Engineers' publishedby Cambridge University Press.

Vocabulary: Synonyms and Antonyms.

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement andSubject-verb Agreement.

Reading: Improving Comprehension Skills – Techniques for Good Comprehension

Writing: Format of a Formal Letter-**Writing Formal Letters** E.g.., Letter of Complaint, Letter of Requisition, Job Application with Resume.

UNIT –III

'Blue Jeans' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives-Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-skills of Reading- Skimming and Scanning

Writing: Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying**- Providing Examples or Evidence

UNIT –IV

'What Should You Be Eating' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Comprehension- Intensive Reading and Extensive Reading

Writing: Writing Practices--Writing Introduction and Conclusion - Essay Writing-Précis Writing.

UNIT –V

'How a Chinese Billionaire Built Her Fortune' from the prescribed textbook 'English for Engineers' published by Cambridge University Press.

Vocabulary: Technical Vocabulary and their usage

Grammar: Common Errors in English

Reading: Reading Comprehension-Exercises for Practice

Writing: **Technical Reports**- Introduction – Characteristics of a Report – Categories of Reports

Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing aReport.

TEXTBOOK:

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

REFERENCE BOOKS:

1. Swan, M. (2016). Practical English Usage. Oxford University Press.
2. Kumar, S and Lata, P. (2018). Communication Skills. Oxford University Press.
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
5. Hamp-Lyons, L. (2006). Study Writing. Cambridge University Press.
6. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.

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21CH102BS: ENGINEERING CHEMISTRY LAB

B.Tech. I Year I Sem. **L T P C**

0 0 3 1.5

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- To determine the rate constant of reactions from concentrations as an function of time.
- The measurement of physical properties like adsorption and viscosity.
- To synthesize the drug molecules and check the purity of organic molecules by thin layer chromatographic (TLC) technique.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness and chloride content in water.
- Estimation of rate constant of a reaction from concentration – time relationships.
- Determination of physical properties like adsorption and viscosity.
- Calculation of Rf values of some organic molecules by TLC technique.

List of Experiments:

1. Determination of total hardness of water by complexometric method using EDTA
2. Determination of chloride content of water by Argentometry
3. Estimation of an HCl by Conductometric titrations
4. Estimation of Acetic acid by Conductometric titrations
5. Estimation of HCl by Potentiometric titrations
6. Estimation of Fe^{2+} by Potentiometry using KMnO4
7. Determination of rate constant of acid catalysed hydrolysis of methyl acetate
8. Synthesis of Aspirin and Paracetamol
9. Thin layer chromatography calculation of Rf values. eg ortho and para nitro phenols
10. Determination of acid value of coconut oil
11. Verification of freundlich adsorption isotherm-adsorption of acetic acid on charcoal
12. Determination of viscosity of castor oil and ground nut oil by using Ostwald's viscometer.
13. Determination of partition coefficient of acetic acid between n-butanol and water.
14. Determination of surface tension of a give liquid using stalagmometer.

REFERENCE BOOKS:

1. Senior practical physical chemistry, B.D. Khosla, A. Gulati and V. Garg (R. Chand & Co., Delhi)
2. An introduction to practical chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, N. Delhi)
3. Vogel's text book of practical organic chemistry 5^{th} edition
4. Text book on Experiments and calculations in Engineering chemistry – S.S. Dara

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(UGC-AUTONOMOUS)

21EN102HS: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

B.Tech. I Year I Sem. **L T P C**
0 0 2 1

The **Language Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Course Objectives:

- To facilitate computer-assisted multi-media instruction enabling individualized andindependent language learning
- To sensitize students to the nuances of English speech sounds, word accent, intonationand rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation ofEnglish by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mothertongue influence
- To train students to use language appropriately for public speaking and interviews
- **Learning Outcomes:** Students will be able to attain
- Better understanding of nuances of English language through audio- visual experience andgroup activities

  Neutralization of accent for intelligibility
- Speaking skills with clarity and confidence which in turn enhances their employabilityskills

Syllabus

English Language and Communication Skills Lab (ELCS) shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

Listening Skills

Objectives

1. To enable students develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that they can comprehend the speechof people of different backgrounds and regions

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

Speaking Skills

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
   - Oral practice: Just A Minute (JAM) Sessions
   - Describing objects/situations/people
   - Role play – Individual/Group activities

➢ **The following course content is prescribed for the English Language and Communication Skills**

Lab based on Unit-6 of AICTE Model Curriculum 2018 for B.Tech First English. As the syllabus isvery limited, it is required to prepare teaching/learning materials by the teachers collectively in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning and timesaving in the Lab)

Exercise – ICALL

Lab:

Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

ICS Lab:

Understand: Communication at Work Place- Spoken vs. Written language.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

Exercise – IICALL Lab:

Understand: Structure of Syllables – Word Stress and Rhythm– Weak Forms and Strong Forms in Context.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

ICS Lab:

Understand: Features of Good Conversation – Non-verbal Communication.

Practice: Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

Exercise - IIICALL Lab:

Understand: Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

Practice: Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

ICS Lab:

Understand: How to make Formal Presentations.

Practice: Formal Presentations.

Exercise – IVCALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests. **ICS Lab**:

Understand: Public Speaking – Exposure to Structured Talks.

Practice: Making a Short Speech – Extempore.

Exercise – VCALL Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests. **ICS Lab**:

Understand: Interview Skills.*Practice:*

Mock Interviews.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. **Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public-Address System, a LCD and a projector etc.

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21EE102ES: BASIC ELECTRICAL ENGINEERING LAB

B.Tech. I Year I Sem. **L T P C**
0 0 2 1

Course Objectives:

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

Course Outcomes:

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

List of experiments/demonstrations:

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits using DC excitation
4. Transient Response of RLC Series circuit using DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor

No-Load Characteristics of a Three-phase Alternator

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MA202BS: ADVANCED CALCULUS

Common for All Branches

B.Tech. I Year II Sem.

L	T	P	C
3	1	0	4

Course Objectives: To learn

- Methods of solving the differential equations of first and higher order.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals

Course Outcomes: After learning the contents of this paper the student must be able to

- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and Gravity for cubes, sphere and rectangular parallelopiped
- Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I: First Order ODE

Exact, linear and Bernoulli's equations; Applications : Newton's law of cooling, Law of natural growth and decay; Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT-II: Ordinary Differential Equations of Higher Order

Second order linear differential equations with constant coefficients: Non-Homogeneous terms of the type e^{as}, sin ax , cos ax, polynomials in x, $e^{as}V(x)$ and x V(x); method of variation of parameters; Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Multivariable Calculus (Integration)

Evaluation of Double Integrals (Cartesian and polar coordinates); change of order of integration (only Cartesian form); Evaluation of Triple Integrals: Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelopiped).

UNIT-IV: Vector Differentiation

Vector point functions and scalar point functions. Gradient, Divergence and Curl. Directional derivatives, Tangent plane and normal line. Vector Identities. Scalar potential functions. Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9thEdition,Pearson, Reprint, 2002.

REFERENCES:

1. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
2. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21PH201BS: APPLIED PHYSICS

B.Tech. I Year II Sem. **L T P C**
3 1 0 4

Course Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course Outcomes: Upon graduation:

- The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
- The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
- Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
- The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent waveequation, Particle in one dimensional box.

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO_2) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

UNIT-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXT BOOKS:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learing.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCE BOOKS:

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CS201ES: PROGRAMMING FOR PROBLEM SOLVING

B.Tech. I Year II Sem. **L T P C**
3 1 0 4

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of C programming language.
- To learn the usage of structured programming approach in solving problems.

Course Outcomes: The student will learn

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.
- Searching and sorting problems.

UNIT - 1: Introduction to Programming

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program etc., Number systems
Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming
Introduction to C Programming Language: variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code , Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments
Bitwise operations: Bitwise AND, OR, XOR and NOT operators
Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops
I/O: Simple input and output with scanf and printf, formatted I/O, Introduction to stdin, stdout and stderr. Command line arguments

UNIT - II: Arrays, Strings, Structures and Pointers:

Arrays: one and two dimensional arrays, creating, accessing and manipulating elements of arrays
Strings: Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr etc.), arrays of strings
Structures: Defining structures, initializing structures, unions, Array of structures
Pointers: Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation)
Enumeration data type

UNIT - III: Pre-processor and File handling in C:

Preprocessor: Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef
Files: Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions.

UNIT - IV: Function and Dynamic Memory Allocation:

Functions: Designing structured programs, Declaring a function, Signature of a function, Parameters

and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, Some C standard functions and libraries

Recursion: Simple programs, such as Finding Factorial, Fibonacci series etc., Limitations of Recursive functions

Dynamic memory allocation: Allocating and freeing memory, Allocating memory for arrays of differentdata types

UNIT - V: Introduction to Algorithms:

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a givenset, finding if a number is prime number, etc.

Basic searching in an array of elements (linear and binary search techniques),

Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms),Basic concept of order of complexity through the example programs

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
2. Hall of India
3. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
4. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
5. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21ME203ES: ENGINEERING GRAPHICS

B.Tech. I Year II Sem. **L T P C**
1 0 4 4

Pre-requisites: Nil Course

objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

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

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Scales – Plain & Diagonal.

UNIT- II

Orthographic Projections: Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids –Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

UNIT – IV

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone,
Intersection of Solids: Intersection of – Prism vs Prism- Cylinder Vs Cylinder

UNIT – V

Isometric Projections: Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa –Conventions

Introduction to CAD: (For Internal Evaluation Weightage only):

Introduction to CAD Software Package Commands - Free Hand Sketches of 2D - Creation of 2D Sketches by CAD Package

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing / N. S. Parthasarathy and Vela Murali/ Oxford

REFERENCE BOOKS:

1. Engineering Drawing / Basant Agrawal and McAgrawal/ McGraw Hill
2. Engineering Drawing/ M. B. Shah, B.C. Rane / Pearson.

Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21PH202BS: APPLIED PHYSICS LAB

B.Tech. I Year II Sem.

L	T	P	C
0	0	3	1.5

List of Experiments:

1. Energy gap of P-N junction diode:
   To determine the energy gap of a semiconductor diode.
2. Solar Cell:
   To study the V-I Characteristics of solar cell.
3. Light emitting diode:
   Plot V-I and P-I characteristics of light emitting diode.
4. Stewart – Gee's experiment:
   Determination of magnetic field along the axis of a current carrying coil.
5. Hall effect:
   To determine Hall co-efficient of a given semiconductor.
6. Photoelectric effect:
   To determine work function of a given material.
7. LASER:
   To study the characteristics of LASER sources.
8. Optical fibre:
   To determine the bending losses of Optical fibres.
9. LCR Circuit:
   To determine the Quality factor of LCR Circuit.
10. R-C Circuit:
    To determine the time constant of R-C circuit.

Note: Any 8 experiments are to be performed

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21CS202ES: PROGRAMMING FOR PROBLEM SOLVING LAB

B.Tech. I Year II Sem. **L T P C**
0 0 3 1.5

Course Objectives: The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept.
- To create, read from and write to text and binary files

Course Outcomes: The candidate is expected to be able to:

- formulate the algorithms for simple problems
- translate given algorithms to a working and correct program
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures
- use pointers of different types
- create, read and write to and from simple text and binary files
- modularize the code with functions so that they can be reused

Practice sessions:

a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

Simple numeric problems:

a. Write a program for fiend the max and min from the three numbers.
b. Write the program for the simple, compound interest.
c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction.Read percentage from standard input.
d. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
e. 5 x 1 = 5
f. 5 x 2 = 10
g. 5 x 3 = 15
h. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Expression Evaluation:

a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula s = ut+(1/2)at^2 where u and a are the initial velocity in m/sec (= 0) and acceleration in m/sec^2 (= 9.8 m/s^2)).

b. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
c. Write a program that finds if a given number is a prime number
d. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
e. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
f. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
g. Write a C program to find the roots of a Quadratic equation.
h. Write a C program to calculate the following, where x is a fractional value.i.

1-x/2 +x^2/4-x^3/6

j. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x^2+x^3+.....+x^n. For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Arrays and Pointers and Functions:

a. Write a C program to find the minimum, maximum and average in an array of integers.
b. Write a functions to compute mean, variance, Standard Deviation, sorting of n elements in single dimension array.
c. Write a C program that uses functions to perform the following:
d. Addition of Two Matrices
e. ii. Multiplication of Two Matrices
f. iii. Transpose of a matrix with memory dynamically allocated for the new matrix as row and column counts may not be same.
g. Write C programs that use both recursive and non-recursive functions
h. To find the factorial of a given integer.
i. ii. To find the GCD (greatest common divisor) of two given integers.
j. iii. To find x^n
k. Write a program for reading elements using pointer into array and display the values using array.
l. Write a program for display values reverse order from array using pointer.
m. Write a program through pointer variable to sum of n elements from array.

Files:

a. Write a C program to display the contents of a file to standard output device.
b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
c. Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.
d. Write a C program that does the following:

It should first create a binary file and store 10 integers, where the file name and 10 values aregiven in the command line. (hint: convert the strings using atoi function)

Now the program asks for an index and a value from the user and the value at that index shouldbe changed to the new value in the file. (hint: use fseek function)

The program should then read all 10 values and print them back.

e. Write a C program to merge two files into a third file (i.e., the contents of the firs t file followed by those of the second are put in the third file).

Strings:

a. Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
b. Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
c. Write a C program that uses functions to perform the following operations:
d. To insert a sub-string in to a given main string from a given position.
e. ii. To delete n Characters from a given position in a given string.
f. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)
g. Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.
h. Write a C program to count the lines, words and characters in a given text.

Miscellaneous:

a. Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.

b. Write a C program to construct a pyramid of numbers as follows:

```
1          *          1          1          *
1 2        * *        2 3        2 2        * *
1 2 3      * * *      4 5 6      3 3 3      * *
                                             *
                                4 4 4 4    * *
                                           *
```

Sorting and Searching:

a. Write a C program that uses non recursive function to search for a Key value in a given
b. list of integers using linear search method.
c. Write a C program that uses non recursive function to search for a Key value in a given
d. sorted list of integers using binary search method.
e. Write a C program that implements the Bubble sort method to sort a given list of
f. integers in ascending order.
g. Write a C program that sorts the given array of integers using selection sort in descending order
h. Write a C program that sorts the given array of integers using insertion sort in ascending order
i. Write a C program that sorts a given array of names

Suggested Reference Books for solving the problems:

i. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
ii. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)
iii. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
iv. Hall of India
v. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
vi. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
vii. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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*21MC201ES: ENVIRONMENTAL SCIENCE

B.Tech. I Year II Sem. **L T P C**
3 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situconservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981,Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedicalwaste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies

for risk assessment, Concepts of Environmental Management Plan

(EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA),Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21MA304BS: NUMERICAL METHODS AND COMPLEX VARIABLES

B.Tech II Year I Sem. **L T P C**
3 1 0 4

Course Objectives:

- Various methods to the find roots of an equation and estimate the value for the given data using interpolation.
- Evaluation of integrals using numerical techniques
- Solving ordinary differential equations using numerical techniques.
- Differentiation and integration of complex valued functions.
- Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem and Expansion of complex functions using Taylor's and Laurent's series.
- Evaluation of real integrals and transformations.

Course Outcomes (COs):

- Estimate the value for the given data using interpolation and Find the root of a given equation.
- Identify the numerical solutions for a given ODE's
- Understand the concept of a complex function and its analyticity
- Explain Taylor's and Laurent's series expansions of complex function
- Finding the Residues and Conformal Mapping.

Syllabus:

Unit-I: Numerical Methods – I

Solution of polynomial and transcendental equations – Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method. Finite differences- forward differences- backward differences-central differences-symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central
difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation

UNIT-II: Numerical Methods – II

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.
Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods;
Runge-Kutta method of fourth order

UNIT-III: Complex Variables (Differentiation)

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof),
Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties.

UNIT-IV: Complex Variables (Integration)

Line integrals, Cauchy's theorem, Cauchy's Integral formula, Lowville's theorem (AII theorems without proof); zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem (without proof).

UNIT V: Evaluation of real integrals and conformal transformations

Evaluation of real integrals using Residues: $\int_0^{2\pi} f(sin\theta, \cos\theta)d\theta$, $\int_{-\infty}^{\infty} f(x)dx$, Bilinear transformations, conformal mapping.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
3. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill,2004.

References:

1. M. K. Jain, SRK Iyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Engineering mathematics volume-III, S.CHAND T.K.V Iyenger. B. Krishna Gandhi, S. Ramganatham

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE305PC: ELECTRICAL CIRCUIT ANALYSIS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To understand Magnetic Circuits, Network Topology and Three phase circuits.
- To analyze transients in Electrical systems.
- To evaluate Network parameters of given Electrical network
- To design basic filter configurations

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Apply network theorems for the analysis of electrical circuits.
- Obtain the transient and steady-state response of electrical circuits.
- Analyze circuits in the sinusoidal steady-state (single-phase and three-phase).
- Analyze two port circuit behaviour.

UNIT – IIntroduction toElectrical&Magnetic Circuits:

Electrical Circuits: Circuit Concept – Types of Elements-R-L-C parameters – Voltage and Current sources – Independent and dependent sourcesSource transformation – Voltage – Current relationship for passive elements, Kirchhoff's laws,RMS,Average values of fundamental waveforms network reduction techniques – Node and Mesh analysis of Networks with Independent and Dependent voltage and current sources,star-to-delta and delta-to-star transformation.

Magnetic Circuits:–Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit - Analysis of series and parallel magnetic circuits

UNIT –IINetwork Theorems:

Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Tellegen's, Millman's and Compensation theorems for D.C. and A.C. excitations

UNIT - III

Transient Analysis of Electrical circuits:

Solution of first and second order differential equationsfor Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forcedand force free response, time constants, steady state and transient state response for DC and AC Excitations.

UNIT - IV

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis ofelectrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplacetransform,

UNIT - V

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of twoport variables, impedance parameters, admittance parameters, transmission parameters and hybridparameters, interconnections of two port networks.

Network Topology: Definitions, Graph, Tree, Basic cut-set and Basic Tie-set matrices for planar networks - Duality and Dual networks.

TEXT BOOKS:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

REFERENCE BOOKS:

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.
3. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 1999.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE307PC: ELECTROMAGNETICFIELDS

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To Study the relation between the electric field and the magnetic field, about the various laws governing the concepts of these fields.
- To understand the behavior of conductors and dielectrics, their boundary conditions, Maxwell's equations with respect to electrostatics and magneto statics.
- To utilize the concepts related to Static magnetic fields – Biot-Savart's law.
- To utilize the concepts related to time varying fields, about scalar and vector magnetic potential, self and mutual inductance.
- To Study the phenomena of energy stored and energy density in electrostatics and magneto statics, and Poynting theorem**.**

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understand different laws in electrostatic fields.
- Study behaviour of conductors, insulators, Dielectrics and capacitance.
- Analyze the complete behaviour of Magneto static field and apply its laws and also learn about Maxwell's equation.
- Learn about Force in magnetic fields and magnetic potential and self and mutual inductance.
- Understand time varying fields and Analyze Maxwell equations for time variant fields.

UNIT-I

Electrostatics:

Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI dueto a line and a surface charge – Work done in moving a point charge in anelectrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law, Laplace's and Poison's equations –Electric dipole – Dipole moment –Torque on an Electric dipole in an electric field.

UNIT-II

Dielectrics& Capacitance:

Behavior of conductors in an electric field – Conductors and Insulators – Electricfield inside a dielectric material – polarization –Boundary conditions –Conductorand Dielectric Boundary– Energystored and energy density in a static electric field – Current density – conductionand Convection current densities – Ohm's law in point form – Continuity Equation

UNIT-III

Magneto Statics:

Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI) – MFIdue to a straight current carrying filament – MFI due to circular, square andsolenoid current carrying wire – Relation between magnetic flux, magneticflux density and Magnetic field intensity –

Ampere's Law & Applications:

Ampere's circuital law and its applications. MFI due to an infinite sheet ofcurrent and a long current carrying filament – Point form of Ampere's circuitallaw

UNIT – IV

Force in Magnetic fields and Magnetic Potential:

Force in Magnetic fields: Magnetic force - Moving charges in a Magneticfield – Lorentz force equation – force on a current element in a magnetic field– Force on a straight and a long current carrying conductor in a magnetic field– Force between two straight long and parallel current carrying conductors –Magnetic dipole and dipole moment- Torque on a current loop placed in a magnetic field.

Magnetic Potential and Concept of Inductance: Scalar magnetic potentialand its limitations – vector magnetic potential and its properties - Self and Mutual inductance –determination of self-inductance of a solenoid and toroid– energystored and energy density in a magnetic field.

UNIT – V

Time Varying Fields:

Time varying fields – Faraday's laws of electromagnetic induction– Statically and Dynamically induced EMFs, Integral form of Maxwell's equations-–Point form of Maxwell's equation-Poynting theorem.

TEXT BOOKS :

1. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc.Graw-Hill Companies, 7th Editon.2009.
2. "Electromagnetic Fields" by Matthew.N.O.Sadiku, Oxford Publications4th Edition, 2009.

REFERENCE BOOKS:

1. "Introduction to Electro Magnetics" by CR Paul and S.A. Nasar, Mc-GrawHill Publications.4th Edition, 2009.
2. " Engineering Electro magnetics" by Nathan Ida, Springer(India) Pvt. Ltd.2nd Edition.
3. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of IndiaPvt.Ltd,2nd edition. 2015.
4. J. D Kraus, Electro magnetics, Mc Graw-Hill Inc. 4th edition, 1992.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE308PC: ELECTRICAL MACHINES-I

B.Tech. II Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Electrical machines course is one of the important courses of the Electrical discipline.
- In this course the different types of DC generators and Motors, which are widely used in industryare covered and their performance aspects will be studied.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

- Evaluate the stored and converted energy and also exerted force in electromechanical energyconversion devices.
- Analyze DC generators construction and operation and Understand the effects of armature reaction
- Select appropriate D.C Generator to meet the requirements of the application in industry and Analyze their characteristics
- Analyze DC motors construction and operation and Understand the Speed control of DC motors

Test the performance and select appropriate D.C machine to meet the requirements of theapplication in industry.

UNIT – I

Magnetic fields, magnetic circuits and Magnetic Forces:

review of Ampere Law and Biot Savart Law; B-H curve of magnetic materials, hysteresis and eddy current losses, Concept of statically and dynamically induced emf, Lorentz's Equation of Force Energy stored in the magnetic circuits, flow of energy in electromechanical devices.

UNIT – II

D.C. Generators Construction & operation:

D.C. Generators – Principle of operation – Action of commutator – constructional features – armaturewindings – lap and wave windings – simplex and multiplex windings – use of laminated armature –E.M.F Equation – Problems.

Armature reaction: Cross magnetizing and demagnetizing AT/pole – compensating winding – Commutation – reactance voltage – methods of improving commutation.

UNIT – III

Types of D.C Generators & characteristics:

Methods of Excitation – separately excited and self-excited generators – build-up of E.M.F - critical fieldresistance and critical speed - causes for failure to self-excite and remedial measures. Load characteristics of shunt, series and compound generators. Applications,. Parallel operation of D.C series generators - Use of equalizer bar and cross connection of field windings -Load sharing.

UNIT – IV

D.C Motors Operation & Speed control:

D.C Motors – Principle of operation – Back E.M.F. - Torque equation – characteristics and application ofshunt, series and compound motors – Armature reaction and commutation. Applications,

Speed control of D.C. Motors: Armature voltage and field flux control methods. Motor starters (3 pointand 4 point starters).

UNIT – V

Testing of D.C. machines:

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

Text Books:

1. Electrical Machines – P.S. Bimbra., Khanna Publishers.
2. Electric Machines by I.J. Nagrath& D.P. Kothari, Tata McGraw – Hill Publishers, 3rd edition, 2004.

References

1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers
2. Electric Machinery – A. E. Fritzgerald, C. Kingsley and S. Umans, McGraw-Hill Companies, 5thedition
3. Electromechanical Energy Conversion with Dynamics of Machines – by R. D. Begamudre, NewAge International (P) Ltd., Publishers, 9thedition,2018.
4. Electric Machines – M. V. Deshpande, PHI Learning Pvt.Ltd.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21ME312PC: FLUID MECHANICS AND HYDRAULIC MACHINES

B.Tech. II Year I Sem. **L/T/P/C**

3/1/0/3

Course Objectives:

The objectives of the course are to enable the student;

- To understand the basic principles of fluid mechanics
- To identify various types of flows
- To understand boundary layer concept sand flow through pipes
- To evaluate the performance of hydraulicturbines
- Tounderstandthefunctioningandcharacteristic curvesofpumps

Course Outcomes:

- Able toexplaintheeffectoffluidpropertieson aflowsystem.
- Able toidentifytype offluidflowpatternsand describe continuityequation.
- Toanalyzeavarietyofpracticalfluidflowandmeasuringdevicesandutilize FluidMechanicsprinciplesin design.
- Toselectandanalyzeanappropriateturbinewithreferencetogivensituationinpowerplants.
- Toestimateperformanceparametersof agivenCentrifugalandReciprocatingpump.
- Abletodemonstrateboundarylayerconcepts.

UNIT-I

Fluidstatics:Dimensionsandunits:physicalpropertiesoffluidsspecificgravity,viscosity,andsurfacetension – vapour pressure and their influence on fluid motion-atmospheric, gauge and vacuum pressures–measurement of pressure-Piezometer,U-tube and differential manometers.

UNIT-II

Fluidkinematics:Streamline,pathlineandstreaklinesandstreamtube,classificationofflows-steady& unsteady, uniform & non-uniform, laminar & turbulent, rotational & irrotational flows-equation of continuity for one dimensional flow and three-dimensional flows.

Fluid dynamics: Surface and body forces –Euler's and Bernoulli's equations for flow along a streamline,momentumequation and its application on force on pipe bend.

UNIT-III

Boundary Layer Concepts: Definition, thicknesses,characteristics along thin plate, laminar andturbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer,submergedobjects– drag and lift.

Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel-total energy line-hydraulic gradient line. Measurement of flow:Pitot tube,venturi meter,and orifice emeter, Flow nozzle

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.

Hydraulic Turbines: Classification of turbines, Heads and efficiencies, impulse and reaction turbines,Peltonwheel,FrancisturbineandKaplanturbine-

workingproportions,workdone,efficiencies,hydraulicdesign –draf ttube theory-functionsand efficiency.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities, characteristiccurves,governingofturbines,selectionof typeofturbine,cavitation,surgetank,waterhammer.

UNIT-V

Centrifugalpumps:Classification,working,workdone–barometrichead-lossesandefficiencies specificspeed-performance characteristic curves,NPSH.
Reciprocatingpumps: Working,Discharge,slip,indicatordiagrams.

TEXTBOOKS:

1.Hydraulics,FluidmechanicsandHydraulicMachinery-MODIandSETH.
2.FluidMechanicsandHydraulicMachinesbyRajput.

REFERENCES:

1.FluidMechanicsandFluidPower Engineeringby D.S.Kumar,Kotaria& Sons. 2.FluidMechanicsandMachineryby D.RamaDurgaiah,NewAgeInternational. Hydraulic Machines by Banga & Sharma,KhannaPublishers

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EC308PC: ELECTRONIC DEVICES AND CIRCUITS

B.Tech.IIYearISem. **L T P C**

3 1 0 3

CourseObjectives:

- Tointroduce componentssuch asdiodes,BJTsand FETs.
- Toknowtheapplicationsofcomponents.
- Toknowtheswitchingcharacteristicsofcomponents
- Togiveunderstanding ofvarioustypesofamplifiercircuits

CourseOutcomes: UponcompletionoftheCourse,thestudents willbeableto:

- Knowthe characteristicsofvariouscomponents.
- Understandtheutilizationof components.
- Understandthebiasingtechniques
- Designandanalyzesmallsignalamplifiercircuits.

UNIT-I

Diode and Applications: Diode - Static and Dynamic resistances, Equivalent circuit, Load lineanalysis, DiffusionandTransition Capacitances,Diode Applications:Switch-Switchingtimes.

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive andInductiveFilters,Clippers-Clippingattwoindependentlevels,Clamper-ClampingCircuitTheorem,ClampingOperation,TypesofClampers.

UNIT-II

BipolarJunctionTransistor (BJT): Principle ofOperation,Common Emitter,Common BaseandCommonCollectorConfigurations,Transistorasaswitch,switchingtimes,TransistorBiasingand Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self-Bias, Bias Stability, BiasCompensationusing Diodes.

UNIT-III

JunctionFieldEffectTransistor(FET): Construction,PrincipleofOperation,PinchOff Voltage,Volt-Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor.

SpecialPurposeDevices: ZenerDiode-Characteristics,VoltageRegulator.Principle of Operation-SCR,Tunneldiode,UJT,Varactor Diode.

UNIT–IV

Analysis and Design of Small Signal Low Frequency BJT Amplifiers: Transistor Hybrid model,Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CBand CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and by pass capacitor on CE Amplifier.

UNIT–V

FET Amplifiers: Small Signal Model**,** Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFETAmplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOSAmplifiers.

TEXTBOOKS:

1. ElectronicDevicesandCircuits-JacobMillman,McGrawHillEducation
2. ElectronicDevicesandCircuitstheoryRobertL.Boylestead,LouisNashelsky,11th Edition, 2009,Pearson**.**

REFERENCEBOOKS:

1. TheArtofElectronics,Horowitz,3rd Edition CambridgeUniversityPress
2. ElectronicDevicesand Circuits,DavidA.Bell– 5th Edition,Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2Ed.,2008,McGrawHill

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EC309PC:ELECTRONIC DEVICES AND CIRCUITSLAB

B.Tech. IIYearISem.

L	T	P	C
0	0	2	1

ListofExperiments (Twelveexperimentstobedone):

Verify any twelve experiments in H/W Laboratory

1.PNJunctiondiode characteristics A)Forward bias B)Reversebias.
2.Zener diodecharacteristics and Zener as voltage Regulator
3.FullWave Rectifier with &without filters
4.InputandoutputcharacteristicsofBJTinCE Configuration
5.InputandoutputcharacteristicsofFEinCSConfiguration
6.CommonEmitter Amplifier Characteristics
7.CommonBaseAmplifier Characteristics
8.CommonSource amplifier Characteristics
9. Measurement of h-parameters of transistor in CB, CE, CC configurations
10. Switching characteristics of a transistor
11.SCRCharacteristics.
12.TypesofClippersatdifferentreferencevoltages
13.TypesofClampersatdifferentreferencevoltages
14.Thesteadystateoutputwaveform of clampers forasqu are wave input

Major Equipment required for Laboratories:

1. Regulated Power Suppliers, 0-30V
2. 20MHz,Dual Channel CathodeRay Oscilloscopes.
3. Functions Generators-Sine and Square wave signals
4. Multimeters
5. Electronic Components

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21ME313PC: FLUID MECHANICS AND HYDRAULIC MACHINESLAB

B.Tech. II Year I Sem.

L	T	P	C
0	0	2	1

Course Objectives:

- To understand the basic principles of fluid mechanics.
- To identify various types of flows.
- To understand boundary layer concept sand flow through pipes.
- To evaluate the performance of hydraulic turbines.
- To understand the functioning and characteristic curves of pumps.

Course Outcomes:

- Able to explain the effect of fluid properties on a flow system.
- Able to identify type of fluid flow patterns and describe continuity equation.
- Toanalyzeavarietyofpracticalfluidflowandmeasuringdevicesandutilizefluidmechanicsprinciplesin design.
- Toselectandanalyzeanappropriateturbinewithreferencetogivensituationinpowerplants.
- To estimate performance parameters of a given Centrifugal and Reciprocating pump.
- Abletodemonstrate boundary layer concepts

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelt on Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orificemeter.
10. Determination of friction factor for a given pipeline.
11. Determination of loss of head due to sudden contractionina pipeline.
12. Verification of Bernoulli’s Theorems.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21MC303: CONSTITUTION OF INDIA

B.Tech. II Year I Sem. L T P C
3 0 0 0

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it"as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality

14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21CS405PC-DATABASE MANAGEMENT SYSTEMS

B.Tech. II Year IISem.

L	T	P	C
3	0	0	3

.**Course Objectives:**

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- Topics include data models, database design, relational model, relational algebra, transaction
- control, concurrency control, storage structures and access techniques.

Course Outcomes:

- Gain knowledge of fundamentals of DBMS, database design and normal forms
- Master the basics of SQL for retrieval and management of data.
- Be acquainted with the basics of transaction processing and concurrency control.
- Familiarity with database storage structures and access techniques

UNIT - I

Database System Applications: A Historical Perspective, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Architecture of DBMS,Classification of DBMS.Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes, Weak Entity sets and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model

UNIT - II

Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views.Relational Algebra, Tuple relational Calculus, Domain relational calculus.

UNIT - III

SQL: QUERIES, CONSTRAINTS, TRIGGERS: form of basic SQL query, UNION, INTERSECT, and EXCEPT, Nested Queries, aggregation operators, NULL values, complex integrity constraints in SQL, triggers and active data bases.Schema Refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, multi-valued dependencies, FOURTH normal form, FIFTH normal Form,E.F.Codd rules.

UNIT - IV

Transaction Processing Concept: Transaction Concept,Transaction State, Implementation of Atomicity and Durability,.

Concurrency Control Techniques : Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions.

UNIT - V

Indexing: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.Database Security & Authorization : Introduction to DB Security issues, Discretionary access control based on granting /recovery of privileges .

TEXT BOOKS:

1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

REFERENCE BOOKS:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.

5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student EditionDatabase Management Systems

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE410PC: ELECTRICAL MACHINES-II

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

As an extension of Electrical Machines-I course this subject facilitates

- To study the performance of Transformers and Induction motors which are the major part ofindustrial drives and agricultural pump sets.
- To know the applications of transformers and induction machines

Course Outcomes:

After the completion of this course, the students should be able to

- Understand the concepts and performance of single phase transformer.
- Test the performance of single phase Transformer.
- Choose a suitable three phase transformer based on its application and also convert three phase totwo phases or vice versa.
- Understand the concepts of Construction, operation characteristics, testing (concept of circlediagram) and speed.
- Analyze speed torque characteristics and control the speed of induction motors.

UNIT-I:

Single Phase Transformers

Single phase transformers – constructional details –minimization of hysteresis and eddy current losses –E.M.F equation – operation on no load and on load – phasor diagrams. Equivalent circuit –losses andEfficiency –regulation. All day efficiency –effect of variation of frequency & supply voltage on iron losses.

UNIT-II:

Testing of Single Phase Transformer:

OC and SC tests- Sumpner's test- predetermination of efficiency and regulation – Separation of lossestest. Parallel operation with equal and unequal voltage ratios.

UNIT-III:

Auto &Polyphase Transformers:

Autotransformers –equivalent circuit – comparison with two winding transformers. Polyphase transformers –Polyphase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, and open Δ.–three winding transformers –tertiary windings- determination of Zp, Zs, and Zt transientsin switching –off load and on load tap changing, Scott connection.

UNIT-IV:

Polyphase Induction Motors:

Polyphase induction motors-construction details of cage and wound rotor machines-production of a rotatingmagnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current andPF at standstill and during operation.

Characteristics of Induction Motors:

Rotor power input, rotor copper loss and mechanical power developed and their interrelation-torqueequation-deduction from torque equation - expressions for maximum torque and starting torque – torqueslip characteristic - equivalent circuit - Phasor diagram - crawling and cogging.

UNIT-V:

Circle Diagram & Speed Control of Induction Motors:

No-load Test and Blocked rotor test –Predetermination of performance-Methods of starting and startingcurrent and Torque calculations.

Speed Control Methods:

Speed control-change of voltage, change of frequency, V/f, injection of an EMF into rotor circuit –Numerical Problems. Induction generator – principle of operation and its role in electrical systems.

Text Books

1. Electrical machines-PS Bhimbra, Khanna Publishers.
2. Electric Machines –by I.J.Nagrath&D.P.Kothari, Tata McGraw Hill, 7th Edition.2009

References

1. Electric machinery - A.E. Fitzgerald, C.Kingsley and S.Umans, McGraw Hill Companies, 5th edition
2. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2ndedition.
3. Performance and Design of AC Machines-M.G. Say. BPB Publishers.
4. Electrical Machines – M.V Deshpande, Wheeler Publishing
5. Electrical Machines – J.B. Gupta, S.K. Khataria& Son's Publications

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE412PC: POWER SYSTEMS-I

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To Study the Operation of thermal, nuclear, power plants operation.
- To Study the Operation of Gas and Hydroelectric power plants operation.
- To Design AC and DC distribution system and also Calculate voltage drop in distribution System.
- To Design Air insulated indoor/outdoor substations, and study the Voltage control and power factor improvement techniques.
- To Study the Economics aspects of power generation and Different types of tariff.

Course Outcomes:

At the end of this course, students will demonstrate the ability to:

- Understand the operation of conventional generating stations and renewable sources of electrical power.
- Compare AC and DC distribution, and Analyze voltage drop calculations.
- Understand Air insulated indoor/outdoor substations, operation, Voltage control and power factor improvement techniques.
- Analyze the Economic aspects of power generation and Different types of tariff. , Apply the above conceptual things to real world electrical power generation.

UNIT-I

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, Condensers, Chimney and cooling towers. Numerical Problems.

Nuclear Power Stations:

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. Numerical Problems.

UNIT –II

Gas and Hydroelectric Power Stations

Gas Power Stations: Principle of Operation and Components. Elements of hydroelectric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies. Numerical Problems.

Non-conventional Energy Sources (Fundamentals):

Ocean Energy, Tidal Energy, Wave Energy, wind Energy, Fuel Cells, and Solar Energy, Cogeneration and energy conservation and storage

UNIT-III

D.C.& 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.

A.C. Distribution Systems:

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

UNIT-IV

Substations, Power Factor Control

Substations: Classification of substations - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment. Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

Power Factor Control: Causes and disadvantages of Low Power factor- Methods of improving power factor-Most economical power factor-Numerical Problems.

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.

Tariff: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs.

Desirable Characteristics of a Tariff-Objectives of Tariff-Types of Tariff-Numerical Problems**.**

TEXT BOOKS :

1. Generation, Distribution and Utilization of electrical energy by C.L.Wadhwa,New age International Publishers.
2. Elements of Electrical Power Station Design, 3rd Edition, Wheeler.Pub.1998-M.V.Deshpande.
3. Power System Engineering- by R.K.RJputLaxmi Publications (P) Limited, New Delhi 2006.
4.Non conventional Energy Sources G.D.Rai Khanna Publications (P) Limited

REFERENCE BOOKS :

1. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND&COMPANY LTD., New Delhi 2004.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2018.
3. Hand book of Switchgear (BHEL) Tata Mc-Graw Hill Publication 2017.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE414PC: CONTROL SYSTEMS

B.Tech. II Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

Course Outcomes:

After successful completion of this course, the students can be able to

CO -1: Understand the various feedback control systems and mathematical models

CO-2: Analyze the system steady state and transient performance

CO-3: Evaluate the effects of feedback on system performance

CO-4: Obtain the transfer function/ state space models

CO-5: Design suitable controller and compensator for the improvement of system performance

UNIT – I: Introduction to Control Problem:

Open-Loop and Closed-loop systems, benefits of Feedback. Mathematical models of physical systems. Transfer function models of linear time-invariant systems –RLC Circuits, DC and AC servo motors. Block diagram algebra and Signal Flow Graphs.

UNIT – II: Time Response Analysis:

Standard test signals. Time response of first and second order systems for standard test inputs. Application of initial and final value theorems. Design specifications for second-order systems based on the time- response.

UNIT – III: Stability and Root Locus:

Concept of Stability, Routh-Hurwitz Criterion, Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

Introduction to Controller Design: controller design- Application of Proportional, Integral and Derivative Controllers. Design specifications in frequency-domain. Frequency domain methods of design- Lead and Lag compensators

UNIT – IV: Frequency-Response Analysis:

Relationship between time and frequency response. Bode plots- transfer function from bode plot-phase and gain margins- stability analysis. Polar and Nyquist plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margins.

UNIT – V: State Space Analysis:

Concepts of state variables. State space model - RLC circuits and DC motors. State Transition Matrix and its properties- Transformations: State space to Transfer function and vice versa. Eigen values and Stability Analysis. Concept of controllability and observability.

TEXT BOOKS:

1. "I. J. Nagrath and M. Gopal", "Control Systems Engineering", New Age International(P) Limited, Publishers, 5th edition, 2009
2. "B. C. Kuo", "Automatic Control Systems", John Wiley and sons, 8th edition, 2003.

REFERENCE BOOKS:

1. "N. K. Sinha", "Control Systems", New Age International (P) Limited Publishers, 3rdEdition, 1998.
2. "NISE", "Control Systems Engineering", John Wiley, 6th Edition, 2011.
3. "Katsuhiko Ogata", "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 3rd edition, 1998

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EC403PC: SWITCHING THEORY AND LOGIC DESIGN

B.Tech.IIYear II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Analog Electronics

Course Objectives:

- Tolearnbasictechniquesforthedesignofdigitalcircuitsandfundamentalconceptsusedinthedesign of digital systems.
- Tounderstandcommonformsofnumberrepresentationindigitalelectroniccircuitsandtobeabletocon vertbetween different representations.
- To implement simple logical operations using combination allogic circuits
- Todesigncombinationallogiccircuits,sequentiallogiccircuits.
- Toimparttostudenttheconceptsofsequentialcircuits,enablingthemtoanalyzesequentialsystemsin termsofstatemachines.
- Toimplementsynchronous statemachinesusingflip-flops.

CourseOutcomes: Attheendofthiscourse,studentswilldemonstratetheabilityto

- Understandworkingoflogicfamiliesandlogicgates.
- DesignandimplementCombinationalandSequentiallogiccircuits.
- UnderstandtheprocessofAnalogtoDigitalconversionandDigitaltoAnalogconversion.
- Beableto usePLDstoimplementthe givenlogicalproblem.

UNIT-I

Fundamentals of Digital Systems and Logic Families:
Digital signals,digital circuits,AND,OR,NOT,NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complementsarithmetic, codes, error detecting and correcting codes, characteristics ofdigital lCs, digital logic families,TTL,SchottkyTTL and CMOSlogic,inter facing CMOSand TTL,Tri-statelogic.

UNIT-II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation,andsimplificationoflogicfunctionsusingKmap,minimizationoflogicalfunctions.Don'tcareconditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry lookahead adder, serial ladder, ALU, elementary ALU design, popular MSI chips,digitalcomparator,paritychecker/generator,codeconverters,priorityencoders,decoders/drivers fordisplaydevices,Q-Mmethodoffunction realization.

UNIT-III

SequentialCircuitsandSystems:A1-bitmemory,thecircuitpropertiesofBi stable latch,the clocked SR flip flop, J, K, T and D types flip-flops, applications of flip-flops, shift registers, applications of shiftregisters, serial to parallel converter, parallel to serial converter, ring counter, sequence generator,ripple(Asynchronous)counters,synchronouscounters,countersdesignusingflipflops,specialcounterIC's,asynchronoussequentialcounters,applicationsofcounters.

UNIT-IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/Aconverter, specifications for D/A converters, examples of D/A converter lCs, sample and hold circuit,analog to digital converters: quantization and encoding, parallel comparator A/D converter, successiveapproximation A/D converter, counting A/Dconverter,dual slope A/D converter, A/D converter usingvoltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/DconverterICs

UNIT-V

SemiconductorMemoriesandProgrammableLogicDevices: Memoryorganizationandoperation,expanding memory size, classification and characteristics of memories, sequential memory, read onlymemory (ROM),read and writememory(RAM), content addressable memory (CAM), charge decoupled device memory (CCD), commonly used memory chips, ROM as a PLD, Programmable logicarray,Programmablearraylogic,complex Programmablelogicdevices(CPLDS),FieldProgrammableGateArray(FPGA).

TEXTBOOKS:

1.R.P.Jain,"ModernDigitalElectronics",McGrawHillEducation,2009.
2.M.M.Mano,"DigitallogicandComputerdesign",PearsonEducationIndia,2016.

REFERENCEBOOK:

1.A. Kumar,"Fundamentalsof DigitalCircuits",PrenticeHallIndia, 2016.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE406PC: ELECTRICAL CIRCUITS LAB

B.Tech. II Year II Sem.

L	T	P	C
0	0	3	1.5

Course Objectives:

- To design electrical systems
- To analyze a given network by applying various Network Theorems
- To measure three phase Active and Reactive power.
- To understand the locus diagrams

Course Outcomes:

- Analyze complex DC and AC linear circuits
- Apply concepts of electrical circuits across engineering
- Evaluate response in a given network by using theorems

The following experiments are required to be conducted as compulsory experiments

1. Verification of Thevenin's and Norton's Theorems
2. Verification of Superposition and Maximum Power Transfer theorems
3. Verification of compensation
4. Reciprocityand Milliman's theorems
5. Series and Parallel Resonance
6. Two port network parameters – Z – Y parameters, Analytical verification.
7. Two port network parameters – A, B, C, D & Hybrid parameters, Analytical verification
8. Separation of Self and Mutual inductance in a Coupled Circuit. Determination of Co-efficientof Coupling.

In addition to the above eight experiments, at least any two of the experiments from the followingList are required to be conducted

9. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer
   Determination of form factor for non-sinusoidal waveform
10. Measurement of Active Power for Star and Delta connected balanced loads
11. Measurement of Reactive Power for Star and Delta
12. Diagrams of RL and RC Series Circuits
13. Time response of first order RC / RL network for periodic non – sinusoidal inputs – TimeConstant and steady state error determination

TEXT BOOKS:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 2006.
2. D. Roy Choudhury, "Networks and Systems", New Age International Publications, 1998.

REFERENCE BOOKS:

1. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 2004.

21EE409PC: ELECTRICAL MACHINES-I LAB

B.Tech. II Year II Sem.

L	**T**	**P**	**C**
0	**0**	**3**	**1.5**

Course Objectives:

- To expose the students to the operation of DC Generator
- To expose the students to the operation of DC Motor.
- To examine the self-excitation in DC generators

Course Outcomes:

- Start and control the Different DC Machines.
- Assess the performance of different machines using different testing methods
- Identify different conditions required to be satisfied for self - excitation of DC Generators.
- Separate iron losses of DC machines into different components

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator
1. (Determination of critical field resistance and critical speed)
2. Load test on DC shunt generator (Determination of characteristics)
3. Load test on DC series generator (Determination of characteristics)
4. Load test on DC compound generator (Determination of characteristics.
5. Hopkinson's test on DC shunt machines (Predetermination of efficiency)
6. Fields test on DC series machines (Determination of efficiency)
7. Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies)
8. Brake test on DC compound motor (Determination of performance curves)

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

9. Brake test on DC shunt motor (Determination of performance curves)
10. Retardation test on DC shunt motor (Determination of losses at rated speed)
11. Separation of losses in DC shunt motor.

TEXT BOOKS:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,2004.

REFERENCE BOOKS:

1. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
2. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
3. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

21HS401 SOCIAL INNOVATION IN PRACTICE

B.Tech. II Year II Sem. **L T P C**
3 0 0 1.5

COURSE OBJECTIVES:
The course should enable the students to:

- Understand social innovation concepts and approaches.
- Understand the community problems, social and economical change.
- Identify new and unaddressed social needs.
- Analysis of social innovation disclosures in different sectors.

Design innovative solutions with Social impact through application of new models of leadership, collective intelligence and creativity techniques.

UNIT-I
INTRODUCTION TO SOCIAL INNOVATION

Core definitions, core elements and common features of social innovation, a topology of social innovations,history of social innovation, social and economic change, Swachh Bharat, Unnat Bharat Abhiyan, National Service Scheme (NSS).

UNIT-II
INTERACTION AND ENGAGEMENT WITH SOCIETY

Engage with community, interact with them to understand the community problems, Understanding social and economical change individuals, organizations and movements.

UNIT-III
PROCESS OF SOCIAL INNOVATION

Understanding the pain/need, description and problem definition, social and economic constraints for affordable and appropriate technology.

UNIT-IV
SOCIAL INNOVATION ACROSS FOUR SECTORS IN INDIA AND GLOBAL SCENARIO

The four sectorsthe non-profit sector, public sector, the private sector, the informal sector, links between and cross sectors

UNIT-V
SOCIAL INNOVATION CASE STUDIES

Designing and implementing social innovations, report writing and documentation, presentation of the case studies with a focus on impact and vision on society**.**

TEXT BOOKS:

1. The Power of Social Innovation: How Civic Entrepreneurs Ignite Community Networks for Good 1st Edition by Stephen Goldsmith, Michael R. Bloomberg, Gigi Georges, Tim Glynn Burke.

2. The Open Book of Social Innovation: Ways to Design, Develop and Grow Social Innovation Paperback March, 2010 by Robin Murray, Julia Caulier-Grice, Geoff Mulgan.

REFERENCE BOOKS:

1. Social innovator series: ways to design, develop and grow social innovation, the open book of social innovation by robin murray julie caulier-grice geoff mulgan.

The International Handbook on Social Innovation: Collective Action, Social Learning and Transdisciplinary Research Paperback by Frank Moulaert , Diana MacCallum. Guide to Social Innovation by Johannes HAHN and Laszlo ANDOR.

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21MA408BS: APTITUDE AND CRITICAL THINKING SKILLS PRACTICE

B.Tech. II Year II Sem. **L T P C**

3 0 0 1.5

Course Objectives:

- To categorize, apply and use thought process to distinguish between concepts of Quantitative methods.
- To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
- To critically evaluate numerous possibilities related to puzzles.

Course Outcomes:

The student will be able to

- Use their logical thinking and analytical abilities to solve Quantitative aptitude questions from company specific and other competitive tests.
- Solve questions related to Time and distance and time and work etc. from company specific and other competitive tests.
- Understand and solve puzzle related questions from specific and other competitive tests

UNIT I

NUMERICAL ABILITY:

Simplification, BODMAS, Fractions, Decimals, Squares, Square Roots, Cubes, Cube Roots, Speed Maths, LCM & HCF

UNIT II

Numerical computation:

Applications based on Numbers, Chain Rule, Ratio Proportion

Numerical Reasoning:

Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

UNIT III

Numerical estimation - I

Applications Based on Time and work, Time and Distance

Combinatory:

Counting techniques, Permutations, Combinations and Probability

Numerical estimation – II

Applications based on Percentages, Profit Loss and Discount, Simple interest and Compound Interest Partnerships.

UNIT IV

Data interpretation

Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams
Application to industry in Geometry and Menstruation

UNIT V

Critical Thinking:

Alphabet Test, Coding-Decoding, Statement and Conclusion, Statement and Arguments, Statement and Assumption, Calendars, Clocks, Cubes and dice, Counting of figures.

Books for practice

1. Quantitative aptitude by R S Agarwal, S Chand Publications
2. Verbal and non verbal Reasoning by RS Agarwal from S Chand publications

References

1. Barron‟s by Sharon Welner Green and IraK Wolf (Galgotia Publications pvt. Ltd.)
2. Quantitative Aptitude by U Mohan Rao Scitech publications
3. Quantitative Aptitude by Arun Sharma McGrawhill publications
4. Quantitative Aptitude by Ananta Asisha Arihant publications
5. Quantitative Aptitude by Abhijit Guha
6. Quantitative Aptitude by Pearson publications
7. Material from „IMS, Career Launcher and Time Institutes for Competitive exams.
8. Elementary and Higher Algebra by H. S. Hall an S. R. Knight

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21MC402: GENDER SENSITIZATION LAB

B.Tech. II Year II Sem. L T P C

COURSE DESCRIPTION

This course offers an introduction to Gender Studies, an interdisciplinary field that asks critical questions about the meanings of sex and gender in society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary. It draws on multiple disciplines – such as literature, history, economics, psychology, sociology, philosophy, political science, anthropology and media studies – to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with race, class, caste, nationality and other social identities. This course also seeks to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination. The course also features several exercises and reflective activities designed to examine the concepts of gender, gender-based violence, sexuality, and rights. It will further explore the impact of gender-based violence on education, health and development.

Objectives of the Course:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

Learning Outcomes:

- Students will have developed a better understanding of important issues related to gender in
- contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and
- legal aspects of gender. This will be achieved through discussion of materials derived from
- research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to
- counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and
- economics.
- Men and women students and professionals will be better equipped to work and live together as
- equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide
- protection and relief to women, the textbook will empower students to understand and respond to
- gender violence.

UNIT - I: UNDERSTANDING GENDER

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. GrowingupMale.FirstlessonsinCaste.

UNIT – II: GENDER ROLES AND RELATIONS

Two or Many? -Struggles with Discrimination-Gender Roles and Relations-Types of Gender Roles-Gender Roles and Relationships Matrix-Missing Women-Sex Selection and Its Consequences-Declining Sex Ratio. Demographic Consequences-Gender Spectrum: Beyond the Binary

UNIT – III: GENDER AND LABOUR

Division and Valuation of Labour-Housework: The Invisible Labor- "My Mother doesn't Work." "Share the Load."-Work: Its Politics and Economics -Fact and Fiction. Unrecognized and Unaccounted work. - Gender Development Issues-Gender, Governance and Sustainable Development-Gender and Human Rights-Gender and Mainstreaming

UNIT – IV: GENDER - BASED VIOLENCE

The Concept of Violence- Types of Gender-based Violence-Gender-based Violence from a Human Rights Perspective-Sexual Harassment: Say No! -Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking OutIs Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Thinking about Sexual Violence Blaming the Victim-"I Fought for my Life"

UNIT – V: GENDER AND CULTURE

Gender and Film-Gender and Electronic Media-Gender and Advertisement-Gender and Popular Literature- Gender Development Issues-Gender Issues-Gender Sensitive Language-Gender and Popular Literature - Just Relationships: Being Together as Equals Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Rosa Parks-The Brave Heart.

Note: **Since it is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field from engineering departments.**

- ***Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments. Apart from the above prescribed book, Teachers can make use of any authentic materials related to the topics given in the syllabus on "Gender".***
- **ESSENTIAL READING**: The Textbook, "*Towards a World of Equals: A Bilingual Textbook on Gender" written* by A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu **published by Telugu Akademi, Telangana Government in 2015.**

ASSESSMENT AND GRADING:

- ✓ Discussion & Classroom Participation: 20%
- ✓ Project/Assignment: 30%
- ✓ End Term Exam: 50%

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE516PC: ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Pre-requisite: Basic Electrical Engineering, Analog Electronics, Electrical Circuit Analysis & Electro Magnetic fields.

Course objectives:

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Powerfactor, power, energy and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

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

- Understand different types of measuring instruments, their construction, operation and characteristics
- Identify the instruments suitable for typical measurements
- Apply the knowledge about transducers and instrument transformers to use them effectively.
- Apply the knowledge of smart and digital metering for industrial applications

UNIT-I:

Introduction to Measuring Instruments: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments–expression for the deflecting torque and control torque–Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type–extension of range of E.S. Voltmeters.

UNIT-II:

Potentiometers & Instrument Transformers: Principle and operation of D.C. Crompton's potentiometer–standardization–Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization–applications. CT and PT– Ratio and phase angle errors

UNIT-III:

Measurement of Power & Energy:

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter –driving and braking torques –errors and compensations–testing by phantom loading using R.S.S.meter.Three phase energy meter–tri-vector meter.

UNIT-IV:

DC& AC Bridges: Methods of measuring low, medium and high resistance–sensitivity of Wheat-stone's bridge, Kelvin's double bridge

Measurement of inductance and Capacitance-Maxwell's bridge, Maxwell's Inductance Bridge, Hay's bridge, Anderson's bridge-Owen's bridge. Measurement of capacitance and loss angle –Disauties's Bridge–Schering Bridge, -Wien's bridge

UNIT-V:

Transducers: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermo couples, Piezo electric transducers,

Introduction to Smart and Digital Metering:

Digital Multi-meter, True RMS meters, Clamp-on meters, Digital Storage Oscilloscope

TEXTBOOKS:

1. G.K.Banerjee,"Electrical and Electronic Measurements", PHI Learning Pvt.Ltd.,2nd Edition,2016
2. S.C.Bhargava,"Electrical Measuring Instruments and Measurements",BS Publications,2012.

REFERENCES:

1. A.K.Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co.Publications, 2005.
2. R.K.Rajput, "Electrical & Electronic Measurement & Instrumentation", S.Chand and Company Ltd.,2007.
3. Bucking ham and Price, "Electrical Measurements", Prentice–Hall,1988.
4. Reissl and, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International(P)LimitedPublishers,1st Edition 2010.
5. E.W.Golding and F.C.Widdis,"Electrical Measurements and measuring Instruments",fifthEdition,WheelerPublishing,2011.

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE518PC: POWER SYSTEMS-II

B.Tech. III Year I Sem. **L T P C**

3 0 0 3

Prerequisite: Power Systems –I and Electromagnetic field theory\

Course Objectives:

- To compute inductance and capacitance of different transmission lines.
- To understand performance of short, medium and long transmission lines.
- To examine the traveling wave performance and sag of transmission lines.
- To design insulators for over head lines and understand cables for power transmission.

Course Outcomes: After completion of this course, the student

- Able to compute inductance and capacitance for different configurations of transmission lines.
- Able to analyze the performance of transmission lines
- Can understand transient's phenomenon of transmission lines.
- Able to calculate sag and tension calculations.
- Will be able to understand overhead line insulators and underground cables.

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

UNIT-II:

Performance of Short and Medium Length 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 for symmetrical & Asymmetrical Networks, Numerical Problems. Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

Performance of Long Transmission Lines: Long Transmission Line - Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations,Surge Impedance and SIL of Long Lines, Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numerical problems).

UNIT – III Power System Transients: Types of System Transients - Wave Length and Velocity of Propagation of Waves - 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).

Various Factors Governing The Performance of Transmission Line: Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

UNIT-IV Overhead Line Insulators: Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding, Recent advances in Transmission insulators.

Sag and Tension Calculations: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT-V Underground Cables: Types of Cables, Construction, Types of Insulating materials, Calculation 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 - HV cables.

TEXT BOOKS:

1. "C. L. Wadhwa", "Electrical power systems", New Age International (P) Limited Publishers, 1998.

2. "Grainger and Stevenson", "Power Systems Analysis", Mc Graw Hill, 1 st Edition 2003.

3. "M. L. Soni, P. V. Gupta, U.S. Bhatnagar and A. Chakrabarthy", Power System Engineering, Dhanpat Rai & Co Pvt. Ltd, 2009.

REFERENCE BOOKS:

1. “I. J. Nagarath & D. P Kothari” , “Power System Engineering”, TMH, 2nd Edition 2010

2. “B. R. Gupta”, “Power System Analysis and Design”, Wheeler Publishing, 1998.

3. “Abhijit Chakrabarti and Sunitha Halder”, “Power System Analysis Operation and control”, PHI, 3rd Edition, 2010

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE519PC: POWER ELECTRONICS

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

Prerequisite:Analog Electronics,Digital Electronics

Course Objectives:

- To Design/develop suitable power converter for efficient controlor conversion of power in drive applications

- To Design/ develop suitable power converter for efficient transmission and utilization of power in power system applications.

Course Outcomes: At the end of this course students will demonstrate the ability to

- Understand the differences between signal level and power level devices.
- Analyze controlled rectifier circuits.
- Analyze the operation of DC-DC choppers.
- Analyze the operation of voltage source inverters.

UNIT-I:

Power Switching Devices: Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT,SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, SCR connections

UNIT-II:

AC-DC Converters (Phase Controlled Rectifiers): Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, General idea of gating circuits, Single phase and Three phase dual converters

UNIT-III:

DC-DC Converters (Chopper/SMPS): Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter-Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT-IV:

AC-DC Converters (Inverters): Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120- and 180-degrees mode of operation, Voltage control of single-phase inverters–single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

UNIT-V:

AC-AC Converters: Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single-phase voltage controllers for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phase cyclo-converters, relevant waveforms, circulating current mode of operation, Advantages and disadvantages.

TEXTBOOKS:

1. M.H.Rashid,“Power electronics:circuits, devices,and applications”,Pearson Education India,2009.
2. N.Mohanand T.M.Undeland,“Power Electronics: Converters,Applications and Design”,John Wiley & Sons,2007.

REFERENCEBOOKS:

1. R.W.EricksonandD.Maksimovic,“FundamentalsofPowerElectronics”,SpringerScience&Business

Media,2007.

L.Umanand,“PowerElectronics:EssentialsandApplications”,WileyIndia,2009

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE521PC: SWITCH GEAR AND PROTECTION

B.Tech. III Year I Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power Systems-I, Power Systems-II

Course Objectives:

- To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other hazards.
- To describe neutral grounding for over all protection.
- To understand the phenomenon of Over Voltages and it’s classification.

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

- Compare and contrast electromagnetic, static and microprocessor-based relays
- Apply technology to protect power system components.
- Select relay settings of over current and distance relays.
- Analyze quenching mechanisms used in air, oil and vacuum circuit breakers

UNIT–I:

Circuit Breakers

Introduction, arcing in circuit breakers, arc interruption theories, re-striking and recovery voltage, resistance switching, current chopping, interruption of capacitive current, oil circuit breaker, air blast circuit breakers, SF6 circuit breaker, operating mechanism, selection of circuit breakers, high voltage d.c.breakers,ratings of circuit breakers, testing of circuit breakers.

FUSES: Introduction, fuse characteristics, types of fuses, application of HRC fuses,

Operating Principles and Relay Construction: Electromagnetic relays, thermal relays, static relays, micro processor based protective relays.

UNIT–II: Over-Current Protection

Time-current characteristics, current setting, over current protective schemes, directional relay, protection of parallel feeders, protection of ring mains, Phase fault and earth fault protection, Combined earth fault and phase fault protective scheme, Directional earth fault relay.

Distance Protection: Impedance relay, reactance relay, MHO relay, input quantities for various types of distance relays, Effect of arc resistance, Effect of power swings, effect of line length and source impedance on the performance of distance relays, selection of distance relays,MHO relay with blinders, Reduction of measuring units, switched distance schemes,auto re-closing.

UNIT-III:

Pilot Relaying Schemes-Wire Pilot protection, Carrier current protection.

AC Machines and Bus Zone Protection: Protection of Generators, Protection of transformers, Bus-zone protection, frame leakage protection.

UNIT-IV:

Static Relays

Amplitude and Phase comparators, Duality between AC and DC, Static amplitude comparator, integrating and instantaneous comparators, static phase comparators, coincidence type of phase comparator, static over current relays, static directional relay, static differential relay, static distance relays,Multi input comparators,concept of Quadrilateral and Elliptical relay characteristics.

Microprocessor Based Relays: Advantages, over current relays, directional relays, distance relays.

UNTI-V: Protective Relays

Introduction, Need for power system protection, effects of faults, evolution of protective relays, zones of protection, primary and backup protection, essential qualities of protection, classification of protective relays and schemes, current transformers, potential transformers, basic relay terminology

TEXTBOOKS:

1. Badriram and D.N.Vishwakarma, Power System Protection and Switchgear,TMH2001.
2. U.A.Bakshi,M.V.Bakshi: Switchgear and Protection,Technical Publications,2009.

REFERENCEBOOKS:

1. C.Russel Mason–"Theart and science of protective relaying,Wiley Eastern,1995

L.P.Singh"Protective relaying from Electro mechanical to Microprocessors",New Age International

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE526PE: ELECTRICAL MACHINES-III (PE-I)

B.Tech. III Year I Sem. **L T P C**

3 0 0 3

UNIT – I: Synchronous Machines & Characteristics: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation. Harmonics in generated EMF – suppression of harmonics – 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 Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT – III: Parallel Operation of Synchronous Generator: 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 – synchronous condenser – Mathematical analysis for power developed. Power Circles: Excitation and power circles – hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT – V: Single Phase Motors & Special Machines: Single phase Motors: Single phase induction motor – Constructional features-Double revolving field theory Equivalent circuit – split-phase motors – Capacitor start Capacitor run motors. Principles of A.C. Series motor-Universal motor, Stepper motor shaded pole motor.

TEXT BOOKS: 1. Electrical machines-PS Bhimbra, Khanna Publishers.
2. Principles of Electrical Machines, V. K. Mehta, Rohit Mehta, S. Chand Publishing.

REFERENCE BOOKS:
1. Electromachanics-III (Synchronous and single phase machines), S.Kamakashiah, Right Publishers
2. Electric Machines, I.J. Nagrath& D.P. Kothari, Tata McGraw – Hill Publishers.
3. Performance and Design of AC Machines, MG.Say, BPB Publishers.
4. Theory of Alternating Current Machinery, Langsdorf, Tata McGrawHill Companies.

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE527PE: OPTIMIZATION TECHNIQUES (PE-I)

B.Tech. III Year I Sem. **L T P C**
3 0 0 3

Prerequisite: Mathematics–I,Mathematics–II

Course Objectives:

- To introduce various optimization technique si.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
- Constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- To explain the concept of Dynamic programming and its applications to project implementation.

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

- Explain the need of optimization of engineering systems
- Understand optimization of electrical and electronics engineering problems
- apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- apply unconstrained optimization and constrained non-linear programming and dynamic programming
- Formulate optimization problems.

UNIT-I

Introduction and Classical Optimization Techniques: Statement of an Optimization problem – design vector–design constraints–constraint surface–objective function–objective function surfaces-Classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization–multivariable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn– Tucker conditions.

UNIT-II

Linear Programming: Standard form of a linear programming problem–geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method–testing for optimality of balanced transportation problems.

UNIT-III

Unconstrained Non-linear Programming: One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method

Unconstrained Optimization Techniques: Uni-variant method, Powell's method and steepest descent method.

U**NIT-IV**

Constrained Non-linear Programming: Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method – Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT-V

Dynamic Programming: Dynamic programming multistage decision processes – types – concept ofsub optimization and the principle of optimality – computational procedure in dynamic programming –examples illustrating the calculus method of solution - examples illustrating the tabular method ofsolution.

TEXTBOOKS:

1. SingiresuS.Rao,Engineering Optimization:Theoryand PracticebyJohnWileyand Sons,4th edition,2009.
2. H.S.Kasene&K.D.Kumar,IntroductoryOperationsResearch,Springer(India),Pvt.Ltd.,2004

REFERENCEBOOKS:

1. GeorgeBernardDantzig, MukundNarain Thapa,"Linearprogramming", Springerseries inoperationsresearch 3rd edition,2003.
2. H.A.Taha,"OperationsResearch:AnIntroduction",8th Edition,Pearson/PrenticeHall,2007.
3. KalyanmoyDeb,"Optimization forEngineeringDesign–AlgorithmsandExamples",PHILearningPvt.Ltd,NewDelhi,2005.

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE528PE: ADVANCED CONTROL SYSTEMS (PE-I)

B.Tech. III Year I Sem. **L T P C**

3 0 0 3

Objective: This subject deals with state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

UNIT – I: Stability Analysis-I: Frequency Domain: Polar Plots-Nyquist Plots-Stability Analysis. Lag, Lead, Lead-Lag Controllers design in frequency Domain.

UNIT –II: S Stability Analysis-II: Stability in the sense of Lyapunov. Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

UNIT –III: Phase-Plane Analysis: Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

UNIT – IV: Describing Function Analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

UNIT – V: 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. Advanced Control Systems, B. N. Sarkar, PHI Learning Private Limited.
2. Advanced Control Theory, Somanath Majhi, Cengage Learning.

REFERENCE BOOKS: 1. Control Systems theory and applications, S.K Bhattacharya, Pearson. 2. Control Systems, N.C.Jagan, BS Publications.
3. Control systems, A.Ananad Kumar, PH

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE511PC: ELECTRICAL MACHINES-II LAB

B.Tech. III Year I Sem.

L	T	P	C
0	0	3	1.5

Prerequisite: Electrical Machines–I & Electrical Machines–II

Course Objectives:

- To understand the operation of synchronous machines
- To understand the analysis of power angle curve of asynchronous machine
- To understand the equivalent circuit of a single-phase transformer and single-phase induction motor
- To understand the circle diagram of an induction motor by conducting a blocked rotor test.

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

- Assess the performance of different machines using different testing methods
- To convert the Phase from three phase to two phase and vice versa
- Compensate the changes in terminal voltages of synchronous generator after estimating the change by different methods
- Control the active and reactive power flows in synchronous machines
- Start different machines and control the speed and power factor

The following experiments are required to be conducted as compulsory experiments

1. O.C.& S.C. Tests on Single phase Transformer

2. Sumpner's test on a pair of single-phase transformers
3. No-load & Blocked rotor tests on three phase Induction motor
4. Regulation of a three–phase alternator by EMF & MMF methods
5. Scott Connection of transformer
6. Break test on Three phase Induction motor
7. Equivalent Circuit of a single-phase induction motor
8. Determination of Xd and Xq of a salient pole synchronous machine

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

1. Separation of core losses of a single-phase transformer
2. Efficiency of a three-phase alternator
3. Parallel operation of Single-phase Transformers
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
5. Heat run test on a bank of 3 No's of single-phase Delta connected transformers
6. Measurement of sequence impedance of a three-phase alternator.
7. Vector grouping of Three Transformer

TEXTBOOKS:

1. A.E.Fitzgerald and C.Kingsley,"Electric Machinery",M c Graw Hill Education,2013.
2. M.G.Say,"Performance and design of AC machines",CBS Publishers,2002.

REFERENCEBOOKS:

1. P.S.Bimbhra,"Electrical Machinery",Khanna Publishers,2011.
2. I. J. Nagrathand D. P.Kothari, "ElectricMachines",Mc Graw Hill Education, 2010.
3. A. S.Langsdorf,"Alternating current machines",Mc Graw Hill Education,1984.
4. P.C.Sen,"Principles of Electric Machines and Power Electronics",JohnWiley & Sons,2007

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE

(UGC-AUTONOMOUS)

21EE515PC: CONTROL SYSTEMS & SIMULATION LAB

B.Tech. III Year I Sem. **L T P C**

0 0 3 1.5

Prerequisite: Control Systems

Course Objectives:

- To understand the different ways of system representations such as Transfer function representation and state space representations and to assess the system dynamic response
- To assess the system performance using time domain analysis and methods for improving it
- To assess the system performance using frequency domain analysis and techniques for improving the performance
- To design various controllers and compensators to improve system performance

Course Outcomes: After completion of this lab the student is able to

- How to improve the system performance by selecting a suitable controller and/or a compensator for a specific application
- Apply various time domain and frequency domain techniques to assess the system performance
- Apply various control strategies to different applications (example: Power systems, electrical drives etc)
- Test system controllability and observability using state space representation and applications of state space representation to various systems

The following experiments are required to be conducted compulsory experiments:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller–Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.
4. Effect of feedback on DC servomotor
5. Transfer function of DC motor
6. Transfer function of DC generator
7. Temperature controller using PID
8. Characteristics of AC servo motor

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

1. Effect of P,PD,PI,PID Controller on a second order systems
2. Lag and lead compensation–Magnitude and phase plot
3. (a)Simulation of P, PI, PID Controller.
4. (b)Linear system analysis(Time domain analysis, Error analysis)using suitable software
5. Stability analysis (Bode,RootLocus, Nyquist) of Linear Time Invariant system using suitable software
6. State space model for classical transfer function using suitable software-Verification.
7. Design of Lead-Lag compensator for the given system and with specification using suitable software

TEXTBOOKS:

1. M.Gopal,“Control Systems:Principles and Design”,Mc Graw Hill Education, 1997.
2. B. C.Kuo,“Automatic Control System”, Prentice Hall,1995

REFERENCEBOOKS:

1. K.Ogata,“Modern Control Engineering”, Prentice Hall,1991.
2. J.Nagrath and M.Gopal,“Control Systems Engineering”, New Age International,2009

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE513PC: POWER SYSTEM & SIMULATION LAB

B.Tech. III Year I-Sem.

L	T	P	C
0	0	3	2

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Electrical Machines

Course Objectives:

- Perform testing of CT,PT's and Insulator strings
- To find sequence impedances of 3-Φ synchronous machine and Transformer
- To perform fault analysis on Transmission line models and Generators.

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

- Perform various load flow techniques
- Understand Different protection methods
- Analyze the experimental data and draw the conclusions**.**

The following experiments are required to be conducted as compulsory experiments:

Part-A

1. Characteristics of IDMT Over-Current Relay.
2. Differential protection of 1-Φ transformer.
3. Characteristics of Micro Processor based Over Voltage/Under Voltage relay.
4. A,B,C,D constants of a Long Transmission line
5. Finding the sequence impedances of 3-Φ synchronous machine.
6. Finding the sequence impedances of 3-Φ Transformer.

In addition to the above six experiments, at least any four of the experiments from the

following list are required to be conducted.

Part-B

1. Formation of Y BUS.
2. Load Flow Analysis using Gauss Seidal (GS) Method.
3. Load Flow Analysis using Fast Decoupled (FD) Method.
4. Formation of Z BUS.
5. Simulation of Compensated Line
6. Performance testing of CT and PT and insulator strings.

TEXT BOOKS:

1. C.L.Wadhwa: Electrical Power Systems–Third Edition, New Age International Pub.Co.,2001.
2. Hadi Sadat: Power System Analysis–Tata Mc Graw Hill Pub.Co.2002.

REFERENCEBOOK:

1.D.P.Kothari:Modern Power System Analysis-Tata McGrawHillPub.Co.2003

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
*21MC505: ENVIRONMENTAL SCIENCE

B.Tech. III Year I-Sem.

L	T	P	C
2	0	0	0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

UNIT-I

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II

Natural Resources: Classification of Resources: Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III

Biodiversity And Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.
Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts: C**limate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

UNIT-V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning PrivateLtd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI LearningPvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Introduction to Environmental Science by Y. Anjaneyulu, BS.Publications.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21MC507: ARTIFICIAL INTELLIGENCE

B.Tech. III Year I-Sem.

L	T	P	C
2	0	0	0

Course Objectives: To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

UNIT - I

Introduction: AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents

Basic Search Strategies: Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A*), Constraint Satisfaction (Backtracking, Local Search)

UNIT - II

Advanced Search: Constructing Search Trees, Stochastic Search, A* Search Implementation, Minimax Search, Alpha-Beta Pruning

Basic Knowledge Representation and Reasoning: Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

UNIT - III

Advanced Knowledge Representation and Reasoning: Knowledge Representation Issues, Nonmonotonic

Reasoning, Other Knowledge Representation Schemes

Reasoning Under Uncertainty: Basic probability, Acting Under Uncertainty, Bayes' Rule,

Representing Knowledge in an Uncertain Domain, Bayesian Networks

UNIT - IV

Learning: What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving,

Learning from Examples, Winston's Learning Program, Decision Trees.

UNIT - V

Expert Systems: Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

TEXT BOOK:

1. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

REFERENCE BOOKS:

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.

2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21SM601MS: BUSINESS ECONOMICS & FINANCIAL ANALYSIS

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Course Objective:

- To learn the basic Business types, impact of the Economy on Business and Firms specifically.
- To analyze the Business from the Financial Perspective.

Course Outcome:

- The students will understand the various Forms of Business and the impact of economic variables on the Business.
- The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt.
- The Students can study the firm's financial position by analysing the Financial Statements of a Company

UNIT – I

Introduction to Business and Economics:

Business: Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

Economics: Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply in Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

UNIT - II

Demand and Supply Analysis:

Elasticity of Demand: Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

Supply Analysis: Determinants of Supply, Supply Function & Law of Supply.

UNIT - III

Production, Cost, Market Structures & Pricing:

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

Cost analysis: Types of Costs, Short run and Long run Cost Functions.

Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

UNIT - IV

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

UNIT - V

Financial Analysis through Ratios: Concept of Ratio Analysis, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios (simple problems). Introduction to Fund Flow and Cash Flow Analysis (simple problems).

TEXT BOOKS:

1. D.D. Chaturvedi, S.L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata McGraw Hill, 2011.

3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata McGraw Hill Education Pvt. Ltd. 2012.

REFERENCES:

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE622PC: COMPUTER METHODS IN POWER SYSTEMS

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Systems-I & Power Systems –II

Course Objectives:

- To understand and develop Y_{bus} and Z_{bus} matrices
- To know the importance of load flow studies and its importance
- To analyze various types of short circuits
- To know rotor angle stability of power systems

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

- Develop the Y_{bus} and Z_{bus} matrices
- Analyze load flow for various requirements of the power system
- Analyze short circuit studies for the protection of power system
- Estimate stability and instability in power systems

UNIT - I

Power System Network Matrices: Graph Theory: Definitions and Relevant concepts in Graph Theory, Network Matrices. Transmission Network Representations: Bus Admittance frame and Bus Impedance frame. Formation of Y_{bus}: Direct and Singular Transformation Methods, Numerical Problems. Formation of Z_{Bus}: Modification of existing Z_{Bus} Matrix for addition of a new branch, & complete Z_{Bus} building algorithm Numerical Problems.

UNIT – II

Power Flow Studies – I: Introduction: Necessity of Power Flow Studies, Bus classification and Notations, Convergence & Bus mismatch criteria. Load Flow Methods: Gauss-Seidal Method in complex form without & with voltage control buses, line flows and loss calculations, Newton Raphson method in Polar and Rectangular form, derivation of Jacobian elements, Numerical Problems for one or two iterations.

UNIT – III

Power Flow Studies - II: Introduction to sensitivity & decoupled sub matrices of J-matrix, Decoupled load flow method and its assumptions, Fast Decoupled load method and its assumptions, Comparison of Different Methods – DC load Flow method, Numerical problems for one or two iterations.

UNIT – IV

Short Circuit Analysis: Per-Unit Systems. 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. Symmetrical Components, sequence impedances and networks, Numerical Problems. Unsymmetrical Fault Analysis: Fault current calculations for LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT – V

Power System Stability Analysis: Introduction to Power System Stability issues. Rotor dynamics & Swing equation, Power angle equation with & without neglecting line resistance, Steady State Stability, Determination of Transient Stability through Equal Area Criterion for single machine infinite system, Critical clearing angle & time, Numerical problems. Multi-machine transient analysis: Classical representation of system and its assumptions, Solution of Swing Equation by Point-by-Point Method, Methods to improve Stability.

TEXT BOOKS:

1. "I. J. Nagrath& D. P. Kothari", "Modern Power system Analysis", Tata McGraw-Hill Publishing Company, 4thEdition2011.
2. "Hadi Saadat", "Power System Analysis", TMH Edition,2002.

REFERENCE BOOKS:

1. "M. A. Pai", "Computer Techniques in Power System Analysis", TMH Publications, 3rd Edition 2014.
2. GraingerandStevenson,"PowerSystemAnalysis",TataMcGrawHill,2003.
3. Abhijit Chakrabarthi and Sunita Haldar, "Power System Analysis Operation and Control", 3rd Edition, PHI,2010.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EC624PC: MICROPROCESSORS & MICROCONTROLLERS

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Nil

Course Objectives:

- To familiarize the architecture of microprocessors and micro controllers
- To provide the knowledge about interfacing techniques of bus & memory.
- To understand the concepts of ARM architecture
- To study the basic concepts of Advanced ARM processors

Course Outcomes: Upon completing this course, the student will be able to

- Understands the internal architecture, organization and assembly language programming of8086 processors.
- Understands the internal architecture, organization and assembly language programming of8051/controllers
- Understands the interfacing techniques to 8086 and 8051 based systems.
- Understands the internal architecture of ARM processors and basic concepts of advanced ARMprocessors.

UNIT -I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT -II:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

UNIT –III:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT –IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

UNIT – V:

PIC Architecture: Block diagram of basic PIC 18 micro controller – registers I/O ports,

Raspberry Pi : Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals.

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K. M. Bhurchandani, TMH, 2nd Edition 2006.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier,2012

REFERENCE BOOKS:

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
3. The 8051 Microcontrollers, Architecture and Programming and Applications -K. Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP- L138 Experimenter, Donald Reay,WILEY 2012.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE649OE: INTRODUCTION TO FUZZY LOGIC AND NEURAL NETWORKS (OE)

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the basics of Neural Networks and its architectures.
- To introduce the Fuzzy sets and Fuzzy Logic system components
- To deal with the applications of Neural Networks and Fuzzy systems

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

- To understand artificial neural network models and their training algorithms
- To understand the concept of fuzzy logic system components, fuzzification and defuzzification
- Apply the above concepts to real-world problems and applications.

UNIT – I

Introduction To Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Essentials of Artificial Neural Networks: 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

Feed Forward Neural Networks: Single Layer Feed Forward Neural Networks: Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications.

Multilayer Feed forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Backpropagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements.

UNIT - III

Associative Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules Hamming Distance, The Linear Associator, Matrix Memories, Content Addressable Memory).

Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT – IV

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

UNIT – V

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

TEXT BOOKS:

1.Rajasekharan and Pai, Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications– PHI Publication, 1 st Edition, 1905
2. Satish Kumar, Neural Networks, TMH, 2004.

REFERENCE BOOKS:

1. “James A Freeman and Davis Skapura”, Neural Networks, Pearson Education, 2002.
2. “Simon Hakins”, Neural Networks, Pearson Education, 3rd Edition 2008.
3. C. Eliasmith and Ch. Anderson, Neural Engineering, PHI, 2004.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE648OE: RENEWABLE ENERGY SOURCES

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To explain the concepts of Non-renewable and renewable energy systems
- To outline utilization of renewable energy sources for both domestic and industrial applications
- To analyse the environmental and cost economics of renewable energy sources in comparison with fossil fuels.

Course Outcomes:

After the completion of this laboratory course, the student will be able

- Understanding of renewable energy sources
- Knowledge of working principle of various energy systems
- Capability to carry out basic design of renewable energy systems

UNIT-I

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Nonrenewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO2 reduction potential of renewable energy- concept of Hybrid systems.

UNIT-II

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

UNIT-III

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy – Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

UNIT-IV

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications, alcohol production from biomass, bio diesel production, Urban waste to energy conversion, Biomass energy programme in India.

UNIT-V

Ocean Energy: Ocean wave energy conversion, principle of Ocean Thermal Energy Conversion (OTEC), ocean thermal power plants, tidal energy conversion, Tidal and wave energy its scope and development, Scheme of development of tidal energy.

1. **Small hydro Power Plant:** Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.

2. **Geothermal Energy:** Geothermal power plants, various types, hot springs and steam ejection.

REFERENCE BOOKS:

1. Non-Conventional Energy Sources by G.D Rai

2. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.

3. Kishore VVN, Renewable Energy Engineering and Technology, Teri Press, New Delhi, 2012

4. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future, Oxford University Press, U.K, 1996.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE629PE: DIGITAL CONTROL SYSTEMS (PE – II)

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Control Systems

Course Objectives:

- To understand the fundamentals of digital control systems, z-transforms
- To understand state space representation of the control systems, concepts of controllability and observability.
- To study the estimation of stability in different domains
- To understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Obtain discrete representation of LTI systems.
- Analyze stability of open loop and closed loop discrete-time systems.
- Design and analyze digital controllers.
- Design state feedback and output feedback controllers.

UNIT- I

Discrete Representation Of Continuous Systems: Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modeling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

UNIT- II

Discrete System Analysis: Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

Stability of Discrete Time System: Stability analysis by Jury test. Stability analysis using bilinear transformation. Design of digital control system with dead beat response. Practical issues with dead beat response design.

UNIT- III

State Space Approach for Discrete Time Systems: State space models of discrete systems, State space analysis. Lyapunov Stability. Controllability, reach-ability, Re constructibility and observability analysis. Effect of pole zero cancellation on the controllability & observability.

UNIT- IV

Design of Digital Control System: Design of Discrete PID Controller, Design of discrete state feedback controller. Design of set point tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator.

UNIT- V

Discrete Output Feedback Control: Design of discrete output feedback control. Fast output sampling (FOS) and periodic output feedback controller design for discrete time systems.

TEXT BOOKS:

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs,1995.
2. M. Gopal, “Digital Control Engineering”, Wiley Eastern,1988.

REFERENCE BOOKS:

1. G.F.Franklin,J.D.Powell and M.L.Workman,“Digital Control of Dynamic Systems”, Addison- Wesley,1998.
2. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston,1980.

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
(21EE630PE) ELECRICAL DRIVES AND CONTROL (PE – II)

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the drive system and operating modes of drive and its characteristics
- To understand Speed – Torque characteristics of different motor drives by various power converter topologies
- To appreciate the motoring and braking operations of drive
- To differentiate DC and AC drives

Course Outcomes:

- After completion of this course the student is able to
- Identify the drawbacks of speed control of motor by conventional methods.
- Differentiate Phase controlled and chopper-controlled DC drives speed-torque characteristics merits and demerits
- Understand Ac motor drive speed-torque characteristics using different control strategies its merits and demerits
- Describe Slip power recovery schemes

UNIT – I:

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

UNIT – II:

Four Quadrant Operation of DC Drives through Dual Converters: Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of D.C motors by dual converters–Closed loop operation of D.C motor (Block Diagram Only).

UNIT-III:

Control of DC Motors By Choppers (1-, 2-, 4- Quadrant Operations): Single quadrant, Two–quadrant and four quadrant chopper fed dc separately excited and series excited motors – Continuous current operation – Output voltage and current wave forms–Speed torque expressions–speed torque characteristics – Problems on Chopper fed DC Motors – Closed Loop operation (Block Diagram Only).

UNIT –IV:

Control of Induction Motors: Variable voltage 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).

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

UNIT – V:

Control of Synchronous Motors: Separate control & self control of synchronous motors – Operation of self controlled synchronous motors by VSI and CSI cyclo converters. Load commutated CSI fed Synchronous Motor – Operation – Waveforms – speed torque characteristics – Applications – Advantages and Numerical Problems – Closed Loop control operation of synchronous motor drives (Block Diagram Only), variable frequency control, Cyclo converter, PWM, VFI, CSI.

TEXT BOOKS:

Power Semiconductor Drives, PV Rao, BS Publications.
Fundamentals of Electric Drives, G K Dubey Narosa Publications

REFERENCE BOOKS:

1.Power Semiconductor Drives, S. B. Dewan, G. R. Slemon , A. Straughen, Wiley Pvt Ltd.

Electric Drives N.K.De,P.K.Sen,PHIL earning Private Ltd.

2.Thyristor Control of Electric drives, Vedam Subramanyam Tata McGraw HillPublications.

3.Electrical machines and Drive Systems, John Hindmarsh, Alasdair Renfrew, Newnes.

4.Electric Motors and Drives, Fundamentals, Types and Applications Austin Hughes, Newnes.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE631PE: UTILIZATION OF ELECTRICAL ENERGY (PE – II)

B.Tech. III Year II-Sem.

L	T	P	C
3	0	0	3

B.Tech. III Year II Sem.

Course Objectives:

- To understand the fundamentals of illumination and good lighting practices
- To understand the methods of electric heating and welding.
- To understand the concepts of electric drives and their application to electrical traction systems.

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

- Acquire knowledge on, electric drives characteristics and their applicability in industry based on the nature of different types of loads and their characteristics
- Understands the concepts and methods of electric heating, welding, illumination and electric traction
- Apply the above concepts to real-world electrical and electronics problems and applications..

UNIT – I:

Electric Drives: Type of electric drives,choice of motor,starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, loadequalization.

UNIT – II:

Electric Heating & Welding: Electric Heating: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating.

Electric welding: resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III:

Illumination : Introduction, terms used in illumination, laws of illumination, polar curves, photometry, integrating sphere, sources of light. Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT – IV:

Electric Traction-I : System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, methods of electric braking-plugging rheostatic braking and regenerative braking. Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT – VIII

Electric Traction-II: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

TEXT BOOK:

Utilization of Electrical Power, Er. R. K. Rajput, Laxmi Publications

1. Art & Science of Utilization of electrical Energy, Partab, Dhanpat Rai &Sons.

REFERENCEBOOKS:

1. Utilization of Electric Energy, E. Openshaw Taylor, University press.
2. Generation, Distribution and Utilization of electrical Energy, C.L. Wadhwa, New Age International (P) Limited.
3. Utilization of Electrical Power including Electric drives and Electric traction, N.V.Suryanarayana, New Age International (P)Limited.
4. Utilization of Electric Energy, VVL Rao, University Press.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EN603HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB

B.Tech. III Year II Semester

L	T	P	C
0	0	3	1.5

1. INTRODUCTION:

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

2. OBJECTIVES:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

1. To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
2. Further, they would be required to communicate their ideas relevantly and coherently in writing.
3. To prepare all the students for their placements.

3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary - Starting a conversation – responding appropriately and relevantly – using the right body language– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. Activities on Reading Comprehension –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. Activities on Writing Skills – Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing –improving one's writing.
4. Activities on Presentation Skills – Oral presentations (individual and group) through JAM Sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.
5. Activities on Group Discussion and Interview Skills – Dynamics of group discussion, Intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. MINIMUM REQUIREMENT:

The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

5. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 7th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd.2nd Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5thEdition.

REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill2009

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE620PC: POWER ELECTRONICS AND SIMULATION LAB

B.Tech. III Year II-Sem.

L	T	P	C
0	0	3	1.5

Prerequisite: Power Electronics

Course Objectives:

- Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
- Design the power converter with suitable switches meeting a specific load requirement.

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

- Understand the operating principles of various power electronic converters.
- Use power electronic simulation packages& hardware to develop the power converters.
- Analyze and choose the appropriate converters for various applications

Any eight experiments should be conducted

1. Study of Characteristics of SCR, MOSFET &IGBT
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase half controlled &fully controlled bridge converter with R and RL Loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. Single Phase Cyclo-converter with R and RL loads
7. Single Phase series& parallel inverter with R and RL loads
8. Single Phase Bridge inverter with R and RL loads

Any two experiments should be conducted

1. DC Jones chopper with R and RL Loads
2. Three Phase half-controlled bridge converter with R-load
3. Single Phase dual converter with RL loads
4. (a)Simulation of single-phase Half wave converter using R and RL loads (b)Simulation of single-phase full converter using R, RL and RLE loads (c)Simulation of single-phase Semi converter using R, RL and RLE loads
5. (a)Simulation of Single-phase AC voltage controller using R and RL loads (b)Simulation of Single phase Cyclo-converter with R and RL-loads
6. Simulation of Buck chopper
7. Simulation of single-phase Inverter with PWM control
8. Simulation of three phase fully controlled converter with R and RL loads, with and without freewheeling diode. Observation of waveforms for Continuous and Discontinuous modes of operation.
9. Study of PWM techniques

TEXT BOOKS:

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications.
2. User's manual of related software's

REFERENCE BOOKS:

1. Reference guides of related software's
2. Rashid, Spice for power electronics and electric power, CRC Press

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE617PC: ELECTRICAL MEASUREMENTS LAB

B.Tech. III Year II-Sem.

L	T	P	C
0	0	3	1.5

Pre-requisite: Measurements and Instrumentation

Course Objectives:

- To calibrate LPF Watt Meter, energy meter, P. F Meter using electro dynamo meter type instrument as the standard instrument
- Todetermineunknowninductance,resistance,capacitancebyperformingexperimentsonD. C Bridges & A. C Bridges
- To determine three phase active & reactive powers using single wattmeter method practically
- To determine the ratio and phase angle errors of current transformer and potential transformer.

Course Outcomes: After completion of this lab the student is able to

- to choose instruments
- test any instrument
- find the accuracy of any instrument by performing experiment
- calibrate PMMC instrument using D.C potentiometer

The following experiments are required to be conducted as compulsory experiments

1. Calibration and Testing of single-phase energy Meter.
2. Measurement of choke coil parameters using 3-voltmeter and 3-Ammeter method.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of displacement with the help of LVDT.

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

9. Calibration LPF wattmeter – by Phantom testing.
10. Measurement of 3-phase power with single watt meter and two CTs.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
12. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of the given PT
13. Resistance strain gauge – strain measurements and Calibration.
14. Transformer turns ratio measurement using AC bridges.
15. Measurement of % ratio error and phase angle of given CT by comparison.

TEXT BOOKS:

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016
2. "S.C.Bhargava","ElectricalMeasuringInstrumentsandMeasurements",BSPublications,2012.

REFERENCE BOOKS:

1. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications,2005.
2. "R.K.Rajput","Electrical&ElectronicMeasurement&Instrumentation",S.ChandandCompany Ltd.,2007.

B.TECH. EEE **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE625PC: ELECTRICAL & ELECTRONICS DESIGN LAB

B.Tech. III Year II-Sem.

L	T	P	C
0	0	3	1.5

Prerequisite: Basics of Electrical Engineering

Course Objectives:

- To enhance practical knowledge related to different subjects
- To develop hardware skills such as soldering, winding etc.
- To develop debugging skills.
- To increase ability for analysis and testing of circuits.
- To give an exposure to market survey for available components
- To develop an ability for proper documentation of experimentation.
- To enhance employability of a student.
- To prepare students for working on different hardware projects**.**

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

- Get practical knowledge related to electrical
- Fabricate basic electrical circuit elements/networks
- Trouble shoot the electrical circuits
- Design filter circuit for application
- Get hardware skills such as soldering, winding etc.
- Get debugging skills.

Group A:

1. Design and fabrication of reactor/ electromagnet for different inductance values.
2. Design and fabrication of single-phase Induction/three phase motor stator.
3. Start delta starter wiring for automatic and manual operation.
4. Wiring of distribution box with MCB, ELCB, RCCB and MCCB.
5. Wiring of 40 W tube, T-5, LED, Metal Halide lamps and available latest luminaries.
6. Assembly of various types of contactors with wiring.
7. Assembly of DOL and 3-point starter with NVC connections and overload operation.

Group B: This group consists of electronic circuits which must be assembled and tested on general purpose PCB or bread boards.

1. Design and development of 5 V regulated power supply.
2. Design and development of precision rectifier.
3. Design and development of first order/ second order low pass/high pass filters with an application.
4. Microcontroller Interface circuit for temperature/level/speed/current/voltage measurement.
5. Peak detector using op-amplifiers.
6. Zero crossing detector using op-amplifiers.
7. PCB design and layout.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MC604: INTELLECTUAL PROPERTY RIGHTS

B.Tech. III Year II-Sem.

L	T	P	C
2	0	0	0

UNIT – I

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT – II

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

UNIT – III

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

UNIT – IV

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation. Unfair competition: Misappropriation right of publicity, false advertising.

UNIT – V

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

TEXT & REFERENCE BOOKS:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21MC606: CYBER SECURITY

B.Tech. III Year II-Sem.

L	T	P	C
2	0	0	0

Prerequisites: NIL

Course objectives:

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

Course Outcomes: The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT- IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. **Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

Cybercrime: Examples and Mini-Cases

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

TEXT BOOKS:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

REFERENCES:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE723PC: POWER SYSTEM OPERATION AND CONTROL

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Pre-requisites: Power System-I, Power System-II

Course Objectives:

- To understand real power control and operation
- To know the importance of frequency control
- To analyze different methods to control reactive power
- To understand unit commitment problem and importance of economic load dispatch
- To understand real time control of power systems

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

- Understand operation and control of power systems.
- Analyze various functions of Energy Management System (EMS) functions.
- Analyze whether the machine is in stable or unstable position.
- Understand power system deregulation and restructuring

UNIT-I

Load Flow Studies

Introduction, Bus classification -Nodal admittance matrix - Load flow equations - Iterative methods -Gauss and Gauss Seidel Methods, Newton-Raphson Method-Fast Decoupled method-Merits and demerits of the above methods-System data for load flow study

UNIT-II

Economic Operation of Power Systems

Distribution of load between units within a plant-Transmission loss as a function of plant generation, Calculation of loss coefficients-Distribution of load between plants.

UNIT-III

Load Frequency Control

Introduction, load frequency problem-Megawatt frequency (or P-f) control channel, MVAR voltages (or Q-V) control channel-Dynamic interaction between P-f and Q-V loops. Mathematical model of speed-governing system-Turbine models, division of power system into control areas, P-f control of single control area (the uncontrolled and controlled cases)-P-f control of two area systems (the uncontrolled cases and controlled cases)

UNIT-IV

Power System Stability

The stability problem-Steady state stability, transient stability and Dynamic stability-Swing equation. Equal area criterion of stability-Applications of Equal area criterion, Step by step solution of swing equation-Factors affecting transient stability, Methods to improve steady state and Transient stability, Introduction to voltage stability

UNIT-V

Computer Control of Power Systems

Need of computer control of power systems. Concept of energy control centre(or)load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration –SCADA and EMS functions. Network topology–Importance of Load Forecasting and simple techniques of forecasting.

TEXTBOOKS

1. C.L.Wadhwa, Electrical Power Systems, 3rdEdn, New Age International Publishing Co.,2001.
2. D.P.Kothari and I.J.Nagrath, Modern Power System Analysis, 4thEdn, Tata Mc Graw Hill Education Private Limited 2011.

REFERENCEBOOKS:

1. D.P.Kothari: Modern Power System Analysis-TataMcGrawHillPub.Co.2003.
2. Hadi Sadat: Power System Analysis–TataMcGrawHillPub.Co.2002.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE724PC: HVDC AND FACTS CONTROLLERS

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power System-I, Power System-II, Power System Protection, Power System Operation and Control, Power Electronics

Course Objectives:

- To compare EHV AC and HVDC systems
- To analyze Graetz circuit and also explain 6 and 12 pulse converters
- To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
- To describe various protection methods for HVDC systems and Harmonics

Course Outcomes: After completion of this course the student is able to

- Compare EHVAC and HVDC system and to describe various types of DC links
- Analyze Graetz circuit for rectifier and inverter mode of operation
- Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
- Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

UNIT-I

Basic Concepts: Necessity of HVDC systems, Economics and Terminal equipment of HVDC transmission systems, Types of HVDC Links, Apparatus required for HVDC Systems, Comparison of AC and DC Transmission, Application of DC Transmission System, Planning and Modern trends in D.C.Transmission.

Analysis of HVDC Converters: Choice of Converter Configuration, Analysis of Graetz circuit, Characteristics of 6 Pulse and 12 Pulse converters, Cases of two 3 phase converters in Y/Y mode –their performance.

UNIT-II

Converter and HVDC System Control: Principle of DC Link Control, Converters Control Characteristics, Firing angle control, Current and extinction angle control, Effect of source inductance on the system, Starting and stopping of DC link, Power Control.

Reactive Power Control in HVDC: Introduction, Reactive Power Requirements in steady state, sources of - Static VAR Compensators, Reactive power control during transients.

UNIT-III

Power Flow Analysis in AC/DC Systems: Modeling of DC Links, DC Network, DC Converter, Controller Equations, Solution of DC load flow, P.U.System for DC quantities, solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT-IV

Converter Faults and Protection: Converter faults, protection against over current and over voltage in converter station, surge arresters, smoothing reactors, DC breakers, Audible noise, space charge field, corona effects on DC lines, Radio interference.

UNIT-V:

Harmonics: Generation of Harmonics, Characteristics harmonics, calculation of AC Harmonics, Non-Characteristics harmonics, adverse effects of harmonics, Calculation of voltage and Current harmonics, Effect of Pulse number on harmonics

Filters: Types of AC filters, Design of Single tuned filters–Design of High pass filters.

TEXT BOOKS:

1. "K.R.Padiyar",HVDC Power Transmission Systems: Technology and system Interactions, New Age International (P) Limited, and Publishers,1990.
2. "S K Kamakshaiah, V Kamaraju",HVDC Transmission,TMH Publishers, 2011

REFERENCE BOOKS:

1. "S.Rao",EHV AC and HVDC Transmission Engineering and Practice, Khanna publications,3rd Edition1999.
2. "JosArrillaga",HVDC Transmission, The institution of electrical engineers, IEE power & energyseries 29,2nd edition 1998.
3. "E.W.Kimbark",Direct Current Transmission, John Wiley and Sons, volume 1,1971.

"E. Uhlmann", Power Transmission by Direct Current, B.S.Publications, 2009

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE732PE: ELECTRICAL AND HYBRID VEHICLES (PE-III)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Semiconductor Drives, Electrical Drives and Control, Utilization of Electric Energy

Course Objectives:

- To understand the fundamental concepts, principles, analysis and design of hybrid and electric vehicles.
- To know the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used energy storage devices, etc.

Course Outcomes: At the end of this course, students will demonstrate the ability to

- Understand the models to describe hybrid vehicles and their performance.
- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems.

UNIT-I

Introduction: Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT-II

Introduction To Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.

Hybrid Electric Drive-Trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT-III

Electric Trains: Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

Electric Propulsion Unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV

Energy Storage: Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT-V

Energy Management Strategies: Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS:

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives",JohnWiley&Sons,2011.
2. S. Onori, L.Ser rao and G.Rizzoni,"HybridElectricVehicles:EnergyManagementStrategies",Springer,2015.

REFERENCE BOOKS:

1. M.Ehsani, Y.Gao,S.E. Gayand A.Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals,Theory,andDesign",CRCPress,2004.
2. T .Denton, "Electric and Hybrid Vehicles", Routledge, 2016.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE733PE: SWITCHED MODE POWER SUPPLY (PE-III)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Pre requisite: Power Electronics

Course Objectives:

- The introduction of concept of switched mode power supply with both D.C. and A.C. outputs.
- To elaborately study the working of switched mode topologies including resonant power suppliers.
- To have the knowledge of their importance and applications in various fields.

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

- Understand the concepts and principle of operation of various types of switched mode power supply systems for both D.C. and A.C. outputs.

UNIT-I

Switched Mode Power Conversion: Introduction to Switched Mode Power Supply**,** Linear DC to DC Power converters, Non-Idealities in reactive elements, Design of Inductors,DesignofTransformers-Copperloss,Powerfactor,Non-isolated topologies, Isolated topologies, Quasi-resonant zero-current/zero-voltages witch Operating principle of Non-Isolated DC to DC power Converters (Buck, Boost, Buck-Boost, and Cuk) Equivalent circuit model of the non-isolated DC-DC converters. Isolated converters (forward, Fly back).

UNIT-II

Multiple Output Fly back Switch Mode Power Supplies: Introduction, operating Modes, operating principles, Direct off line Fly back Switch Mode Power Supplies, Fly back converter, snubber network, Problems.

UNIT–III

Using Power Semiconductors in Switched Mode Topologies: Introduction to Switched Mode Power Supply Topologies, The Power Supply Designer's Guide to High Voltage Transistors, Base Circuit Design for High Voltage Bipolar Transistors in Power Converters, Isolated Power Semi conductors for High Frequency Power Supply Applications

UNIT-IV

Rectification: Explanation, Advantages and disadvantages, SMPS and linear power supply comparison, Theory of operation, Input rectifier stage, Inverter stage, Voltage converter and output rectifier, Regulation, An Introduction to Synchronous Rectifier Circuits using Power MOS Transistors

UNIT–V

Switch mode variable power supplies: Introduction, variable SMPS techniques, operating principles, practical limiting factors, Efficiency and EMI Applications.

Resonant Power Supplies: An Introduction to Resonant Power Supplies, Resonant Power Supply Converters-The Solution for Mains Pollution Problems.

Text books:

1. "Keith H. Billings and Taylor Morey", "Switch Mode Power Supplies", TataMcGraw-HillPublishingCompany,3rd edition2010.
2. "Robert W. Erickson", "Switch Mode Power Supplies", Springer, 2ndedition2001.

Reference Books:

1. "Sanjaya Maniktala","Switching Power Supplies A-Z",Elsevier, 2ndEdition2012
2. "Steven M.Sandler",Switch Mode Power Supplies, Tata Mc Graw Hill, 1st Edition 2006

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)
21EE734PE: HIGH VOLTAGE ENGINEERING (PE-III)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Pre requisite: Power Systems–I, Electromagnetic Field theory

Course Objectives:

- To deal with the detailed analysis of Break down occurring in gaseous, liquids and solid dielectrics
- To inform about generation and measurement of High voltage and current
- To introduce High voltage testing methods

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

- Acquire knowledge on, basics of high voltage engineering
- Understand break-down phenomenon in different types of dielectrics
- Understand generation and measurement of high voltages and currents
- Understand the phenomenon of over-voltages, concept of insulation co-ordination
- Know testing of various materials and electrical apparatus used in high voltage engineering

UNIT–I

Introduction to High Voltage Technology And Applications: Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT– II

Break Down In Gaseous And Liquid Dielectrics: 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-break down in pure and commercial liquids.

Break Down In Solid Dielectrics: Intrinsic break down, electro mechanical breakdown, thermal break down, break down of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT–III

Generation of High Voltages And Currents: Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

Measurement Of High Voltages And Currents: Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT– IV

Non-Destructive Testing Of Material And Electrical Apparatus: Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

High Voltage Testing Of Electrical Apparatus: Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, and Radio Interference measurements.

UNIT–V

Over Voltage Phenomenon And Insulation Co-Ordination: Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

Text Books:

1. M.S.Naidu and V.Kamaraju, High Voltage Engineering by–TMH Publications, 4th Edition2009.
2. E. Kuffel, W. S. Zaengl, J. Kuffel , High Voltage Engineering: Fundamentals by Elsevier,2nd Edition2000.

Reference Books:

1. C. L. Wadhwa, High Voltage Engineering by, New Age Internationals (P) Limited,1997.
2. Ravindra Arora, Wolfgang Mosch, High Voltage Insulation Engineering by, New Age International (P) Limited,1995.
3. "Mazen Abdel Salam, Hussein Anis,Ahdan El-Morshedy and Roshdy Radwan", High Voltage Engineering, Theory and Practice, CRC Press,2nd Edition2000.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE735PE: ELECTRICAL DISTRIBUTION SYSTEMS (PE-IV)

B.Tech. IV Year I-Sem.	L	T	P	C
	3	0	0	3

Pre requisites: Power System–I, Power System -II

Course Objectives:

- To distinguish between transmission and distribution systems
- To understand design considerations of feeders
- To compute voltage drop and power loss in feeders
- To understand protection of distribution systems
- To examine the power factor improvement and voltage control

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

- Distinguish between transmission, and distribution line and design the feeders
- Compute power loss and voltage drop of the feeders
- Design protection of distribution systems
- understandtheimportanceofvoltagecontrolandpowerfactorimprovement

UNIT-I

General Concepts: Introduction to distribution system, Distribution system planning, Factors effecting the Distribution system planning, Load modelling and characteristics. Coincidence factor – contribution factor - Loss factor - Relationship between the load factor and loss factor. Load growth, Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Distribution Feeders: Design Considerations of Distribution Feeders: Radial, loop and network types of primary feeders, Introduction to low voltage distribution systems (LVDS) and High voltage distribution systems (HVDS), voltage levels, Factors effecting the feeder voltage level, feeder loading, Application of general circuit constants (A,B,C,D) to radial feeders, basic design practice of the secondary distribution system, secondary banking, secondary network types, secondary mains.

UNIT-II

Substations: Location of Substations: Rating of distribution substation, service area with ‘n’ primary feeders. Benefits derived through optimal location of substations. Optimal location of Substations (Perpendicular bisector rule and X,Y co-ordinate method).

System Analysis: 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, analysis of non-three phase systems, method to analyze the distribution feeder cost.

UNIT-III

Protection: Objectives of distribution system protection, types of common faults and procedure for fault calculations, over current Protective Devices: Principle of operation of Fuses, Auto-Circuit Recloser –and Auto-line sectionalizes, and circuit breakers.

Coordination: Coordination of Protective Devices: Objectives of protection co-ordination, general coordination procedure, Types of protection coordination: Fuse to Fuse, Auto-Recloser to Fuse, Circuit breaker to Fuse, Circuit breaker to Auto-Recloser.

UNIT-IV

Compensation for Power Factor Improvement: Capacitive compensation for power-factor control -Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), effect of series capacitors, difference between shunt and series capacitors, Calculation of Power factor correction, capacitor allocation - Economic justification of capacitors - Procedure to determine the best capacitor location.

UNIT-V

Voltage Control: Voltage Control: Importance of voltage control, methods of voltage control, Equipment for voltage control, effect of shunt capacitors, effect of series capacitors, effect of AVB/AVR on voltage control, line drop compensation, voltage fluctuations.

TEXT BOOKS:

1. Turan Gonen, Electric Power Distribution System Engineering, CRCPress,3rd Edition2014.
2. V. Kamaraju, Electrical Power Distribution Systems, Tata Mc Graw Hill Publishing Company, 2nd edition,2010.

REFERENCE BOOKS:

1. G. Ram Murthy, Electrical Power Distribution hand book, 2ndedition, Universitypress2004.
2. A.S.Pabla, Electric Power Distribution, Tata Mc Graw Hill Publishing company, 6thedition,2013.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE736PE: POWER SYSTEM RELIABILITY ENGINEERING (PE-IV)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Pre requisite: Reliability Engineering

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

- To describe the generation system model and recursive relation for capacitive model building
- To explain the equivalent transitional rates, cumulative probability and cumulative frequency
- To develop the understanding of risk, system and load point reliability indices
- To explain the basic and performance reliability indices

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

- Understand the importance of maintaining reliability of power system components.
- Apply the probabilistic methods for evaluating the reliability of generation and transmission systems.
- Assess the different models of system components in reliability studies.
- Assess the reliability of single area and multi area systems.

UNIT-I

Basic Reliability Concepts: The general reliability function. The exponential distribution – Mean time to failures – series and parallel systems. Markov process – continuous Markov process – Recursive techniques– Simple series and parallel system models.

UNIT-II

Generating Capacity – Basic Probability Methods: The generation system model – Loss of load indices – Capacity expansion analysis – scheduled outages. Load forecast uncertainty Loss of energy indices. The frequency and duration method.

UNIT-III

Transmission Systems Reliability Evaluation: Radial configuration–Conditional probability approach– Network configurations– State selection.

UNIT-IV

Generation Planning: Comparative economic assessment of individual generation projects– Investigation and simulation models–Heuristic and linear programming models–Probabilistic generator and load models.

UNIT-V

Transmission and Distribution Planning: Deterministic contingency analysis–Probabilistic transmission system – reliability analysis. Reliability calculations for single area and multi–area power systems. Network configuration design–consisting of schemes–security criteria configuration synthesis.

TEXT BOOKS:

1. Roy Billint on and Ronald Allan Pitam: Reliability Evaluation of PowerSystems,1996.
2. R.L. Sullivan: Power System Planning, Mc Graw Hill International, 1977.

REFERENCES:

1. Wheel Wright and Makridakis: Forecasting methods and Applications, John Wiley, 1992.
2. J. Endremyl: Reliability Modeling in Electric Power Systems, JohnWiley,2005.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE737PE: AI TECHNIQUES IN POWER SYSTEMS (PE-IV)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Artificial Intelligence Techniques in Electrical Engineering

Course Objectives: Students will be able to

- Understanding fuzzy logic, ANN
- Understanding GA&EP

Course Outcomes: Students will be able to

- Learn the concepts of biological foundations of artificial neural networks
- Learn Feedback networks and radial basis function networks and fuzzy logics
- Identifications of fuzzy and neural network
- Acquire the knowledge of GA

UNIT-I:

Biological foundations to intelligent Systems, Artificial Neural Networks, Single layer and Multi layer Feed Forward NN, LMS and Back Propagation Algorithm, Feedback networks and Radial Basis Function Networks.

UNIT-II:

Fuzzy Logic, Knowledge Representation and Inference Mechanism, Defuzzification Methods. Fuzzy Neural Networks and their learning methods

UNIT-III:

System Identification using Fuzzy and Neural Network.

UNIT-IV:

Genetic algorithm, Reproduction crossover, mutation, Introduction to evolutionary program.

UNIT-V:

Applications of above mentioned techniques to practical problems

TEXTBOOKS:

1. J M Zurada ,“An Introduction to ANN”, Jaico Publishing House
2. Simon Haykins, “Neural Networks”, Prentice Hall

REFERENCES:

1. Timothy Ross,“Fuzzy Logic with Engg. Applications”, McGraw. Hill
2. Driankov,Dimitra,“AnIntroductiontoFuzzyControl”,NarosaPublication
3. Golding,“Genetic Algorithms”, Addison-Wesley Publishing Com

B.TECH. **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE750OE: POWER SYSTEMS RELIABILITY (OE-II)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Reliability Engineering, Power System-I, Power System-II, Power System Operation and Control

Course Objectives:

- To describe the generation system model and recursive relation for capacitive model building
- To explain the equivalent transitional rates, cumulative probability and cumulative frequency
- To develop the understanding of risk, system and load point reliability indices
- To explain the basic and performance reliability indices

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

- Estimate loss of load and energy indices for generation systems model
- Describe merging generation and load models
- Apply various indices for distribution systems
- Evaluate reliability of interconnected systems

UNIT- I

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Binomial distribution- Expected value and standard deviation - Binomial distribution, Poisson distribution, normal distribution, exponential distribution, Weibull distribution. Definition of Reliability: Definition of terms used in reliability, Component reliability, Hazard rate, derivation of the reliability function in terms of the hazard rate. Hazard models - Bath tub curve, Effect of preventive maintenance. Measures of reliability: Mean Time to Failure and Mean Time between Failures.

UNIT - II

Generating System Reliability Analysis: 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. 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. 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- IV

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 concepts of parallel distribution system reliability

UNIT- V

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. Reliability Evaluation of Power systems by R. Billinton, R.N. Allan, BS Publications, 2007.
2. Reliability Modeling in Electric Power Systems by J. Endrenyi, John Wiley and Sons, 1978

REFERENCE BOOKS:

1.Reliability Engineering: Theory and Practice by Alessandro Birolini, Springer Publications.
2. An Introduction to Reliability and Maintainability Engineering by Charles Ebeling, TMH Publications.
3. Reliability Engineering by E. Balaguruswamy, TMH Publications.
4. Reliability Engineering by Elsayed A. Elsayed, Prentice Hall Publications.

B.TECH. **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE751OE: BASIC POWER PLANT ENGINEERING (OE-II)

B.Tech. IV Year I-Sem.

L	T	P	C
3	0	0	3

Course Objective: The goal of this course is to become prepared for professional engineering design of conventional and alternative power-generation plants. The learning objectives include

- Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
- A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
- Awareness of the economic, environmental, and regulatory issues related to power generation.

Course Outcomes: At the end of the course students are able to:

Understand the concept of Rankine cycle.

- Understand working of boilers including water tube, fire tube and high pressure boilers and determine efficiencies.
- Analyze the flow of steam through nozzles
- Evaluate the performance of condensers and steam turbines
- Evaluate the performance of gas turbines

UNIT – I

Introduction to the Sources of Energy – Resources and Development of Power in India.
Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II

Internal Combustion Engine Plant: Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging. Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison. Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT – III

Hydro Electric Power Plant: Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways. Hydro Projects And Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants. Power From Non-Conventional Sources: Utilization of Solar- Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.

UNIT – IV

Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. Types of Reactors: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT – V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOKS:

1. Power Plant Engineering/ P. K. Nag / Mc Graw Hill
2. Power Plant Engineering / Hegde / Pearson.

REFERENCES BOOKS:

1. Power Plant Engineering / Gupta / PHI
2. Power Plant Engineering / A K Raja / New age

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EC725PC: MICROPROCESSORS AND MICROCONTROLLERS LAB

B.Tech. IV Year I-Sem.

L	T	P	C
0	0	2	1

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

1. Assembly Language Programs to 8086 to Perform
2. Arithmetic, Logical, String Operations on 16 Bit and 32-Bit Data.
3. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (6 weeks)

1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
2. Time delay Generation Using Timers of 8051.
3. Serial Communication from / to 8051 to / from I/O devices.
4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer 0 8051 in 8 bit Auto reload Mode and Connect a 1 HZ Pulse to INT1 pin and Display on Port 0. Assume Crystal Frequency as 11.0592 MHZ

Cycle 3: Interfacing I/O Devices(5 Weeks)

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. Triangular Wave Generator through DAC interfaces to 8051.
5. Using raspberry pi
   a. Calculate the distance using a distance sensor.
   b. Basic LED functionality

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE852OE: POWER QUALITY ENGINEERING (OE-III)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Systems - II

Course Objectives:

- Definition of power quality and different terms of power quality.
- Study of voltage power quality issue – short and long interruption.
- Detail study of characterization of voltage sag magnitude and three phase unbalanced voltage sag.
- Know the behaviour of power electronics loads; induction motors, synchronous motor etc by the power quality issues.
- Overview of mitigation of power quality issues by the VSI converters.

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

- Know the severity of power quality problems in distribution system
- Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage)
- Concept of improving the power quality to sensitive load by various mitigating custom power devices

UNIT – I

Introduction: Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT – II

Long & Short Interruptions: Interruptions – Definition – Difference between failures, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – costs of Interruption – Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation.

Short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT – III

Single and Three Phase Voltage Sag Characterization: Voltage sag – definition, causes of voltage sag, voltage sag magnitude, and monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, and voltage sag duration. Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT – IV

Power Quality Considerations In Industrial Power Systems: Voltage sag – equipment behaviour of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT - V

Mitigation of Interruptions & Voltage Sags: Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

Power Quality and EMC Standards: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

Text Books:

1. "Math H J Bollen", "Understanding Power Quality Problems" , IEEE Press, 2000.
2. "R. Sastry Vedam and Mulukutla S. Sarma", "Power Quality VAR Compensation in Power Systems", CRC Press, 2008.

Reference Books:

1. C. Sankaran, Power Quality, CRC Press 2001.
2. Roger C. Dugan , Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, Tata McGraw Hill Education Private Ltd, 3rd Edition 2012.

B.TECH. **R21 Regulations**

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
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21EE853OE: INDUSTRIAL AUTOMATION (OE-III)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives

1. To introduce the importance of automation techniques manufacturing and process industries.
2. To impart the role of PLC in industry automation.
3. To expose to various control techniques employed in process automation.
4. To develop automation system for manufacturing and process industries.

Course Outcomes: On completion of this course, the students will be able to

1. Familiar with various automation technologies in manufacturing and process industries.
2. Understand various automation tools and methods in manufacturing industry.
3. Implement various control and automation method in process industries.
4. Familiar with various communication technologies in manufacturing and process industries.

UNIT-I

Introduction- Automation in production system, Principles and strategies of automation, Basic elements of an automated system, Advanced automation functions, Levels of automations, Automated flow lines and transfer mechanisms, Analysis of transfer lines without storage, Automated flow lines with storage buffers.

UNIT-II

Material handling and identification technologies -Overview of material handling systems, Types of material handling equipment, Design of the system, Conveyor system, Automated guided vehicle system, Automated storage systems, Interfacing handling and storage with manufacturing, Overview of Automatic Identification Methods.

UNIT-III

Automated Manufacturing Systems-Components, Classification and overview of manufacturing systems, Cellular manufacturing, Flexible manufacturing system(FMS), FMS and its planning and implementation, Automated assembly system – design and types of automated assembly systems, Analysis of multi station and single station assembly machine.

UNIT-IV

Introduction to computer based industrial automation- Direct Digital Control (DDC), Distributed Control System (DCS) and supervisory control and data acquisition (SCADA) based architectures. SCADA for process industries includes understanding of RTUs, Pumping stations, Evacuation processes, Mass Flow Meters and other flow meters, Leak-flow studies of pipelines, Transport Automation.

UNIT-V

Programmable Logic Controller (PLC)- Block diagram of PLC, Programming languages of PLC, Basic instruction sets, Design of alarm and interlocks, Networking of PLC, Overview of safety of PLC with case studies. Process Safety Automation: Levels of process safety through use of PLCs, Integrating Process safety PLC and DCS, Application of international standards in process safety control. Distributed Control System- Local Control Unit (LCU) architecture, LCU Process Interfacing Issues, Block diagram and Overview of different LCU security design approaches, Networking of DCS. Introduction to communication protocols- Profibus, Field bus, HART protocols. Data gathering, Data analytics, Real-time analysis of data stream from DCS, Historian build, Integration of business inputs with process data, Leveraging RTU (as different from PLCs and DCS)

TEXT BOOKS:

1. M.P.Groover,"Automation, Production Systems and Computer Integrated Manufacturing", 5 th Edition, Pearson Education, 2009.
2. John W. Webb and Ronald A. Reis, "Programmable Logic Controllers: Principles and Applications", 5th Edition, Prentice Hall Inc., New Jersey, 2003.
3. Krishna Kant, "Computer - Based Industrial Control", 2nd Edition, Prentice Hall, New Delhi, 2011.
4. Frank D. Petruzella, "Programmable Logic Controllers", 5th Edition, McGraw- Hill, New York, 2016.

REFERENCE BOOKS

1. Curtis D. Johnson, "Process Control Instrumentation Technology", 8th Edition, Pearson New International, 2013.
2. Lukas M.P, " Distributed Control Systems", Van Nostrand Reinhold Co., New York, 1986.
3. N. Viswanandham, Y. Narahari, "Performance Modeling of Automated Manufacturing Systems", 1st Edition, 2009.
4. https://nptel.ac.in/syllabus/108108098/

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE838PE: NETWORK SYNTHASIS AND CONTROL (PE-V)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- Explain the concepts of basic and modern control system for the real time analysis and design of control systems.
- To explain and apply concepts of state variables analysis.
- To study and analyze non linear systems.
- To analyze the concept of stability of nonlinear systems and categorization.
- To apply the comprehensive knowledge of optimal theory for Control Systems

Course Outcomes:

- Design pole assignment and state observer using state feedback.
- Develop the describing function for the nonlinearity present to assess the stability of the system.
- Develop Lyapunov function for the stability analysis of nonlinear systems
- Formulate and solve deterministic optimal control problems in terms of performance indices.
- Apply knowledge of control theory for practical implementations in engineering and network analysis.

UNIT–I

Network Functions: Network function for one-port and two-port, calculation of network function for ladder and general networks, poles and zeros with restrictions for driving point functions and transform functions, two-port parameters, stability by Routh-Harwitz criterion.

UNIT– II

Network Synthesis: Identification of network synthesis, Brune's positive and real function (PRF), properties of PRF, testing of driving point functions, even and odd function, one terminal pair network driving point synthesis with LC elements, RC elements, Foster and Causer form.

UNIT-III

Non-linear systems Analysis: Introduction, Common Nonlinear System Behaviours, Common Nonlinearities in Control Systems, Fundamentals, Describing Functions of Common Nonlinearities, Stability Analysis by Describing Function Method, Concept of Phase Plane Analysis, Construction of Phase Portraits, System Analysis on the Phase Plane. Simple Variable Structure Systems, Lyapunov Stability Definitions, Lyapunov Stability Theorems, Lyapunov Functions for Nonlinear Systems.

UNIT-IV:

Optimal Control: Introduction to optimal control – Formulation of optimal control problems – calculus of variations – fundamental concepts, functional, variation of functional – fundamental theorem of theorem of Calculus of variations – boundary conditions – constrained minimization – formulation using Hamiltonian method – Linear Quadratic regulator.

UNIT-V:

State Feedback Controllers and Observers: State feedback controller design through Pole Assignment, using Ackkermans formula– State observers: Full order and Reduced order observers.

Text Books:

1. “Network Analysis”, Valkenburg, PHI Pbs.
2. Circuit theory, Kurikose-PHI Pbs.

Reference Books:

1. “Introduction to Network Synthesis”, Valkenburg, PHI Pbs.
2. Sudhakar, A. Shyammohan, “Circuits and Network”, Third Edition, 2006,Tata McGraw Hill.
3. Kelkar, Pandit, “Linear Network Theory”, Pratibha Publication.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE839PE: POWER QUALITY (PE-V)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Prerequisite: Power Systems-II

Course Objectives:

- Definition of power quality and different terms of power quality.
- Study of voltage power quality issue– short and long interruption.
- Detail study of characterization of voltage sag magnitude and three phase unbalanced voltage sag.
- Know the behavior of power electronics loads; induction motors, synchronous motor etc by the power quality issues.
- Overview of mitigation of power quality issues by the VSI converters.

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

- Know the severity of power quality problems in distribution system
- Understand the concept of voltage sag transformation from up-stream(higher voltages) to down-stream (lower voltage)
- Concept of improving the power quality to sensitive load by various mitigating custom power devices

UNIT–I

Introduction: Introduction of the Power Quality (PQ) problem, Terms used in PQ:Voltage,Sag,Swell,Surges,Harmonics,overvoltages,spikes,Voltagefluctuations,Transients,Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT– II

Long & Short Interruptions: Interruptions –Definition – Difference between failures, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency–Limits for the interruption duration–costs of Interruption– Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation.

Short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT–III

Single and Three Phase Voltage Sag Characterization: Voltage sag – definition, causes of voltage sag, voltage sag magnitude, and monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, and voltage sag duration.

Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT– IV

Power Quality Considerations In Industrial Power Systems: Voltage sag – equipment behavior of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT-V

Mitigation of Interruptions & Voltage Sags: Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

Power Quality and EMC Standards: Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics tandards, PQsurveys.

Text Books:

1. "MathHJBollen","Under standing Power Quality Problems", IEEE Press, 2000.
2. "R. Sastry Vedam and Mulukutla S. Sarma", "Power Quality VAR Compensation in Power Systems", CRC Press,2008.

Reference Books:

1. C.Sankaran,PowerQuality, CRCPress2001 Roger C. Dugan , Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty,
2. ElectricalPowerSystemsQuality,TataMcGrawHillEducationPrivateLtd,3rdEdition2012

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE840PE: NEURAL NETWORKS AND FUZZY LOGIC (PE-V)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the basics of Neural Networks and its architectures.
- To introduce the Fuzzy sets and Fuzzy Logic system components
- To deal with the applications of Neural Networks and Fuzzy systems

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

- To understand artificial neural network models and their training algorithms
- To understand the concept of fuzzy logic system components, fuzzification and defuzzification
- Apply the above concepts to real-world problems and applications.

UNIT–I

Introduction To Neural Networks: Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential Applications of ANN.

Essentials of Artificial Neural Networks: 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

Feed Forward Neural Networks: Single Layer Feed Forward Neural Networks: Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Perceptron Convergence theorem, Limitations of the Perceptron Model,Applications.

Multilayer Feed forward Neural Networks: Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm,KolmogorovTheorem, Learning Difficulties and Improvements.

UNIT-III

Associative Memories: Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory (Associative Matrix, Association Rules, Hamming Distance, The Linear Associator,MatrixMemories,ContentAddressableMemory).Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function, Proof of BAM Stability Theorem. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network.

UNIT– IV

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

UNIT–V

Fuzzy Logic System: Fuzzification, Membership value assignment, development of rule base and decision making system,Defuzzification to crispsets, Defuzzification methods.

Text Books:

1. Rajasekharan andPai, Neural Networks, Fuzzy logic, Genetic algorithms: synthesisandapplications–PHIPublication,1st Edition,1905
2. Satish Kumar,Neural Networks,TMH,2004.

Reference Books:

1. "James A Freeman and Davis Skapura",Neural Networks,PearsonEducation,2002.
2. "SimonHakins",Neural Networks,PearsonEducation,3rd Edition2008
3. C. Eliasmithand Ch.Anderson, Neural Engineering, PHI,2004

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE841PE: SMART GRID TECHNOLOGY (PE-VI)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To group various aspects of the smart grid,
- To defend smart grid design to meet the need sofa utility
- To select issues and challenges that remain to be solved
- To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulate denvironment.

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

- Understand the features of small grid in the context of Indian grid.
- Understand the role of automation in transmission and distribution.
- Apply evolutionary algorithms for smart grid.
- Understand operation and maintenance of PMUs, PDCs, WAMs, and voltage and frequency control in micro grid

UNIT-I

Introduction to Smart Grid: What is Smart Grid- Working definitions of Smart Grid and Associated Concepts –Smart grid Functions-Traditional Power Grid and Smart Grid –New Technologies for Smart Grid– Advantages–Indian Smart Grid –Key Challenges for Smart Grid.

UNIT-II

Smart Grid Architecture: Components and Architecture of Smart Grid Design–Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs–Transmission Automation –Distribution Automation –Renewable Integration

UNIT-III

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

UNIT-IV

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

Communication Technologies and Smart Grid: Introduction to Communication Technology–Synchro-Phasor Measurement Units(PMUs)–Wide Area Measurement Systems(WAMS).

UNIT-V

Control of Smart Power Grid System: Load Frequency Control(LFC) in Micro Grid System–Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

TEXT BOOKS:

1. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013
2. GilMasters, Renewable and Efficient Electric Power System,Wiley-IEEE Press, 2004.

REFERENCE BOOKS:

1. A.G.Phadke and J.S.Thorp,“Synchronized Phasor Measurements and their Applications”, Springer Edition,2010.
2. T.Ackermann,Wind Powerin Power Systems,Hoboken,NJ,USA,JohnWiley,2005.

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE842PE: RENEWABLE ENERGY SOURCES (PE-VI)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce various types of renewable energy technologies
- To understand the technologies of energy conversion from there sources and their quantitative analysis.

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

- Analyze solar thermal and photovoltaic systems and related technologies for energy conversion.
- Understand Wind energy conversion and devices available or it.
- Understand Biomass conversion technologies, Geothermal resources and energy conversion principles and technologies.
- Realize Power from oceans (thermal, wave, tidal) and conversion devices.
- Understand fundamentals of fuel cells and commercial batteries.

UNIT-I

Fundamentals of Solar Energy-Solar spectrum- Solar Radiation on Earth's surface-Solar radiation geometry-Solar radiation measurements- Solar radiation data- Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion- Flat plate collectors- concentrated collectors-constructionandthermalanalysis-Solarapplications-Solarponds-Heliostatsystems-waterheater-airheater-solarstill.

UNIT-II

Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics-Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking-Solar Thermo electric conversion.

UNIT-III

Wind Energy-Fundamentals of wind energy-power available in wind-Betz Limit-Aerodynamics of wind turbine- Wind turbines- Horizontal and vertical axis turbines –their configurations-Wind Energy conversion systems.

UNIT-IV

Energy from BioMass- Various fuels- Sources-Conversion technologies-Wet Processes – Dry Processes- Bio Gas generation – Aerobic and anaerobic digestion - Factors affecting generation of bio gas - Classification of bio gas plants-Different Indian digesters- Digester design considerations - Gasification process - Gasifiers – Applications. Geothermal Energy -sources- Hydrothermal convective - Geo-pressure resources - Petro-thermal systems (HDR) -Magma Resources-Prime Movers.

UNIT-V

OTEC Systems- Principle of operation - Open and closed cycles, Energy from Tides-PrincipleofTidalPower-ComponentsoftidalPowerplants-OperationMethods-Estimation of Energy in Single and double basin systems - Energy and Power from Waves-Wave energy conversion devices -Fuel Cells - Design and Principle of operation - Types of Fuel Cells - Advantages and disadvantages - Types of Electrodes – Applications - Basics of Batteries-Constructional details of Lead acid batteries-Ni-Cd Batteries.

TEXT BOOKS:

1. "JohnTwidell& Wier","Renewable Energy Resources",CRCPress,2009.
2. "G. D.Rai", "Non Conventional Energy sources", Khanna publishers, 2004

REFERENCE BOOKS:

1. "D.P.Kothari,Singal,Rakesh and Ranjan","Renewable Energy sources and Emerging Technologies",PHI,2009.
2. "F. C.Treble",Generating Electricity from Sun, Pergamon Press, 1st Edition1991
3. "C.S.Solanki","SolarPhotovoltaics-Fundamentals-PrinciplesandApplications",PHI,2009
4. "S.P. Sukhatme", "Solar Energy Principles and Application", TMH, 2009

BALAJI INSTITUTE OF TECHNOLOGY & SCIENCE
(UGC-AUTONOMOUS)

21EE843PE: RESTRICTED POWER SYSTEMS (PE-VI)

B.Tech. IV Year II-Sem.

L	T	P	C
3	0	0	3

Course Objectives: Students will be able to

- Understand what is meant by restructuring of the electricity market
- Understand the need behind requirement for deregulation of the electricity market
- Understand the money, power &Information flow in a deregulated power system

Course Outcomes: Students will be able to

- Describe various types of regulations in power systems.
- Identify the need of regulation and deregulation.
- Define and describe the Technical and Non-technical issues in Deregulated Power Industry.
- Identify and give examples of existing electricity markets.
- Classify different market mechanisms and summarize the role of various entities in the market.

UNIT-I:

Fundamentals of restructured system, Market architecture, Load elasticity, Social welfare maximization

UNIT-II:

OPF: Role in vertically integrated systems and in restructured markets, congestion management

UNIT-III:

Optimal bidding, Risk assessment, Hedging, Transmission pricing, Tracing of power

UNIT-IV:

Ancillary services, Standard marketdesign,Distributed generational restructured markets

UNIT-V:

Developments in India, IT applications in restructured markets, Working of restructured power systems**,**PJM, Recent trends in Restructuring

TEXTBOOKS:

1. Lorr inPhilipson,H.LeeWillis,“Understanding electric utilities and de-regulation”,Marcel Dekker Pub.,1998.
2. Steven Stoft,“Power system economics:designing markets for electricity”,JohnWiley and Sons,2002.

REFERENCES:

1. Kankar Bhattacharya, JaapE.Daadler,MathH.J.Boolen,“Operation of restructured power systems”,Kluwer Academic Pub.,2001.
2. Mohammad Shahidehpour, Muwaffaq Alomoush, “Restructured electrical powersystems:operation,trading and volatility”,Marcel Dekker.