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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SMEC R22 SYLLABUS

I YEAR I SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA101BS	Matrices and Calculus	3	1	0	4	40	60	100
2	CH102BS	Engineering Chemistry	3	1	0	4	40	60	100
3	CS104ES	C Programming and Data Structures	3	0	0	3	40	60	100
4	EE105ES	Electrical Circuit Analysis – I	3	0	0	3	40	60	100
5	ME108ES	Computer Aided Engineering Graphics	1	0	4	3	40	60	100
6	EE107ES	Elements of Electrical and Electronics Engineering	0	0	2	1	50	-	50
7	CH104BS	Engineering Chemistry Laboratory	0	0	2	1	40	60	100
8	CS103ES	C Programming and Data Structures Laboratory	0	0	2	1	40	60	100
9		Induction Program							
Total			**13**	**2**	**10**	**20**	**330**	**420**	**750**

I YEAR II SEMESTER

S. No.	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1	MA201BS	Ordinary Differential Equations and Vector Calculus	3	1	0	4	40	60	100
2	AP202BS	Applied Physics	3	1	0	4	40	60	100
3	ME207ES	Engineering Workshop	0	1	3	2.5	40	60	100
4	EN204HS	English for Skill Enhancement	2	0	0	2	40	60	100
5	EE209ES	Electrical Circuit Analysis - II	2	0	0	2	40	60	100
6	AP203BS	Applied Physics Laboratory	0	0	3	1.5	40	60	100
7	EN205HS	English Language andCommunication Skills Laboratory	0	0	2	1	40	60	100
8	CS208ES	Applied Python Programming Laboratory	0	1	2	2	40	60	100
9	EE210ES	Electrical Circuit Analysis Laboratory	0	0	2	1	40	60	100
Total			**10**	**4**	**12**	**20**	**360**	**540**	**900**
Mandatory Course (Non-Credit)									
10	*CH209MC	Environmental Science	3	0	0	0	40	60	100

*MC – Satisfied/Unsatisfied

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SMEC R22 SYLLABUS

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

II B. Tech-I-Semester

S. No.	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.	MA301BS	Numerical Methods and Complex Variables	3	1	0	4	40	60	100
2.	EE301PC	Electrical Machines – I	3	1	0	4	40	60	100
3.	EC308PC	Analog Electronic Circuits	3	0	0	3	40	60	100
4.	EE302PC	Power Systems - I	3	0	0	3	40	60	100
5.	EE303PC	Electro Magnetic Fields	3	0	0	3	40	60	100
6.	EE304PC	Electrical Machines Laboratory – I	0	0	2	1	40	60	100
7.	EC309PC	Analog Electronic Circuit Laboratory	0	0	2	1	40	60	100
8.	EE305PC	Electrical Simulation Laboratory	0	0	2	1	40	60	100
Total			**15**	**2**	**6**	**20**	**320**	**480**	**800**
Mandatory Course (Non-Credit)									
9.	*GS309MC	Gender Sensitization Laboratory	0	0	2	0	100	-	100

*MC – Satisfied/Unsatisfied

II B. Tech-II-Semester

S. No.	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.	ME411PC	Solid Mechanics and Hydraulic Machines	3	1	0	4	40	60	100
2.	EE402PC	Measurements and Instrumentation	3	0	0	3	40	60	100
3.	EE403PC	Electrical Machines – II	3	0	0	3	40	60	100
4.	EC410PC	Digital Electronics	2	0	0	2	40	60	100
5.	EE404PC	Power Systems – II	3	0	0	3	40	60	100
6.	EC411PC	Digital Electronics Laboratory	0	0	2	1	40	60	100
7.	EE405PC	Measurements and Instrumentation Laboratory	0	0	2	1	40	60	100
8.	EE406PC	Electrical Machines Laboratory - II	0	0	2	1	40	60	100
9.	EE407PC	Real Time Research Project / Field Based Project	0	0	4	2	50	-	50
Total			**14**	**1**	**10**	**20**	**370**	**480**	**850**
Mandatory Course (Non-Credit)									
10.	*CI409MC	Constitution of India	3	0	0	0	100	-	100

*MC – Satisfied/Unsatisfied

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III B.Tech-I-Semester

S. No.	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.	EE501PC	Power Electronics	3	1	0	4	40	60	100
2.	EE502PC	Control Systems	3	1	0	4	40	60	100
3.	EC507PC	Microprocessors and Microcontrollers	3	0	0	3	40	60	100
4.		Professional Elective – I	3	0	0	3	40	60	100
5.	BE504MS	Business Economics and Financial Analysis	3	0	0	3	40	60	100
6.	EC508PC	Microprocessors and Microcontrollers Laboratory	0	0	2	1	40	60	100
7.	EE503PC	Power Electronics Laboratory	0	0	2	1	40	60	100
8.	EN506HS	Advanced English Communication Skills Laboratory	0	0	2	1	40	60	100
Total			**15**	**2**	**6**	**20**	**320**	**480**	**800**
Mandatory Course (Non-Credit)									
9.	IP510MC*	Intellectual Property Rights	3	0	0	0	100	-	100

III B. Tech-II-Semester

S.No.	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
			L	T	P		Internal(CIE)	External (SEE)	Total
1.		Open Elective – I	3	0	0	3	40	60	100
2.		Professional Elective – II	3	0	0	3	40	60	100
3.	EC608PC	Digital Signal Processing	3	0	0	3	40	60	100
4.	EE601PC	Power System Protection	3	0	0	3	40	60	100
5.	EE602PC	Power System Operation and Control	3	0	0	3	40	60	100
6.	EE603PC	Power System Laboratory	0	0	2	1	40	60	100
7.	EE604PC	Control Systems Laboratory	0	0	2	1	40	60	100
8.	EC609PC	Digital Signal Processing Laboratory	0	0	2	1	40	60	100
9.	EE605PC	Industry Oriented Mini Project/Internship	0	0	4	2	100	-	100
Total			**15**	**0**	**10**	**20**	**420**	**480**	**900**
Mandatory Course (Non-Credit)									
10.	ES607MC*	Environmental Science	3	0	0	0	100	-	100

*MC–Satisfied/Unsatisfied

Environmental Science – Should be Registered by Lateral Entry Students Only.

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IV B.Tech-I-Semester									
S. No.	Course Code	Course Title	Hours Per Week			Credits	Maximum Marks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.	EE701PC	Power Electronic Applications to Renewable Energy Systems	3	1	0	4	40	60	100
2.		Open Elective – II	3	0	0	3	40	60	100
3.		Professional Elective - III	3	0	0	3	40	60	100
4.		Professional Elective – IV	3	0	0	3	40	60	100
5.	FM702MS	Fundamentals of Management for Engineers	2	0	0	2	40	60	100
6.	EE703PC	Simulation of Renewable Energy Systems Laboratory	0	0	4	2	40	60	100
7.	EE704PC	Project Stage - I	0	0	6	3	40	60	100
Total			**14**	**1**	**10**	**20**	**280**	**420**	**700**

IV B. Tech-II-Semester									
S.No.	Course Code	Course Title	Hours Per Week			Credits	MaximumMarks		
			L	T	P		Internal (CIE)	External (SEE)	Total
1.		Open Elective – III	3	0	0	3	40	60	100
2.		Professional Elective – V	3	0	0	3	40	60	100
3.		Professional Elective – VI	3	0	0	3	40	60	100
4.	EE801PC	Project Stage – II including Seminar	0	0	22	11	40	60	100
Total			**9**	**0**	**22**	**20**	**160**	**240**	**400**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

The list of Professional Electives and Open Electives offered by the Department are:

PROFESSIONAL ELECTIVES:

Professional Elective – I

1. EE511PE	IOT Applications in Electrical Engineering
2. EE512PE	High Voltage Engineering
3. EE513PE	Computer Aided Electrical Machine Design

Professional Elective – II

1. EE621PE	Cyber-Physical Systems
2. EE622PE	Power Semiconductor Drives
3. EE623PE	Wind and Solar Energy Systems

Professional Elective – III

1. EE731PE	Mobile Application Development
2. EE732PE	Signals and Systems
3. EE733PE	Electric and Hybrid Vehicles

Professional Elective – IV

1. EE741PE	HVDC Transmission
2. EE742PE	Power System Reliability
3. EE743PE	Embedded Systems Applications

Professional Elective – V

1. EE851PE	Power Quality and FACTS
2. EE852PE	Solar Power Batteries
3. EE853PE	AI Techniques in Electrical Engineering

Professional Elective – VI

1. EE861PE	Smart Grid Technologies
2. EE862PE	Electrical Distribution Systems
3. EE863PE	Machine Learning Applications to Electrical Engineering

Open Electives offered by Department of EEE are:

OPEN ELECTIVES:

Open Elective – I

1. EE611OE	Renewable Energy Sources
2. EE612OE	Fundamental of Electric Vehicles

Open Elective – II

1. EE721OE	Utilization of Electric Energy
2. EE722OE	Energy Storage Systems

Open Elective – III

1. EE831OE	Charging Infrastructure for Electric Vehicles
2. EE832OE	Reliability Engineering

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MATRICES AND CALCULUS

I B. TECH- I SEMESTER (R 22)								
Course Code	**Programme**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIE**	**SEE**	**Total**
MA101BS	**B. Tech**	**3**	**1**	**0**	**4**	**40**	**60**	**100**

COURSE OBJECTIVES

To learn

1. Types of matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigen-values and eigenvectors and to reduce the quadratic form to canonical form
4. Geometrical approach to the mean value theorems and their application to the mathematical problems
5. Evaluation of surface areas and volumes of revolutions of curves.
6. Evaluation of improper integrals using Beta and Gamma functions.
7. Partial differentiation, concept of total derivative
8. Finding maxima and minima of function of two and three variables.
9. Evaluation of multiple integrals and their applications

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
2. Find the Eigen-values and Eigen vectors
3. Reduce the quadratic form to canonical form using orthogonal transformations.
4. Solve the applications on the mean value theorems.
5. Evaluate the improper integrals using Beta and Gamma functions
6. Find the extreme values of functions of two variables with/ without constraints.
7. Evaluate the multiple integrals and apply the concept to find areas, volumes

UNIT-I	**MATRICES**	**Classes: 10**

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 by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT-II	**EIGEN VALUES AND EIGEN VECTORS**	**Classes:10**

Linear Transformation and Orthogonal Transformation: Eigenvalues, 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	CALCULUS	Classes:10

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 curve (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma function and their applications.

UNIT-IV	MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)	Classes: 10

Definitions of Limit and continuity.

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

UNIT-V	MULTIVARIABLE CALCULUS (INTEGRATION)	Classes: 10

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).

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Editon, 2016.

REFERENCE BOOKS

1. Dr. D. Ranadheer Reddy, Mr. K Upender Reddy & Mr. G Chandra Mohan, A First Course in Linear Algebra and Calculus for Engineers, M/s Students Helpline Publishing House Pvt. Ltd, First Edition-2020.
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.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.
5. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://mathworld.wolfram.com/CanonicalForm.html
3. https://mathworld.wolfram.com/Binomial.html
4. https://www.mathworld.wolfram.com/

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://onlinecourses.nptel.ac.in/noc22_ma75/preview
2. https://onlinecourses.swayam2.ac.in/cec20_ma22/preview

I B. TECH - I SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH102BS	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

To learn

1. To bring adaptability to new developments in Engineering Chemistry and to acquire the skillsrequired to become a perfect engineer.
2. To include the importance of water in industrial usage, fundamental aspects of battery chemistry, significance of corrosion it's control to protect the structures.
3. To imbibe the basic concepts of petroleum and its products.
4. To acquire required knowledge about engineering materials like cement, smart materials and Lubricants.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Students will acquire the basic knowledge of electrochemical procedures related to corrosionand its control.
2. The students are able to understand the basic properties of water and its usage in domesticand industrial purposes.
3. They can learn the fundamentals and general properties of polymers and other engineeringmaterials.
4. They can predict potential applications of chemistry and practical utility in order to become goodengineers and entrepreneurs.

UNIT-I	WATER AND ITS TREATMENT	Classes: 10

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break - point chlorination. Defluoridation- Determination of F^- ion by ion- selective electrode method. Boiler troubles: Sludges, Scales and Caustic embrittlement. Internal treatment of Boiler feed water - Calgon conditioning - Phosphate conditioning - Colloidal conditioning, External treatment methods - Softening of water by ion- exchange processes. Desalination of water – Reverse osmosis.

UNIT-II	BATTERY CHEMISTRY & CORROSION	Classes: 10

Introduction - Classification of batteries- primary, secondary and reserve batteries with examples. Basicrequirements for commercial batteries. Construction, working and applications of: Zn-air and Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between batteryand a fuel cell, Construction and applications of Methanol Oxygen fuel cell and Solid oxide fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: 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 methods.

UNIT-III	POLYMERIC MATERIALS	Classes: 10

Definition – Classification of polymers with examples – Types of polymerization – addition (free radical addition) and condensation polymerization with examples – Nylon 6:6, Terylene

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC and Bakelite, Teflon, Fiber reinforced plastics (FRP). **Rubbers:** Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S, Butyl and Thiokolrubber.

Conducting polymers: Characteristics and Classification with examples-mechanism of conduction intrans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Polylactic acid and poly vinyl alcohol and their applications.

UNIT-IV	ENERGY SOURCES	Classes: 10

Introduction, Calorific value of fuel – HCV, LCV- Dulongs formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining, cracking types – moving bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG, Biodiesel – Transesterification, advantages.

UNIT-V	ENGINEERING MATERIALS	Classes: 10

Cement: Portland cement, its composition, setting and hardening.

Smart materials and their engineering applications

Shape memory materials- Poly L- Lactic acid. Thermoresponse materials- Polyacryl amides, Poly vinylamides

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants - mechanismof lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point,pour point, flash point and fire point.

TEXT BOOKS

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010
2. Engineering Chemistry by Rama Devi, Venkata Ramana Reddy and Rath, Cengage learning, 2016
3. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K.Shashikala, Pearson Publications, 2021.
4. Text book of Engineering Chemistry by Jaya Shree Anireddy, Wiley Publications.

REFERENCE BOOKS

1. A. Aditya Prasad , S.Hemambika and N.V.V. PandurangaRao "Engineering Chemistry", Spectrum Medico Plus Pharma Publishers., Hyderabad, 1 st edition(2020)
2. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
3. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)
4. Engineering Chemistry by A. Aditya Prasad, S. Hemambika and N. V. V. Panduranga Rao, Spectrum Medico Plus Pharma Publishers., Hyderabad, 1st edition (2020)
5. Engineering Chemistry by Thirumala Chary Laxminarayana, Shashikala, Pearson Publications (2020)

WEB REFERENCES

1. https://www.wileyindia.com/engineering-chemistry-as-per-aicte.html
2. https://www.wileyindia.com/wiley-engineering-chemistry-second-edition.html
3. https://www.wyzant.com/resources/lessons/science/chemistry
4. http://www.chem1.com/acad/webtext/virtualtextbook.html

E -TEXT BOOKS

1. https://www.pdfdrive.com/engineering-chemistry-e33546326.html
2. https://www.pdfdrive.com/engineering-chemistry-fundamentals-and-applications-2nd-edition-e191456798.html
3. https://www.pdfdrive.com/engineering-chemistry-e48867824.html

MOOCS COURSE

1. https://nptel.ac.in/courses/122101001
2. https://nptel.ac.in/courses/105106205

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

C PROGRAMMING AND DATA STRUCTURES

I B. TECH- I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS104ES	B. Tech	3	0	0	3	40	60	100

COURSEOBJECTIVES

To learn

Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the various steps in Program development.
2. Explore the basic concepts in C Programming Language.
3. Develop modular and readable C Programs
4. Understand the basic concepts such as Abstract Data Types, Linear and Non-Linear Datastructures.
5. Apply data structures such as stacks, queues in problem solving
6. To understand and analyze various searching and sorting algorithms.

UNIT-I	INTRODUCTION TO COMPUTERS	Classes:12

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development
Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output
Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Statements.

UNIT-II	STATEMENTS, DESIGNING STRUCTURED PROGRAMS, ARRAYS	Classes:12

Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loopexamples, other statements related to looping – break, continue, go to, Recursion.
Designing Structured Programs- Functions, basics, user defined functions, inter functioncommunication, standard functions.
Arrays – Concepts, using arrays in C, inter function communication, array applications, two –dimensional arrays, multidimensional arrays.

UNIT-III	POINTERS, POINTER APPLICATIONS	Classes:12

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility**,**
Pointer Applications – Passing an array to a function, Memory allocation functions, array of pointers **Strings –** Concepts, C Strings, String Input / Output functions, arrays of strings, string

manipulation functions, string / data conversion.

UNIT-IV	DERIVED TYPES	Classes:12

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT-V	SORTING, SORTING AND DATA STRUCTURES	Classes:12

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operation array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXTBOOKS

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, CengageLearning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, PearsonEducation.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCEBOOKS

1. Dr.P.Santosh Kumar Patra, "Programming for Problem Solving in C", Amaravati Publicatoins.
2. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
3. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press

3 Programming in C – Stephen G. Kochan, III Edition, Pearson Education.

4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, PearsonEducation / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.tutorialspoint.com/cplusplus/
3. https://www.cprogramming.com/tutorial/c-tutorial.html

E –TEXT BOOKS

1. https://www.amazon.com/Problem-Solving-Program-Design-7th/dp/0132936496
2. https://www.goodreads.com/book/show/36011306-c-programming-data-structures-for-jntu-with-cd

MOOCS COURSE

1. nptel.ac.in/courses/106105085/4
2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL CIRCUIT ANALYSIS –I

I B. TECH- I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE105ES	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

To learn

1. To gain knowledge in circuits and to understand the fundamentals of derived circuit laws.
2. To learn steady state and transient analysis of single phase and 3-phase circuits.
3. To understand Theorems and concepts of coupled circuits.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand network analysis, techniques using mesh and node analysis.
2. Evaluate steadystate and transient behavior of circuits for DC and AC excitations.
3. Analyze electric circuits using network theorems and concepts of coupled circuits.

UNIT-I	NETWORK ELEMENTS & LAWS	Classes:10

Active elements, Independent and dependent sources. Passive elements — R, L and C, Energy stored in inductance and capacitance, Kirchhoff's laws, Source transformations, Star-delta transformations, Node voltage method, Mesh current method including super node and super mesh analysis.

UNIT-II	SINGLE-PHASE CIRCUITS	Classes:10

RMS and average values of periodic sinusoidal and non- sinusoidal waveforms, Phasor representation, Steady-state response of series, parallel and series-parallel circuits. Impedance, Admittance, Current locus diagrams of RL and RC series and parallel circuits with variation of various parameters. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT-III	NETWORK THEOREMS	Classes:10

Superposition theorem, Thevinin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Milliman's theorem and Reciprocity theorem. (AC & DC).

UNIT-IV	POLY-PHASE CIRCUITS	Classes:10

Analysis of balanced and unbalanced 3-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

UNIT-V	COUPLED CIRCUITS	Classes:10

Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient of coupling, Analysis of circuits with mutual inductance.

Topological Description of Networks: Graph, tree, chord, cut-set, incident matrix, circuit matrix and cut-set matrix,

TEXTBOOKS

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

REFERENCEBOOKS

1. Dr. N. Ramchandra, T.V. Sai Kalyani, K. V. Govardhan Rao, "Electrical Circuit Analysis", Sri Krishna Techno Publishers, 2021.
2. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
3. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
4. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.
5. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
6. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6th Edition, 2002.
7. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

WEB REFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits
4. https://circuitglobe.com/

E –TEXT BOOKS

1. https://menglim498.files.wordpress.com/2013/04/schaum_s_outlines_basic_circuit_analysi
2. https://bookboon.com/en/electrical-electronic-engineering-ebooks
3. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
4. https://easyengineering.net/objective-electrical-technology-by-mehta

MOOCS COURSE

1. https://www.courses.com/electrical-engineering
2. https://www.edx.org/course/circuits-and-electronics-1-basic-circuit-analysi-2?index=product_value_experiment_a&queryID=51bcb65ff605e392abde9ced516b66fa&position=1
3. https://nptel.ac.in/courses/108108076/1
4. https://nptel.ac.in/courses/108102146/
5. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COMPUTER AIDED ENGINEERING GRAPHICS

I B. TECH- I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME108ES	B. Tech	1	0	4	3	40	60	100

COURSEOBJECTIVES

To learn

1. To develop the ability of visualization of different objects through technical drawings
2. To acquire computer drafting skill for communication of concepts, ideas in the design ofengineering products

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. Apply computer aided drafting tools to create 2D and 3D objects
2. Sketch conics and different types of solids
3. Appreciate the need of Sectional views of solids and Development of surfaces of solids
4. Read and interpret engineering drawings
5. Conversion of orthographic projection into isometric view and vice versa manually and by usingcomputer aided drafting

UNIT-I	INTRODUCTION TO ENGINEERING GRAPHICS	Classes:15

Principles of Engineering Graphics and their Significance, Scales – Plain & Diagonal, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Introduction to Computer aided drafting – views, commands and conics

UNIT-II	ORTHOGRAPHIC PROJECTIONS	Classes:15

Principles of Orthographic Projections – Conventions – Projections of Points and Lines Projections of Plane regular geometric figures. Auxiliary Planes. Computer aided orthographic projections – points, lines and planes

UNIT-III	PROJECTIONS OF REGULAR SOLIDS	Classes:15

Projections of Regular Solids – Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views, Computer aided projections of solids – sectional views

UNIT-IV	DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS	Classes:15

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone, Development of surfaces using computer aided drafting

UNIT-V	ISOMETRIC PROJECTIONS	Classes:10

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. Conversion of orthographic projection into isometric view using computer aided drafting.

TEXT BOOKS

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and graphics Using AutoCAD Third Edition, T. Jeyapoovan, Vikas: S.Chand and company Ltd.

REFERENCE BOOKS

1. Dr.D.V.Sreekanth, Dr.M.BhojendraNaik and S.Amith Kumar, " Engineering Graphics" Spectrum University Press, First Edition,(2020)
2. Engineering Drawing, Basant Agrawal and C M Agrawal, Third Edition McGraw Hill
3. Engineering Graphics and Design, WILEY, Edition 2020
4. Engineering Drawing, M. B. Shah, B.C. Rane / Pearson.
5. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford
6. Computer Aided Engineering Drawing – K Balaveera Reddy et al – CBS Publishers

Note: External examination is conducted in conventional mode and internal evaluation to be done byboth conventional as well as using computer aided drafting.

WEB REFERENCES

1. http://freevideolectures.com/Course/3420/Engineering-Drawing
2. https://www.slideshare.net/search/slideshow?searchfrom=header&q=engineering+drawing
3. https://www.wiziq.com/tutorials/engineering-drawing
4. http://road.issn.org/issn/2344-4681-journal-of-industrial-design-and-engineering-graphics

E -TEXTBOOKS

1. http://rgpv-ed.blogspot.com/2009/09/development-of-surfaces.html
2. http://www.techdrawingtools.com/12/l1201.htm

MOOCS COURSE

1. https://nptel.ac.in/course.php
2. https://swayam.gov.in/explorer

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

I B. TECH- I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE107ES	B. Tech	0	0	2	1	50	-	50

COURSEOBJECTIVES

To learn

1. To measure the electrical parameters for different types of DC and AC circuits usingconventional and theorems approach.
2. To study the transient response of various R, L and C circuits using different excitations.
3. To determine the performance of different types of DC machines and Transformers.

COURSEOUTCOMES

Upon successful completion of the course, the student is able to

1. Verify the basic Electrical circuits through different experiments.
2. Evaluate the performance calculations of Electrical Machines and Transformers throughvarious testing methods.
3. Analyze the transient responses of R, L and C circuits for different input conditions.

LIST OF EXPERIMENTS/DEMONSTRATIONS

PART-A (compulsory)

1. Verification Ohm's Law
2. Verification of KVL and KCL
3. Verification of Thevenin's and Norton's theorem
4. Verification of Superposition theorem
5. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of aSingle-Phase Transformer
7. Performance Characteristics of a DC Shunt Motor
8. Open Circuit and Short Circuit Tests on 1-phase Transformer

PART-B (any two experiments from the given list)

1. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
2. Verification of Reciprocity and Milliman's Theorem.
3. Verification of Maximum Power Transfer Theorem.
4. Determination of form factor for non-sinusoidal waveform
5. Transient Response of Series RL and RC circuits for DC excitation

TEXTBOOKS

1. D.P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 4th Edition,2019.
2. MS Naidu and S Kamakshaiah, "Basic Electrical Engineering", Tata McGraw Hill, 2nd Edition,2008.

REFERENCEBOOKS

1. P.Ramana, M.Suryakalavathi, G.T.Chandrasheker,"Basic Electrical Engineering", S.Chand, 2ndEdition, 2019.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009
3. M.S.Sukhija, T.K.Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford, 1st Edition,2012.
4. Abhijit Chakrabarthi, Sudipta Debnath, Chandan Kumar Chanda, "Basic ElectricalEngineering", 2nd Edition, McGraw Hill, 2021.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
7. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

WEB REFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits
4. https://circuitglobe.com/

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1. https://menglim498.files.wordpress.com/2013/04/schaum_s_outlines_basic_circuit_analysi
2. https://bookboon.com/en/electrical-electronic-engineering-ebooks
3. https://easyengineering.net/basic-electrical-engineering-by-wadhwa/
4. https://easyengineering.net/objective-electrical-technology-by-mehta

MOOCS COURSE

1. https://www.courses.com/electrical-engineering
2. https://www.edx.org/course/circuits-and-electronics-1-basic-circuit-analysi-2?index=product_value_experiment_a&queryID=51bcb65ff605e392abde9ced516b66fa&position=1
3. https://nptel.ac.in/courses/108108076/1
4. https://nptel.ac.in/courses/108102146/
5. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ENGINEERING CHEMISTRY LABORATORY

I B. TECH - I SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CH104BS	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

To learn

1. Estimation of hardness of water to check its suitability for drinking purpose.
2. Students are able to perform estimations of acids and bases using conductometry, potentiometry and pH metry methods.
3. Students will learn to prepare polymers such as Bakelite and nylon-6 in the laboratory.
4. Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
2. Able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases.
3. Students are able to prepare polymers like bakelite and nylon-6.
4. Estimations saponification value, surface tension and viscosity of lubricant oils.

LIST OF EXPERIMENTS

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry: Estimation of the concentration of an acid by Conductometry.

III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiomentry.

IV. pH Metry: Determination of an acid concentration using pH meter.

V. Preparations:

1. Preparation of Bakelite.
2. Preparation Nylon – 6.

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Corrosion: Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VIII. Virtual lab experiments

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

TEXT BOOKS

1. Senior practical physical chemistry, B. D. Khosla, A. Gulati and V. Garg (R. Chand and Co.,Delhi)
2. An introduction to practical; chemistry, K.K. Sharma and D. S. Sharma (Vikas publishing, New Delhi)
3. Vogel's text book of practical organic chemistry, 5th edition

REFERENCE BOOKS

1. S.Hemambika, V.Rajasekhar Reddy, "Engineering Chemistry Lab", Spectrum Publications., Hyderabad, 1st Edition (2020)
2. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications,New Delhi (2022)
3. Vogel's text book of practical organic chemistry 5th edition
4. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
5. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

WEB REFERENCES

1. https://www.academia.edu/39911915/Engineering_Chemistry_Laboratory_Manual_and_Observation_Subject_Code_18CHEL16_26
2. https://www.vlab.co.in/broad-area-chemical-engineering

E -TEXT BOOKS

1. https://www.pdfdrive.com/engineering-chemistry-lab-manual-e51801253.html
2. https://www.pdfdrive.com/engineering-chemistry-lab-manual-autonomous-2015-16-e37927940.html

MOOCS COURSE

1. https://www.coursera.org/browse/physical-science-and-engineering/chemistry
2. https://libguides.mines.edu/chem/online-course-resources
3. https://ecampus.oregonstate.edu/online-degrees/undergraduate/online-chemistry-lab-course/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

C PROGRAMMING AND DATA STRUCTURES LABORATORY

I B. TECH - I SEMESTER (R 22)

Course Code	Programme	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS103ES	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES:

To train students

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

COURSE OUTCOMES:

Upon successful completion of the course, student will be able to

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

LIST OF EXPERIMENTS:

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 andcasting. Take the values from standard input.

Simple numeric problems:

a. Write a program for finding the max and min from the three numbers.

b. Write the program for the simple, compound interest.

c. Write a 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 inthe 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^2where 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 numberis 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, Pointers and Functions:

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

TEXTBOOKS:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rdEdition)

REFERENCE BOOKS:

1. D.Krishna and S.Mallibabu,"Programming for Problem Solving Lab Record", Spectrum Publications, 1 st Edition (2020).
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
3. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
4. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
5. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
8. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

WEB REFERENCES

1. https://www.tutorialspoint.com/cprogramming/
2. https://www.tutorialspoint.com/cplusplus/
3. https://www.cprogramming.com/tutorial/c-tutorial.html

E -TEXTBOOKS

1. https://www.amazon.com/Problem-Solving-Program-Design-7th/dp/0132936496
2. https://www.goodreads.com/book/show/36011306-c-programming-data-structures-for-jntu-with-cd

MOOCSCOURSE

1. nptel.ac.in/courses/106105085/4
2. https://www.quora.com/Are-IIT-NPTEL-videos-good-to-learn-basic-C-programming

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

I B. TECH - II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA201BS	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Identify whether the given differential equation of first order is exact or not
2. Solve higher differential equation and apply the concept of differential equation to real worldproblems.
3. Use the Laplace transforms techniques for solving ODE's.
4. Evaluate the line, surface and volume integrals and converting them from one to another

UNIT-I	FIRST ORDER ODE	Classes:10

Exact differential equations, Equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II	ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER	Classes: 10

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

UNIT-III	LAPLACE TRANSFORMS	Classes:10

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV	VECTOR DIFFERENTIATION	Classes: 10

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	Classes: 10

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. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

REFERENCE BOOKS

1. Dr. D. Ranadheer Reddy, Mr. K Upender Reddy& Mr. G Chandra Mohan, A First Course in Linear Algebra and Calculus for Engineers, M/s Students Helpline Publishing House.
2. Pvt. Ltd, First Edition-2020. Dr. D. Ranadheer Reddy, Dr. S. Someshwar & Mrs. M. Jhansi Lakshmi, Advanced Calculus for Engineers, M/s Students Helpline Publishing House Pvt. Ltd, First Edition-2020.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint,2002.
5. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and CompanyLimited, New Delhi.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,Reprint, 2008.

WEB REFERENCES

1. https://www.efunda.com/math/gamma/index.cfm
2. https://www.mathworld.wolfram.com/
3. https://www.efunda.com/math/laplace_transform/index.cfm?search_string=laplace%20transforms

E -TEXT BOOKS

1. https://www.e-booksdirectory.com/listing.php?category=4
2. https://www.e-booksdirectory.com/details.php?ebook=10830

MOOCS COURSE

1. https://archive.nptel.ac.in/content/storage2/courses/122104018/node69.html
2. https://archive.nptel.ac.in/courses/111/106/111106139/
3. https://onlinecourses.nptel.ac.in/noc22_ma75/preview

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

APPLIED PHYSICS

I B. TECH - II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP202BS	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

To learn

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles ofvarious semiconductor devices.
3. Study the fundamental concepts related to the dielectric, magnetic and energy materials.
4. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibres.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator byclassification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and energy for their applications.
4. Appreciate the features and applications of Nanomaterials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT-I	QUANTUM PHYSICS AND SOLIDS	Classes: 12

Quantum Mechanics: Introduction to quantum physics, blackbody radiation – Stefan-Boltzmann's law, Wein's and Rayleigh-Jean's law, Planck's radiation law - photoelectric effect - Davisson and Germer experiment –Heisenberg uncertainty principle - Born interpretation of the wave function – time independent Schrodinger wave equation - particle in one dimensional potential box.

Solids: Symmetry in solids, free electron theory (Drude & Lorentz, Sommerfeld) - Fermi-Dirac distribution - Bloch's theorem -Kronig-Penney model – E-K diagram- effective mass of electron- origin of energy bands- classification of solids.

UNIT-II	SEMICONDUCTORS AND DEVICES	Classes: 12

Intrinsic and extrinsic semiconductors – Hall effect - direct and indirect band gap semiconductors - construction, principle of operation and characteristics of P-N Junction diode, Zener diode and bipolar junction transistor (BJT)–LED, PIN diode, avalanche photo diode (APD) and solar cells, their structure, materials, working principle and characteristics.

UNIT-III	DIELECTRIC, MAGNETIC AND ENERGY MATERIALS	Classes: 12

Dielectric Materials: Basic definitions- types of polarizations (qualitative) - ferroelectric, piezoelectric, and pyroelectric materials – applications – liquid crystal displays (LCD) and crystal oscillators.

Magnetic Materials: Hysteresis - soft and hard magnetic materials - magnetostriction, magneto resistance - applications - bubble memory devices, magnetic field sensors and multiferroics. Energy Materials: Conductivity of liquid and solid electrolytes- superionic conductors - materials and electrolytes for super capacitors - rechargeable ion batteries, solid fuel cells.

UNIT-IV	NANOTECHNOLOGY	Classes: 12

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, precipitation, combustion methods – top-down fabrication: ball milling - physical vapor deposition (PVD) - chemical vapor deposition (CVD) - characterization techniques - XRD, SEM &TEM - applications of nonmaterial's.

UNIT-V	LASER AND FIBER OPTICS	Classes: 12

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations- lasing action - pumping methods- ruby laser, He-Ne laser , CO2 laser, Argon ion Laser, Nd:YAG laser- semiconductor laser-applications of laser.

Fiber Optics: Introduction to optical fiber- advantages of optical Fibers - total internal reflection-construction of optical fiber - acceptance angle - numerical aperture- classification of optical fibers-losses in optical fiber - optical fiber for communication system - applications.

TEXT BOOKS

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication,2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A, Neamen, Mc Graw Hill, 4th Edition,2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS

1. Dr. K. Venkanna and Dr. P. NageswarRao, Applied Physics, Seven Hills International Publishers, 2021.
2. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
3. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons, 11th Edition, 2018.
4. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
5. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
6. A.K. Bhandhopadhya - Nano Materials, New Age International, 1st Edition, 2007.
7. Energy Materials a Short Introduction to Functional Materials for Energy Conversion and Storage Aliaksandr S. Bandarenka, CRC Press Taylor & Francis Group
8. Energy Materials, Taylor & Francis Group, 1st Edition, 2022.

WEB REFERENCES

1. https://ocw.tudelft.nl/courses/solid-state-physics/subjects/3-quantum-theory-of-solids/
2. https://byjus.com/physics/semiconductor-devices/
3. https://www.nano.gov/nanotech-101/what/definition
4. https://www.studocu.com/in/document/delhi-technological-university/engineering-physics/fiber-optics-laser-notes/26618092

E -TEXT BOOKS

1. https://www.pdfdrive.com/physics-for-scientists-engineers-modern-physics-9th-ed-e51722698.html
2. https://www.pdfdrive.com/physics-for-scientists-engineers-modern-physics-9th-ed-e43567270.html

MOOCS COURSE

1. Swayam: https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison: https://alison.com/courses?&category=physics

ENGINEERING WORKSHOP

I B. TECH - II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME207ES	B. Tech	0	1	3	2.5	40	60	100

COURSE OBJECTIVES

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

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including pluming, fitting,carpentry, foundry, house wiring and welding.
3. Identify and apply suitable tools for different trades of Engineering processes including drilling,material removing, measuring, chiseling.
4. 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 - R.HanumaNaik/R.SuvaranaBabu/Sun Techno Publications
2. Work shop Manual - P. Kannaiah/ K.L. Narayana/ Scitech
3. Workshop Manual / Venkat Reddy/ BSP

WEB REFERENCES

1. https://nptel.ac.in/courses/112105126/
2. https://nptel.ac.in/downloads/112105127/
3. https://nptel.ac.in/courses/112107145/
4. https://nptel.ac.in/courses/122104015/

E -TEXT BOOKS

1. http://103.135.169.82:81/fdScript/RootOfEBooks/MED/Introduction Workshop%20Technology
2. https://www.quora.com/Download-free-mechanical-engineering-ebooks-sites

MOOCS COURSE

1. http://www.nits.ac.in/workshops/Workshop_on_MOOCS_26082017.pdf
2. https://www.nitttrc.ac.in/swayam/index.html

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
ENGLISH FOR SKILL ENHANCEMENT

I B. TECH- II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN204HS	B. Tech	2	0	0	2	40	60	100

COURSE OBJECTIVES

To learn

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

COURSE OUTCOMES

1. Understand the importance of vocabularyand sentence structures.
2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.
6. Acquire basic proficiency in reading and writing modules of English.

UNIT-I	Chapter entitled '***Toasted English***' **by R.K.Narayan** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.	**Classes: 10**

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to form Derivatives - Synonyms and Antonyms

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

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

Writing: 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	Chapter entitled **'Appro JRD' by Sudha Murthy** from ***"English: Language, Context and Culture" published*** by Orient BlackSwan, Hyderabad.	**Classes:10**

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

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

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

Writing: Nature and Style of Writing- Defining /Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence.

UNIT-III	Chapter entitled **'Lessons from Online Learning'** by F.Haider Alvi, Deborah Hurst et al from ***"English: Language, Context and Culture"*** published by Orient BlackSwan, Hyderabad.	**Classes:10**
Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses. **Reading:** Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice. **Writing:** Format of a Formal Letter-Writing Formal Letters eg., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.		
UNIT-IV	Chapter entitled **'Art and Literature' by Abdul Kalam** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.	**Classes: 10**
Vocabulary: Standard Abbreviations in English **Grammar:** Redundancies and Clichés in Oral and Written Communication. **Reading**: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice **Writing:** Writing Practices- Essay Writing-Writing Introduction and Conclusion -Précis Writing.		
UNIT-V	Chapter entitled **'Go, Kiss the World' by Subroto Bagchi** from ***"English: Language, Context andCulture"*** published by Orient BlackSwan, Hyderabad.	**Classes: 10**
Vocabulary: Technical Vocabulary and their Usage **Grammar:** Common Errors in English (*Covering all the other aspects of grammar which were notcovered in the previous units*) **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 a Report.		

Note: ***Listening and Speaking Skills which are given under Unit-6 in AICTE Model Curriculum are coveredin the syllabus of ELCS Lab Course.***

- **Note: 1**. As the syllabus of English given in AICTE *Model Curriculum-2018 for B.Tech First Year is* ***Open-ended***, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on theneeds of the students in their respective colleges for effective teaching/learning in the class.

- **Note**: **2**. Based on the recommendations of NEP2020, teachers are requested to be flexible to adopt Blended Learning in dealing with the course contents. They are advised to teach 40 percent of each topic from the syllabus in blended mode.

TEXT BOOKS

1 “English: Language, Context and Culture” by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS

1. Mr. G. Laxmikanth, Dr. Ramchandra Kumar R, and Mr. Ch. Bhaskara Rao, Professional English, Sun Techno Publications, 1 st Edition, 2020.
2. Effective Academic Writing by Liss and Davis (OUP)
3. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
4. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
5. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language,Grammar and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
6. (2019). Technical Communication. Wiley India Pvt. Ltd.
7. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students.Mc Graw-Hill Education India Pvt. Ltd.
8. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

WEB REFERENCES

1. www.edufind.com
2. www.myenglishpages.com
3. http://grammar.ccc.comment.edu
4. http://owl.english.prudue.edu

E -TEXT BOOKS

1. http://bookboon.com/en/communication-ebooks-zip
2. http://learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeanin gsandexamlespdf.pdf

MOOCS Course

1. https://mooec.com/courses/grammar-guru-1
2. https://mooec.com/courses/learning-styles

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL CIRCUIT ANALYSIS – II

I B. TECH- II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE209ES	B. Tech	2	0	0	2	40	60	100

COURSE OBJECTIVES

To learn

1. To study the transient analysis of various R, L and C circuits for different inputs
2. To understand the Fourier series and Laplace transformation.
3. To learn about two-port networks and concept of filters

COURSE OUTCOMES

1. Observe the response of various R, L and C circuits for different excitations.
2. Examine the behavior of circuits using Fourier, Laplace transforms and transfer function of single port network.
3. Obtain two port network parameters and applications and design of various filters.

UNIT-I	TRANSIENT ANALYSIS	Classes: 10

Transient response of R, L & C circuits, Formulation of integral differential equations, Initial conditions, Transient Response of RL, RC and RLC (series and parallel) networks subjected to internal energy, Response to impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-II	ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS	Classes:10

Application of Laplace Transforms to RL, RC and RLC (series and parallel) Networks for impulse, step, and ramp, exponential and sinusoidal excitations.

UNIT-III	TWO PORT NETWORK PARAMETERS	Classes:10

Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks, System function, and Impedance and admittance functions.

UNIT-IV	FOURIER SERIES AND INTEGRAL	Classes:10

Fourier series representation of periodic functions, Symmetry conditions, Exponential Fourier series, Discrete spectrum, Fourier integral and its properties, Continuous spectrum, Application to simple networks

UNIT-V	FILTERS	Classes:10

Classification of filters – Low pass, High pass, Band pass and Band Elimination, Constant-k and M-derived filters-Low pass and High pass Filters and Band pass and Band elimination filters (Elementary treatment only)

TEXT BOOKS

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

REFERENCE BOOKS

1. Dr. N. Ramchandra, T. V. Sai Kalyani, K. V. Govardhan Rao, "Electrical Circuit Analysis", Sri Krishna Techno Publishers, 2021.
2. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
3. James W. Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
4. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.
5. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
6. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6th Edition, 2002.
7. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

WEB REFERENCES

1. https://books.google.co.in/books/about/Electric_Circuit_Analysis.html?id=nzlKPgAACAAJ&redir_esc=y
2. https://books.google.co.in/books/about/Electric_Circuits.html?id=SAUoAQAAMAAJ&redir_esc=y
3. https://books.google.co.in/books/about/Circuits_and_Networks_Analysis_and_Synth.html?id=JW5wCgAAQBAJ&redir_esc=y
4. https://www.bookshopofindia.com/search.asp?action1=default&bookid=9140917

E -TEXT BOOKS

1. https://scholar.google.co.in/scholar?hl=en&as_sdt=0%2C5&as_vis=1&q=network+analysis+van+valkenburg&oq=%E2%80%9CNetwork+Analysis+V
2. https://bookboon.com/en/electrical-electronic-engineering-ebooks
3. https://scholar.google.co.in/scholar?q=Network+Analysis+and+Synthesis&hl=en&as_sdt=0&as_vis=1&oi=scholart

MOOCS COURSE

1. https://www.courses.com/indian-institute-of-technology-delhi/circuit-theory
2. https://www.edx.org/xseries/mitx-circuits-and-electronics

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

APPLIED PHYSICS LABORATORY

I B. TECH - II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
AP203BS	B. Tech	0	0	3	1.5	40	60	100

COURSE OBJECTIVES

1. Capable of handling instruments related to the Hall effect and photoelectric effect experimentsand their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap and resistivity of semiconductor materials.
3. Able to measure the characteristics of dielectric constant of a given material.
4. Study the behavior of B-H curve of ferromagnetic materials.
5. Understanding the method of least squares fitting.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify thematerial whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge of applications of dielectric constant.
4. Understand the variation of magnetic field and behavior of hysteresis curve.
5. Carried out data analysis.

LIST OF EXPERIMENTS

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode
5. Input and output characteristics of BJT (CE, CB & CC configurations)
6. a) V-I and L-I characteristics of light emitting diode (LED)
   b) V-I Characteristics of solar cell
7. Determination of Energy gap of a semiconductor.
8. Determination of the resistivity of semiconductor by two probe method.
9. Study B-H curve of a magnetic material.
10. Determination of dielectric constant of a given material
11. a) Determination of the beam divergence of the given LASER beam
    b) Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
12. Understanding the method of least squares – torsional pendulum as an example.

NOTE: Any 8 experiments are to be performed

TEXT BOOKS

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

REFERENCE BOOKS

1. Dr. K. Venkanna and T. Vamshi Prasad, Applied pHysics Lab Book, Spectrum Publishers, 2021.
2. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers,2017.

WEB REFERENCES

1. Fundamental concepts of semi conductors: https://nptel.ac.in/courses/115102025/
2. Semi conductor Optoelectronics:https://nptel.ac.in/courses/115102103/

E -TEXT BOOKS

1. http://www.lehman.edu/faculty/kabat/F2019-166168.pdf
2. https://www.scribd.com/doc/143091652/ENGINEERING-PHYSICS-LAB-MANUAL

MOOCS COURSE

1. Swayam:https://swayam.gov.in/nd1_noc19_ph13/preview
2. Alison: https://alison.com/courses?&category=physics

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

I B. TECH - II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN205HS	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

To learn

1. To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent,intonation and rhythm
3. To bring about a consistent accent and intelligibility in students' pronunciation ofEnglish by providing an opportunity for practice in speaking
4. To improve the fluency of students in spoken English and neutralize the impact ofdialects.
5. To train students to use language appropriately for public speaking, group discussions and interviews

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. Understand the nuances of English language through audio- visual experience and group activities
2. Neutralise their accent for intelligibility
3. Speak with clarity and confidence which in turn enhances their employability skills

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 the role in the LSRWskills 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 professionalcontexts

• Oral practice
• Describing objects/situations/people
• Role play – Individual/Group activities
• Just A Minute (JAM) Sessions

The following course content is prescribed for the English Language and Communication Skills Lab.

Exercise – I
CALL Lab:
Understand: Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. Practice: Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- Testing Exercises
ICS Lab:
Understand: Spoken vs. Written language- Formal and Informal English.
Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.
Exercise – II CALL Lab:
Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress pattern in sentences – Intonation.
Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stress pattern in sentences – Intonation - Testing Exercises
ICS Lab:
Understand: Features of Good Conversation – Strategies for Effective Communication.
Practice: Situational Dialogues – Role Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.
Exercise - III CALL Lab:
Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).
Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -Testing Exercises
ICS Lab:
Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing
Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.
Exercise – IV CALL Lab:
Understand: Listening for General Details.
Practice: Listening Comprehension Tests - Testing Exercises
ICS Lab:
Understand: Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.
Practice: Making a Short Speech – Extempore- Making a Presentation.
Exercise – V CALL Lab:
Understand: Listening for Specific Details.
Practice: Listening Comprehension Tests -Testing Exercises
ICS Lab:
Understand: Group Discussion
Practice: Group Discussion

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 fo 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 T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

Source of Material (Master Copy):

- Exercises in Spoken English. Part 1,2,3. CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contentsof the syllabus.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge UniversityPress.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS

1. (2022). English Language Communication Skills – Lab Manual cum Workbook. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). Communication Skills: A Workbook. Oxford University Press
4. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. Cambridge University Press

WEB REFERENCES
1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=References 2. https://www.englishlab.co.in/blog/types-of-communication-skills-lab-english-language-lab/
E -TEXT BOOKS
1. https://www.pdfdrive.com/basic-english-grammar-for-english-language-learners-basic-english-grammar-for-english-language-learners-e158730664.html 2. https://www.pdfdrive.com/english-language-communication-skills-e53852464.html
MOOCS COURSE
1. https://www.coursera.org/specializations/improve-english 2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate- english

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

APPLIED PYTHON PROGRAMMING LABORATORY

I B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
CS208ES	B. Tech	0	1	2	2	40	60	100

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. Build basic programs using fundamental programming constructs
2. Write and execute python codes for different applications
3. Capable to implement on hardware boards

LIST OF EXPERIMENTS

Cycle - 1

1. Downloading and Installing Python and Modules
   a) Python 3 on Linux
      Follow the instructions given in the URL https://docs.python-guide.org/starting/install3/linux/
   b) Python 3 on Windows
      Follow the instructions given in the URL https://docs.python.org/3/using/windows.html (Please remember that Windows installation of Python is harder!)
   c) pip3 on Windows and Linux
      Install the Python package installer by following the instructions given in the URL https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/
   d) Installing numpy and scipy
      You can install any python3 package using the command pip3 install <packagename>
   e) Installing jupyterlab
      Install from pip using the command pip install jupyterlab
2. Introduction to Python3
   a) Printing your biodata on the screen
   b) Printing all the primes less than a given number
   c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. Defining and Using Functions
   a) Write a function to read data from a file and display it on the screen
   b) Define a boolean function *is palindrome*(<input>)
   c) Write a function *collatz(x)* which does the following: if x is odd, $x = 3x + 1$; if x is even, then $x = x/2$. Return the number of steps it takes for $x = 1$
   d) Write a function $N(m, s) = exp(-(x-m)^2/(2s^2))/sqrt(2\pi)s$ that

computes the Normaldistribution

4. The package numpy
   a) Creating a matrix of given order *m x n* containing *random numbers* in the range 1 to99999
   b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
   c) Write a program to solve a system of *n* linear equations in *n* variables using matrixinverse
5. The package scipy and pyplot
   a) Finding if two sets of data have the same *mean* value
   b) Plotting data read from a file
   c) Fitting a function through a set a data points using *polyfit* function
   d) Plotting a histogram of a given data set
6. The strings package
   a) Read text from a file and print the number of lines, words and characters
   b) Read text from a file and return a list of all *n* letter words beginning with a vowel
   c) Finding a secret message hidden in a paragraph of text
   d) Plot a histogram of words according to their length from text read from a file

Cycle -2

7. Installing OS on Raspberry Pi
   a) Installation using PiImager
   b) Installation using image file
   - Downloading an Image
   - Writing the image to an SD card
   - using Linux
   - using Windows
   - Booting up

   Follow the instructions given in the URL https://www.raspberrypi.com/documentation/computers/getting-started.html
8. Accessing GPIO pins using Python
   a) Installing GPIO Zero library.
   First, update your repositories list:
   sudo apt update
   Then install the package for Python 3:
   sudo apt install python3-gpiozero
   b) Blinking an LED connected to one of the GPIO pin
   c) Adjusting the brightness of an LED
   d) Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) usingthe in-built PWM wavelength.
9. Collecting Sensor Data
   a) DHT Sensor interface
   - Connect the terminals of DHT GPIO pins of Raspberry Pi.
   - Import the DHT library using *import Adafruit_DHT*
   - Read sensor data and display it on screen.

TEXT BOOKS

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and WebApplications, Sheetal Taneja, Naveen Kumar, Pearson
3. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
4. Think Python, Allen Downey, Green Tea Press
5. Core Python Programming, W. Chun, Pearson
6. Introduction to Python, Kenneth A. Lambert, Cengage

WEB REFERENCES

1. https://www.tutorialspoint.com/python3/
2. https://www.udemy.com/machine-learning-using-r-and-python/
3. https://www.udemy.com/r-programming-language/
4. https://www.simpliv.com/itcertification/data-analytics-using-r-programming
5. https://books.goalkicker.com/PythonBook/

E -TEXT BOOKS

1. https://www.amazon.in/Advanced-Python-Programming-Brian-Overland/dp/0135159946
2. https://www.oreilly.com/library/view/learning-python-5th/9781449355722/

MOOCS COURSE

1. https://nptel.ac.in/courses/106106145
2. https://nptel.ac.in/courses/106106182

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL CIRCUIT ANALYSIS LABORATORY

I B. TECH- II SEMESTER (R 22)

Course Code	Programme	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE210ES	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To design electrical systems and analyze them by applying various Network Theorems
2. To measure three phase Active and Reactive power.
3. To understand the locus diagrams and concept of resonance.

COURSE OUTCOMES

Upon successful completion of the course, the student is able

1. Analyze complex DC and AC linear circuits
2. Apply concepts of electrical circuits across engineering
3. Evaluate response of a given network by using theorems.

LIST OF EXPERIMENTS

The following experiments are required to be conducted as compulsory

1. To drawthe locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.
2. Verification of Series and Parallel Resonance.
3. Determination of Time response of first order RL and RC circuit for periodic non –sinusoidal inputs – Time Constant and Steady state error.
4. Determination of Two port network parameters – Z & Y parameters.
5. Determination of Two port network parameters – A, B, C, D parameters.
6. Determination of Co-efficient of Coupling and Separation of Self and Mutual inductance in a Coupled Circuits.
7. Frequency domain analysis of Low-pass filters.
8. Frequency domain analysis of Band-pass filters.

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

1. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum.
2. Measurement of Active Power for Star and Delta connected balanced loads
3. Measurement of Reactive Power for Star and Delta connected balanced loads.
4. Frequency domain analysis of High-pass filter.
5. Determination of Two port network parameters -Hybrid parameters.
6. To drawthe locus Diagrams of RL (L-Varying) and RC (C-Varying) Series Circuits.
7. Determination of Time response of first order RLC circuit for periodic non – sinusoidal inputs – Time Constant and Steady state error.

TEXT BOOKS

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

REFERENCE BOOKS

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A. Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

WEB REFERENCES

1. https://books.google.co.in/books/about/Electric_Circuit_Analysis.html?id=nzlKPgAACAAJ&redir_esc=y
2. https://books.google.co.in/books/about/Electric_Circuits.html?id=SAUoAQAAMAAJ&redir_esc=y
3. https://books.google.co.in/books/about/Circuits_and_Networks_Analysis_and_Synth.html?id=JW5wCgAAQBAJ&redir_esc=y
4. https://www.bookshopofindia.com/search.asp?action1=default&bookid=9140917

E -TEXT BOOKS

1. https://scholar.google.co.in/scholar?hl=en&as_sdt=0%2C5&as_vis=1&q=network+analysis+van+valkenburg&oq=%E2%80%9CNetwork+Analysis+V
2. https://bookboon.com/en/electrical-electronic-engineering-ebooks
3. https://scholar.google.co.in/scholar?q=Network+Analysis+and+Synthesis&hl=en&as_sdt=0&as_vis=1&oi=scholart

MOOCS COURSE

1. https://www.courses.com/indian-institute-of-technology-delhi/circuit-theory
2. https://www.edx.org/xseries/mitx-circuits-and-electronics

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ENVIRONMENTAL SCIENCE

I B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*CH209MC	B. Tech	3	0	0	0	40	60	100

COURSE OBJECTIVES

To learn

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

COURSE OUTCOMES

Upon successful completion of the course, the student is able to

1. 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	Classes: 10

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:	Classes:10

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 minera 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	Classes:10

Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity consumptive use, productive use, social, ethical, aesthetic and optional values. India as a meg 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-sit conservation. National Biodiversity act.

UNIT-IV	ENVIRONMENTAL POLLUTION AND CONTROL TECHNOLOGIES	Classes: 10

Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondar pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Wate pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Source and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, compositio 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. **Globa 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	Classes: 10

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. A. Aditya Prasad, S. Hemambika, A. Rambabu, “Environmental Science”, Spectrum Eductaional Books, Hyderabad, 1st edition (2021).
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHLLearning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHILearning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
6. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BSPublications.
7. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.

WEB REFERENCES

1. https://education.nationalgeographic.org/resource/ecosystem
2. https://byjus.com/chemistry/natural-resources-pdf/

E –TEXT BOOKS

1. https://www.pdfdrive.com/biodiversity-inventories-in-high-gear-dna-barcoding-facilitates-a-rapid-biotic-survey-of-a-temperate-d149274581.html
2. https://www.pdfdrive.com/pollution-causes-effects-and-control-e159560577.html

MOOCS COURSE

1. https://nptel.ac.in/courses/120108004
2. https://archive.nptel.ac.in/content/storage2/courses/122102006/mod1/Overview%20of%20ecology.htm

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

NUMERICAL METHODS AND COMPLEX VARIABLES

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
MA301BS	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

To learn

1. Expressing periodic function by Fourier series and a non-periodic function by Fourier transforms
2. Various numerical methods to find roots of polynomial and transcendental equations.
3. Concept of finite differences and to estimate the value for the given data using interpolation.
4. Evaluation of integrals using numerical techniques
5. Solving ordinary differential equations of first order using numerical techniques.
6. Differentiation and integration of complex valued functions.
7. Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.
8. Expansion of complex functions using Taylor's and Laurent's series.

UNIT-I	FOURIER SERIES AND FOURIER TRANSFORM	Classes:10

Fourier series - Dirichlet's Conditions - Half-range Fourier series - Fourier Transforms: Fourier Sine and cosine transforms - Inverse Fourier transforms

UNIT-II	NUMERICAL METHODS - I	Classes:10

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

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-III	NUMERICAL METHODS - II	Classes:8

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8th rules.

Ordinary differential equations: Taylor's series, Picard's method, Euler and modified Euler's methods, Runge-Kutta method of fourth order for first order ODE

UNIT – IV	COMPLEX DIFFERENTIATION	Classes: 10

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. (All theorems without Proofs), Conformal mappings, Mobius transformations.

UNIT-V	COMPLEX INTEGRATION	Classes:13

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem. and their properties. (All theorems without Proofs)

TEXTBOOKS

1. Higher Engineering Mathematics By Dr.B.S Grewal, Khanna Publishers.
2. S. S. Sastry, Introductory methods of numerical analysis, PHI, 4th edition, 2005.

REFERENCE BOOKS

1. Dr.P. Santosh Kumar Patra,Dr. D. Ranadheer Reddy, G.Chandra Mohan & Mrs. G.Vanaja, Transformations , Complex variables & Numerical Techniques , M/s SevenHills International Publishers, First Edition-2022.
2. M.K.Jain , SRK Iyenger, R.K.Jain ,Numerical methods for Scientific and Engineering Computations, New Age International publishers.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

WEB REFERENCES

1. https://www.efunda.com/math/laplace_transform/index.cfm
2. https://www.efunda.com/math/fourier_transform/index.cfm
3. https://www.efunda.com/math/complex_numbers/complex.cfm

E -TEXTBOOKS

1. https://www.e-booksdirectory.com/details.php?ebook=10602
2. https://www.e-booksdirectory.com/details.php?ebook=4708

MOOCS COURSE

1. https://swayam.gov.in/
2. https://swayam.gov.in/NPTEL

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL MACHINES - I

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE301PC	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

1. To study and understand different types of DC machines and their performance evaluation through various testing methods.
2. To understand the operation of single and ploy-phase Transformers
3. To analyse the performance of transformers through various testing methods.

UNIT-I	DC GENERATORS	Classes:10

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

UNIT-II	DC MOTORS	Classes:10

Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation.
Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3-point and 4- point starters) Testing of D.C. machines - Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT-III	TESTING OF DC MACHINES	Classes:15

Methods of Testing – direct, indirect, and regenerative testing – Brake test – Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a D.C. motor test.

UNIT – IV	SINGLE PHASE TRANSFORMERS	Classes: 15

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

UNIT-V	TESTING OF TRANSFORMERS AND POLY PHASE TRANSFORMERS	Classes:13

Open Circuit and Short Circuit tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test parallel operation with equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers.

Poly-phase transformers – Poly-phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ, Scott connection and Applications.

TEXTBOOKS

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS

1. Dr. N. Ramchandra, CH. Srinivas, V. Bharath Kumar, "Electrical Machines – I", M/s Seven Hills Interntaional Publishers, 2022.
2. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
5. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers,2004.

WEB REFERENCES

1. https://www.oreilly.com › library › view › electrical-machines-2nd › 25_ref
2. https://swayam.gov.in › nd1_noc19_ee602.
3. https://www.sanfoundry.com › best-reference-books-advance-electrical-machines

E -TEXTBOOKS

1. Electrical Machines-I By U.A.Bakshi, V.U.Bakshi Technical Publications, 2009
   PrintISBN:9783527340224 OnlineISBN:9783527698523 |DOI:10.1002/9783527698523

MOOCS COURSE

1. https://nptel.ac.in/courses/108105017/
2. https://swayam.gov.in/nd1_noc19_ee60/preview

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEMS - I

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE302PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To understnad the power generation through conventional and non-conventional sources.
2. To illustrate the economic aspects of power generation and tariff methods.
3. To know about Overhead line insulators, substations and AC & DC distribution systems.

UNIT-I GENERATION OF ELECTRIC POWER — Classes:10

Conventional Sources (Qualitative): Hydro station, Steam Power Plant, Nuclear Power Plant and Gas Turbine Plant.
Non-Conventional Sources (Elementary Treatment): Solar Energy, Wind Energy, Fuel Cells, Ocean Energy, Tidal Energy, Wave Energy, Cogeneration, Energy conservation and storage.

UNIT-II ECONOMICS OF POWER GENERATION — Classes:10

Introduction, definitions of connected load, maximum demand, demand factor, load factor diversity factor, Load duration curve, number and size of generator units. Base load and peak load plants.
Cost of electrical energy-fixed cost, running cost, Tariff on charge to customer.

UNIT-III OVER HEAD TRANSMISSION LINES — Classes:15

OVER HEAD TRANSMISSION LINES: Line conductors, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, Composite conductors transposition, bundled conductors, and effect of earth on capacitance, skin and proximity effects.
OVERHEAD LINE INSULATORS: Introduction, types of insulators, Potential distribution over a string of suspension insulators, Methods of equalizing the potential, testing of insulators, Sag and tension calculations

UNIT – IV SUBSTATIONS — Classes: 15

AIR INSULATED SUBSTATIONS (AIS): 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.
GAS INSULATED SUBSTATIONS (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT-V	DISTRIBUTION NETWORK	Classes:13

DC DISTRIBUTION: Classification of Distribution Systems. - Comparison of DC vs. AC and Under- Ground vs. Over- Head Distribution Systems. - Requirements and Design features o 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/unequa Voltages) and Ring Main Distributor.

A.C. DISTRIBUTION: Introduction, AC distribution, Single phase, 3-phase, 3 phase 4 wire system, bus bar arrangement, Selection of site for substation. Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

TEXTBOOKS

1. C.L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2nd Edition, New Age International, 2009.
2. V.K Mehta and Rohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, New Delhi, 2004.

REFERENCE BOOKS

1. Dr. P. Santosh Kumar Patra, Dr. N. Ramchandra, G. Esha, N. Daniel Manoj, "Power Systems – I", Amaravathi Publishers, 2022.
2. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
3. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
4. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub. 1998.
5. H.Cotton & H. Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition, 1970.
6. W.D.Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984.

WEB REFERENCES

1. https://nptel.ac.in/courses/112/107/112107216/.
2. https://nptel.ac.in/content/storage2/courses/112107216/3%20assignment%20solution. Pdf
3. https://nptel.ac.in/content/storage2/courses/112107216/Assignment6%20questions.pdf

E -TEXTBOOKS

1. https://www.electricalengineeringinfo.com/2017/06/principles-power-systems-vkmehta-ebook-pdf-download.html
2. 2 A Text Book On Power System Engineering, A. Chakrabarti, Soni Ml, P. V. Gupta, DhanpatRai Publishing Company (P) Limited, 2008, ISBN 8177000209
3. 9788177000207 https://www.scribd.com/doc/192018739/A-Textbook-of-Power-System-Engineeringby-R-K-Rajput-Google-Book

MOOCS COURSE

1. https://nptel.ac.in/courses/112/107/112107216/
2. https://nptel.ac.in/courses/112/103/112103243/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ANALOG ELECTRONIC CIRCUITS

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC308PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To introduce components such as diodes, BJTs and FETs their switching characteristics, applications.
2. Learn the concepts of high frequency analysis of transistors.
3. To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

UNIT-I	DIODE AND BIPOLAR TRANSISTOR CIRCUITS	Classes:10

P-N junction diode, I-V characteristics of a diode; review of half-wave and full-wave rectifiers, clamping and clipping circuits. Input output characteristics of BJT in CB, CE, CC configurations, biasing circuits, Load line analysis, common-emitter, common-base and common collector amplifiers; Small signal equivalent circuits,

UNIT-II	FET CIRCUIT	Classes:10

FET Structure and VI Characteristics, MOSFET structure and I-V characteristics. MOSFET as a switch. small signal equivalent circuits - gain, input and output impedances, small-signal model and common-source, common-gate and common-drain amplifiers, trans conductance, high frequency equivalent circuit.

UNIT-III	MULTI – STAGE AND POWER AMPLIFIERS	Classes:15

Direct coupled and RC Coupled multi-stage amplifiers; Differential Amplifiers, Power amplifiers - Class A, Class B, Class C

UNIT – IV	FEEDBACK AMPLIFIERS AND OSCILLATORS	Classes: 15

Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers – Genera characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Oscillators: Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.

UNIT-V	OPERATIONAL AMPLIFIERS	Classes:13

Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular- wave generators.

TEXTBOOKS

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2nd edition 2010
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.

REFERENCE BOOKS

1. Electronic Devices Conventional and current version -Thomas L. Floyd 2015, pearson.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press, 1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

WEB REFERENCES

1. https://nptel.ac.in/courses/113/106/113106062/
2. https://nptel.ac.in/courses/113/106/113106065/
3. https://nptel.ac.in/courses/108/108/108108122/
4. https://nptel.ac.in/courses/117107094/

E -TEXTBOOKS

1. ELECTRONIC DEVICES AND CIRCUITS, 2nd Edition Jacob Millmanand Christos C
2. ELECTRONIC DEVICES AND CIRCUITS, 2 nd Edition David A.Bell.

MOOCS COURSE

1. https://www.edx.org/course/principle-of-semiconductor-devices-part-ii-field-effecttransistors-and-mosfets-2
2. https://www.coursera.org/lecture/electronics/4-1-introduction-to-pn-junctions-xr0ZQ
3. https://www.coursera.org/lecture/electronics/2-1-introduction-to-op-amps-and-idealbehavior-Q5Di2

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRO MAGNETIC FIELDS

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE303PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To introduce the concepts of electric field and magnetic field.
2. To know Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.
3. To study about electromagnetic waves.

UNIT-I	STATIC ELECTRIC FIELD	Classes:10

Review of conversion of a vector from one coordinate system to another coordinate system, Coulomb's law, Electric field intensity, Electrical field due to point charges. Line, Surface and Volume charge distributions. Gauss law and its applications. Absolute Electric potential, potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT-II	CONDUCTORS, DIELECTRICS AND CAPACITANCE	Classes:10

Current and current density, Ohms Law in Point form, Continuity equation, Boundary conditions of conductors and dielectric materials.
Capacitance, Capacitance of a two-wire line, Poisson's equation, Laplace's equation, Solution of Laplace and Poisson's equation.

UNIT-III	STATIC MAGNETIC FIELDS AND MAGNETIC FORCES	Classes:15

Biot-Savart Law, Ampere Law, Magnetic flux and magnetic flux density, Scalar and Vector Magnetic potentials, Steady magnetic fields produced by current carrying conductors.
Force on a moving charge, Force on a differential current element, Force between differential current elements, Magnetic boundary conditions, Magnetic circuits, Self-inductances and mutual inductances.

UNIT – IV	TIME VARYING FIELDS AND MAXWELL'S EQUATIONS	Classes: 15

Faraday's law for Electromagnetic induction, Displacement current, Point form of Maxwell's Equation, Integral form of Maxwell's equations, Motional Electromotive forces.

UNIT-V	ELECTROMAGNETIC WAVES	Classes:13

Derivation of Wave Equation, Uniform Plane Waves, Maxwell's equation in Phasor form, Wave equation in Phasor form, Plane wave in free space and in a homogenous material. Wave equation for a conducting medium, Plane waves in lossy dielectrics, Propagation in good conductors. Poynting theorem.

TEXTBOOKS

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014.
2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2012.

REFERENCE BOOKS

1. Dr. N. Ramchandra, CH. Nirosha, "Electromagnetic Fields", Spectrum Publishers, 2021.
2. Pramanik, "Electromagnetism-Problems with solution", Prentice Hall India, 2012.
3. G. W. Carter, "The electromagnetic field in its engineering aspects", Longmans, 1954.
4. W. J. Duffin, "Electricity and Magnetism", McGraw Hill Publication, 1980.
5. W. J. Duffin, "Advanced Electricity and Magnetism", McGraw Hill, 1968.
6. E. G. Cullwick, "The Fundamentals of Electromagnetism", Cambridge University Press, 1966.
7. B. D. Popovic, "Introductory Engineering Electromagnetics", Addison-Wesley Educational Publishers, International Edition, 1971.
8. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.

WEB REFERENCES

1. https://www.khanacademy.org/science/physics/magnetic-forces-and-magneticfields/magnetic-field-current-carrying-wire/v/magnetism-6-magnetic-field-due-tocurrent
2. https://nptel.ac.in/courses/108106073/
3. https://www.youtube.com/watch?v=pGdr9WLto4A

E -TEXTBOOKS

1. Electromagnetic Field Theory and Transmission Lines 1st Edition, Kindle Edition.

MOOCS COURSE

1. https://www.classcentral.com/course/edx-electricity-and-magnetism-magnetic-fieldsand-forces-10280 2. https://www.classcentral.com/course/nptel-electromagnetic-theory-5223

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL MACHINES LABORATORY - I

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE304PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To expose the students to the operation of DC Generators.
2. To know the operation of various types of DC Motors.
3. To examine the performance of Single and Three Phase Transformers

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator (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. Hopkinson's test on DC shunt machines (Predetermination of efficiency).
5. Swinburne's test and speed control of DC shunt motor (Predetermination of efficiencies).
6. Brake test on DC compound motor (Determination of performance curves).
7. OC and SC Test on Single Phase Transformer.
8. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta- Delta, Delta-star, Star-Star)

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

1. Brake test on DC shunt motor (Determination of performance curves)
2. Load test on DC compound generator (Determination of characteristics.
3. Fields test on DC series machines (Determination of efficiency)
4. Retardation test on DC shunt motor (Determination of losses at rated speed)
5. Separation of losses in DC shunt motor.
6. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of Single-Phase Transformer.
7. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

TEXTBOOKS

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS

1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers,2004.

WEB REFERENCES

1. https://www.oreilly.com › library › view › electrical-machines-2nd › 25_ref
2. https://swayam.gov.in › nd1_noc19_ee60
3. https://www.sanfoundry.com › best-reference-books-advance-electrical-machines

E -TEXTBOOKS

1. Electrical Machines-I By U.A.Bakshi, V.U.Bakshi Technical Publications, 2009 PrintISBN:9783527340224 Online ISBN:9783527698523 |DOI:10.1002/9783527698523

MOOCS COURSE

1. https://nptel.ac.in/courses/108105017/
2. https://swayam.gov.in/nd1_noc19_ee60/preview

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ANALOG ELECTRONIC CIRCUIT LABORATORY

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC309PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To introduce components such as diodes, BJTs and FETs their switching characteristics, applications.
2. Learn the concepts of high frequency analysis of transistors.
3. To give understanding of various types of basic and feedback amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
4. To introduce the basic building blocks of linear integrated circuits.
5. To introduce the concepts of waveform generation and introduce some special function ICs.

The following experiments are required to be conducted compulsory experiments:

1. Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamic resistance of the Diode.
2. Determine the Ripple factor, %Regulation PIV and TUF of the given Rectifier with & without filter.
3. Obtain the I/O Characteristics of CE configurations of BJT. Calculate h-parameters from the Characteristics.
4. Obtain the I/O Characteristics of CB configurations of BJT. Calculate h-parameters from the Characteristics.
5. Obtain the I/O Characteristics of CC configurations of BJT. Calculate h-parameters from the Characteristics.
6. Obtain the Drain and Transfer characteristics of CD,CS configuration of JFET. Calculate gm, rd from the Characteristics Adder and Subtractor using Op Amp.
7. Inverting and Non-inverting Amplifiers using Op Amps
8. Adder and Subtractor using Op Amp
9. Integrator Circuit using IC 741.
10. Differentiator circuit using Op Amp.
11. Current Shunt Feedback amplifier
12. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
13. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.
14. Design transformer coupled class A power amplifier and draw the input and output waveforms, find its efficiency

- Experiments related to MOSFET may be included

TEXT BOOKS

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw HillEducation, 2nd edition 2010
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.

REFERENCE BOOKS

1. Electronic Devices Conventional and current version -Thomas L. Floyd2015, Pearson.
2. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics", Cambridge University Press,1989.
4. P. R. Gray, R. G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 2001.

WEB REFERENCES

1. https://nptel.ac.in/noc/individual_course.php?id=noc19-ee07
2. https://nptel.ac.in/courses/117101106/
3. https://nptel.ac.in/courses/108102095/
4. https://nptel.ac.in/courses/108102112/

E -TEXTBOOKS

1. https://easyengineering.net/analog-electronics-by-bakshi-and-godse/
2. Electronic circuits: Analysis and Design by Donald Neamen

MOOCS COURSE

1. https://www.classcentral.com/course/swayam-analog-circuits-7957
2. https://www.edx.org/learn/electronics

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL SIMULATION LABORATORY

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE305PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To understand basic block sets of different simulation platform used in electrical/electronic circuit design.
2. To understand use and coding in different software tools used in electrical/ electronic circuit design.
3. To understand the simulation of electric machines/circuits for performance analysis.

The following experiments need to be performed from various subject domains.

1. Introduction to basic block sets of simulation platforms. Basic matrix operations, Generation of standard test signals
2. Solving the linear and nonlinear differential equations
3. Measurement of Voltage, Current and Power in DC circuits.
4. Verification of different network theorems with dependent and independent sources using suitable simulation tools.
5. Verification of performance characteristics of basic Electronic Devices using suitable simulation tools.
6. Analysis of series and parallel resonance circuits using suitable simulation tools
7. Obtaining the response of electrical network for standard test signals using suitable simulation tools.
8. Modeling and Analysis of Low pass and High pass Filters using suitable simulation tools
9. Performance analysis of DC motor using suitable simulation tools
10. Modeling and analysis of Equivalent circuit of transformer using suitable simulation tools.
11. Analysis of single-phase bridge rectifier with and without filter using suitable Simulation tools.
12. Modeling and Verification of Voltage Regulator using suitable simulation tools.
13. Modeling of transmission line using simulation tools.
14. Performance analysis of Solar PV model using suitable simulation tools

TEXTBOOKS

1. Raj Kumar Bansal, Ashok Kumar Goel, Manoj Kumar Sharma, "MATLAB and its applications in Engineeirng", Person Educations.
2. Duane Hanselman, Bruce Little field, "Mastering MATLAB". Person Education 3. "PSPICER , includes PSPICE A/D, Basics", Cadence publication, 2012.

REFERENCE BOOKS

1. David Hocuque,, “Introduction to MATLAB for engineering students”, North Western University.
2. Muhammed H Rasheed, “Introduction to PSPICE using ORCAD for circuits and electronics”, Eastern Economy Edition.
3. Huei-Huang Lee “ programming and engineering computing with MATLAB2018”, SDC Publications

E -TEXTBOOKS

1. Stormy Attaway, “Matlab: A Practical Introduction to Programming and Problem Solving”, Elsiever Publications.
2. Mathworks “MATLAB programming Fundementals”, Mathworks products.
3. Paul W.Tuinenga“SPICE A guide to circuit simulation & Analysis using PSPICE”Prentice Hall Publications

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

GENDER SENSITIZATION LAB

II B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*GS309MC	B. Tech	0	0	2	0	100	-	100

COURSE OBJECTIVES

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

UNIT-I	UNDERSTANDING GENDER	Classes:10

Introduction: Definition of Gender-Basic Gender Concepts and Terminology-Exploring Attitudes towards Gender-Construction of Gender-Socialization: Making Women, Making Men - Preparing for Womanhood. Growing up Male. First lessons in Caste.

UNIT-II	GENDER ROLES AND RELATIONS	Classes:10

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	Classes:15

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	Classes: 15

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	Classes:13

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.

TEXTBOOKS

1. A.Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj,Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu, The Textbook,"Towards a World of Equals: A Bilingual Textbook on Gender" writtenby published byTelugu Akademi, Telangana Government (2015).
2. Raj Pal Singh, Anupama Sihag, "Gender Sensitization: A World of Equals", RajPublications (Dist.), ISBN: 9789386695123, 938669512X (2019)

REFERENCE BOOKS

1. S.Benhabib. Situating the Self: Gender, Community, Gender and Post modernism in Contemporary Ethics, London; Routledge, 1992.

WEB REFERENCES

1. https://www.researchgate.net/publication/329541569_EMPOWERING_WOMEN_THROUGH_GENDER_SENSITIZATION
2. https://eige.europa.eu/gender-mainstreaming/toolkits/gender-sensitive-

E -TEXTBOOKS

1. https://harpercollins.co.in/BookDetail.asp?BookCode=3732
2. https://unesdoc.unesco.org/ark:/48223/pf0000158897_eng

MOOCS COURSE

1. https://www.mooc-list.com/course/sustainable-development-goal-5-gender-equality-canopylab
2. https://www.coursera.org/learn/gender-sexuality

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SOLID MECHANICS AND HYDRAULIC MACHINES

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ME411PC	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

1. To identify an appropriate structural system and work comfortably with basic engineering mechanics and types of loading & support conditions that act on structural systems.
2. To Understand the meaning of centers of gravity, centroids, moments of Inertia and rigid body dynamics.
3. To Study the characteristics of hydroelectric power plant and Design of hydraulic machinery.

UNIT-I	INTRODUCTION OF ENGINEERING MECHANICS	Classes:10

Basic concepts of System of Forces-Coplanar Forces–Components in Space–Resultant- Moment o Forces and its Application – Couples and Resultant of Force System-Equilibrium of System o Forces-Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading. Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone o limiting friction

UNIT-II	CENTROID AND CENTER OF GRAVITY	Classes:10

CENTROID AND CENTER OF GRAVITY: Centroids – Theorem of Pappus- Centroids o Composite figures – Centre of Gravity of Bodies – Area moment of Inertia:–polar Moment o Inertia–Transfer– Theorems - Moments of Inertia of Composite Figures.

SIMPLE STRESSES AND STRAINS ANALYSIS: Concept of stress and strain- St. Venant' Principle- Stress and Strain Diagram - Elasticity and plasticity – Types of stresses and strains Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Pure shear and Complementary shear - Elastic modulii, Elastic constants and the relationship between them

UNIT-III	KINEMATICS AND KINETICS	Classes:15

Introduction – Rectilinear motion – Motion with uniform and variable acceleration–Curvilinear motion– Components of motion– Circular motion Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work- energy – Impulse-momentum.

UNIT – IV	BASICS OF HYDRAULIC MACHINERY	Classes: 15

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, Jet striking centrally and at tip, Velocity triangles at inlet and outlet, expressions for work done and efficiency Elements of a typical Hydropower installation – Heads and efficiencies

UNIT-V	TURBINES AND PUMPS	Classes:13

Classification of turbines – Pelton wheel – Francis turbine – Kaplan turbine – working, working proportions, velocity diagram, work done and efficiency, hydraulic design. Draft tube – Classification, functions and efficiency. Governing of turbines, Performance of turbines Pump installation details – classification – work done – Manometric head – minimum starting speed – losses and efficiencies – specific speed. Multistage pumps – pumps in parallel

TEXTBOOKS

1. M.V. Seshagirirao and Durgaih, "Engineering Mechanics",University Press.
2. P.N Modi and Seth, "Fluid Mechanics and Hydraulic Machinery", standard Book House

REFERENCE BOOKS

1. Dr. D. V, Sreekanth, T. Paramesh, B. Ashok Kumar, "Engineering Mechanics", Amaravati Publishers, 2022.
2. B. Bhattacharya, "Engineering Mechanics", Oxford University Publications.
3. Hibbler, "Engineering Mechanics (Statics and Dynamics)", Pearson Education.
4. Fedrinand L. Singer, "Engineering Mechanics" Harper Collings Publishers.
5. A.K.Tayal, "Engineering Mechanics" , Umesh Publication.
6. Domkundwar & Domkundwar, "Fluid mechanics & Hydraulic Machines", Dhanpat Rai & C
7. R.C.Hibbeler, "Fluid Mechanics", Pearson India Education Services Pvt. Ltd
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5. https://www.coursera.org/learn/3d-cad-fundamental

E -TEXTBOOKS

1. https://akuengineers.files.wordpress.com/2016/12/engineering-mechanics-rs-khurmi.pdf
2. http://clkmein.com/q2KmTm

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1. https://nptel.ac.in/courses/112103109/2

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MEASUREMENTS AND INSTRUMENTATION

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE402PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To introduce the basic principles of all measuring instruments.
2. To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
3. To understand the basic concepts of smart and digital metering.

UNIT-I	INTRODUCTION TO MEASURING INSTRUMENTS	Classes:10

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 AND INSTRUMENT TRANSFORMERS	Classes:10

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement o 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 AND ENERGY	Classes:15

Single phase dynamometer wattmeter, LPF and UPF, Double element and three elemen dynamometer wattmeters, 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 maximum demand meters.

UNIT – IV	DC AND AC BRIDGES	Classes: 15

Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

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

UNIT-V	TRANSDUCERS	Classes:13

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, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes. **INTRODUCTION TO SMART AND DIGITAL METERING:** Digital Multi-meter, True RMS meters, Clamp- on meters, Digital Energy Meter, Cathode Ray Oscilloscope, Digital Storage Oscilloscope.

TEXTBOOKS

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.
2. Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers, 1989.

REFERENCE BOOKS

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
4. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
5. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

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2. http://www.basicsofelectricalengineering.com/
3. https://www.electricaldeck.com
4. https://circuitglobe.com/

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1. https://easyengineering.net/a-course-in-electronic-measurements-and-instrumentation-bysawhney/
2. https://easyengineering.net/a-textbook-of-electrical-technology-by-rajput/

MOOCS COURSE

1. https://nptel.ac.in/courses/108/105/108105153/
2. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ee44/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL MACHINES - II

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE403PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To deal with the detailed analysis of poly-phase induction motors & Alternators.
2. To understand operation, construction and types of single-phase motors and their applications in household appliances and control systems.
3. To introduce the concept of parallel operation of alternators.

UNIT-I	POLY PHASE INDUCTION MACHINES	Classes:10

Constructional details of cage and wound rotor machines production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency – rotor reactance, rotor current and Power factor at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed and their inter relation.

UNIT-II	CHARACTERISTICS OF INDUCTION MACHINES	Classes:10

Torque equation-expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging, No-load Test and Blocked rotor test – Predetermination of performance-Methods of starting and starting current and Torque calculations Applications.

SPEED CONTROL METHODS: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only)-induction generator-principle of operation.

UNIT-III	SYNCHRONOUS MACHINES	Classes:15

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

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 – IV	PARALLEL OPERATION OF SNCHRONOUS MACHINES	Classes: 15

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 reactance's and Applications.

SYNCHRONOUS MOTORS: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed. – Hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT-V	SINGLE PHASE MACHINES	Classes:13

Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – AC series motor- Universal Motor- -Shaded pole motor and Applications.

TEXTBOOKS

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

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1. Dr. P. Santosh Kumar Patra, Dr. N. Ramchandra, V. Bharath Kumar, V. Vishnu Vardhan, "Electrical Machines – II", Spectrum Techno Press, 2022.
2. Prithwiraj Purkait, Indrayudh Bandyopadhyay, "Electrical Machines", Oxford, 2017.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
5. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.

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2. Electrical Machines 2 by J b Gupta. ISBN: 9350141604, 9789350141601

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1. https://www.classcentral.com/course/swayam-electrical-machines-II-12948
2. https://nptel.ac.in/courses/108106072/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DIGITAL ELECTRONICS

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC410PC	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

1. To learn fundamental concepts of digital system design and common forms of number representations and their conversions.
2. To implement and design logical operations using combinational logic circuits and sequential logic circuits.
3. To understand the semiconductor memories and programmable logic devices.

UNIT-I	**FUNDAMENTALS OF DIGITAL SYSTEMS AND LOGIC FAMILIES**	**Classes:10**

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 complements arithmetic.

UNIT-II	**COMBINATIONAL CIRCUITS - I**	**Classes:10**

Standard representation for logic functions, K-map representation and simplification of logic functions using K- map, Minimization of logical functions, Don't care conditions, Multiplexer, De-Multiplexer

UNIT-III	**COMBINATIONAL CIRCUITS - II**	**Classes:15**

Adders, Subtractors, Carry look ahead adder, Digital comparator, Parity checker/generator, Code converters, Priority encoders, Decoders/Drivers for display devices, Q-M method of function realization.

UNIT – IV	**SEQUENTIAL CIRCUITS**	**Classes: 15**

Introduction to flip-flops, SR, JK, T and D type's flip-flops, Shift registers, Conversion of flip-flops, Ring counter, Ripple (Asynchronous) counters, Synchronous counters.

UNIT-V	**SEMICONDUCTOR MEMORIES AND PROGRAMMABLE LOGIC DEVICES**	**Classes:13**

Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read-only memory (ROM), ROM types, Read and write memory (RAM) types, Programmable logic array, Programmable array logic, Field Programmable Gate Array (FPGA).

TEXTBOOKS

1. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS

1. Dr. P. Santosh Kumar Patra, K. Anitha, Dr. P. Joel Joesphson, S. P. Manikanta, "Digital System Design", Seven Hills International Publishers, 2022.
2. R.S. Sedha, "A Textbook of Digital Electronics", S.Chand, 2005
3. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

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4. https://lecturenotes.in/subject/203/switching-theory-and-logic-design-stld
5. http://www.infocobuild.com/education/audio-videocourses/electronics/DigitalCircuitsSystems
6. https://nptel.ac.in/courses/117105080/

E -TEXTBOOKS

1. https://pages.uoregon.edu/rayfrey/DigitalNotes.pdf
2. https://easyengineering.net/fundamentals-of-digital-circuits-by-anand-kumar/

MOOCS COURSE

1. https://www.smartzworld.com/notes/digital-logic-design-dld/
2. https://swayam.gov.in/courses/1392-digital-circuits-and-systems
3. https://swayam.gov.in/courses/4410-synthesis-of-digital-systems

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEMS - II

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE404PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To study the performance of transmission lines and travelling waves.
2. To understand the concept of voltage control, compensation methods and per unit representation of power systems.
3. To know the methods of overvoltage protection, Insulation coordination, Symmetrical components and fault calculation analysis./2

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UNIT-I	PERFORMANCE OF LINES	Classes:10

Representation of lines, short transmission lines, medium length lines, nominal T and PI-representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect.

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

UNIT-II	VOLTAGE CORRECTION AMD POWER FACTOR IMPROVEMENT	Classes:10

VOLTAGE CONTROL & POWER FACTOR IMPROVEMENT: Introduction – methods o voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers, power factor improvement methods.

COMPENSATION IN POWER SYSTEMS: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrica line – Radial line with asynchronous load – Compensation of lines.

UNIT-III	PER UNIT REPRESENTATION OF POWER SYSTEMS	Classes:15

PER UNIT REPRESENTATION OF POWER SYSTEMS: The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages o per unit system.

TRAVELLING WAVES ON TRANSMISSION LINES: Production of travelling waves, oper circuited line, short-circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

UNIT – IV	OVER VOLTAGE PROTECTION AND INSULATION COORDINATION	Classes: 15

Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

UNIT-V	SYMMETRICAL COMPONENTS AND FAULT CALCULATIONS	Classes:13

Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence impedances and sequence networks, fault calculations sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

TEXTBOOKS

1. C.L. Wadhwa, "Electrical Power Systems", New Age International Pub. Co, Third Edition, 2001.
2. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition, 2011.

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1. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering", Dhanpat Rai Publishing Company (P) Ltd, 2008.
2. John J. Grainger & W.D. Stevenson, "Power System Analysis", Mc Graw Hill International,1994.
3. Hadi Scadat, "Power System Analysis", Tata Mc Graw Hill Pub. Co. 2002.
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2. Power System 2 (PS 2) Pdf Notes - Free Download 2020 | SW (smartzworld.com)
3. https://www.sanfoundry.com/1000-power-systems-questions-answers/
4. Power Systems MCQ [Free PDF] - Obj

E -TEXTBOOKS

1. Power Systems by Bakshi | PDF (scribd.com)
2. Handbook of Power Systems II | SpringerLink
3. https://easyengineering.net/objective-electrical-technology-by-mehta/

MOOCS COURSE

1. NPTEL:: Electrical Engineering - NOC:Power System Engineering
2. NPTEL:: Electrical Engineering - Power System Analysis
3. Electric Power Systems | Coursera

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DIGITAL ELECTRONICS LABORATORY

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC411PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To learn basic techniques for the design of digital circuits and number conversion systems.
2. To implement simple logical operations using combinational logic circuits.
3. To design combinational logic circuits, sequential logic circuits

List of Experiments:

1. Realization of Boolean Expressions using Gates
2. Design and realization logic gates using universal gates
3. Generation of clock using NAND/NOR gates
4. Design a 4 – bit Adder / Subtractor
5. Design and realization a 4 – bit gray to Binary and Binary to Gray Converter
6. Design and realization of a 4-bit pseudo random sequence generator using logic gates.
7. Design and realization of an 8-bit parallel load and serial out shift register using flip-flops.
8. Design and realization Asynchronous and Synchronous counters using flip-flops
9. Design and realization 8x1 using 2x1 mux
10. Design and realization 2-bit comparator
11. Verification of truth tables and excitation tables
12. Realization of logic gates using DTL, TTL, ECL, etc.,

TEXTBOOKS

1. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

REFERENCE BOOKS

1. R.S. Sedha, “A Textbook of Digital Electronics”, S.Chand, 2005
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.

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3. https://www.slideshare.net/JournalsPubwwwjourna/international-journal-of-digitalelectronics-vol-2-issue-2
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1. https://pages.uoregon.edu/rayfrey/DigitalNotes.pdf
2. https://easyengineering.net/fundamentals-of-digital-circuits-by-anand-kumar/

MOOCS COURSE

1. https://www.smartzworld.com/notes/digital-logic-design-dld/
2. https://swayam.gov.in/courses/1392-digital-circuits-and-systems
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MEASUREMENTS AND INSTRUMENTATION LABORATORY

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE405PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To calibrate Watt, Energy and PF Meter and determination of three phase active & reactive powers.
2. To determine unknown inductance, resistance, capacitance by performing experiments D.C Bridges & A. C Bridges.
3. To determine the ratio and phase angle errors of Instrument transformers. .

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

1. Calibration and Testing of single-phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of 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:

1. Calibration LPF wattmeter – by Phantom testing.
2. Measurement of 3-phase power with single watt meter and two CTs.
3. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
4. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of the given PT
5. Resistance strain gauge – strain measurements and Calibration.
6. Transformer turns ratio measurement using AC bridges.
7. Measurement of % ratio error and phase angle of given CT by comparison.

TEXT BOOKS

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.
2. Dr. Rajendra Prasad, "Electrical Measurements & Measuring Instruments", Khanna Publishers 1989.

REFERENCE BOOKS

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2nd Edition, 2016.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
4. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.
5. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
6. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1st Edition 2010.
7. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

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2. https://circuitglobe.com/schering-bridge.html
3. https://www.electricalengineeringinfo.com/2016/12/different-types-of-dc-potentiometerslaboratory-
4. type-cromptons-vernier-brooks.html

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1. https://www.academia.edu/8140873/A_K_Sawhney_A_course_in_Electrical_and_Electronic_Measurements_and_Instrumentation
2. https://easyengineering.net/a-textbook-of-electrical-technology-by-rajput/

MOOCS COURSE

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL MACHINES LABORATORY - II

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE406PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To understand the operation of Induction, Synchronous machines and Transformers.
2. To study the performance analysis of Induction and Synchronous Machines through various testing methods.
3. To analyze the performance of single and 3-phase phase transformer with experiments. .

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

1. Sumpner's test on a pair of single-phase transformers
2. No-load & Blocked rotor tests on three phase Induction motor
3. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
4. 'V' and 'Inverted V' curves of a three—phase synchronous motor.
5. Equivalent Circuit of a single-phase induction motor
6. Determination of Xd and Xq of a salient pole synchronous machine
7. Load test on three phase Induction Motor
8. Regulation of three-phase alternator by Z.P.F. and A.S.A methods

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. Heat run test on a bank of 3 Nos. of single-phase Delta connected transformers
5. Measurement of sequence impedance of a three-phase alternator.
6. Vector grouping of Three Transformer
7. Scott Connection of transformer

TEXTBOOKS

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

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1. Prithwiraj Purkait, Indrayudh Bandyopadhyay, “Electrical Machines”, Oxford, 2017.
2. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
3. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
4. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers,2004.

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2. https://swayam.gov.in › nd1_noc19_ee60

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1. **Electrical Machines - II**. Authors, U.A.Bakshi, M.V.Bakshi. Publisher, Technical Publications, 2009. ISBN, 8184316070, 9788184316070.
2. **Electrical Machines 2** by J b Gupta. ISBN: 9350141604, 9789350141601.

MOOCS COURSE

1. https://www.classcentral.com/course/swayam-electrical-machines-ii-12948
2. https://nptel.ac.in/courses/108106072/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CONSTITUTION OF INDIA

II B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
*CI409MC	B. Tech	3	0	0	0	100	-	100

COURSE OBJECTIVES

Students will be able to

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT-I		**Classes:10**

History of Making of the Indian Constitution- History of Drafting Committee.

UNIT-II		**Classes:10**

Philosophy of the Indian Constitution- Preamble Salient Features

UNIT-III		**Classes:15**

Contours of Constitutional Rights & Duties - Fundamental Rights

1. Right to Equality
2. Right to Freedom
3. Right against Exploitation
4. Right to Freedom of Religion
5. Cultural and Educational Rights
6. Right to Constitutional Remedies
7. Directive Principles of State Policy
8. Fundamental Duties.

UNIT – IV		**Classes: 15**

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

UNIT-V		Classes:13
Local Administration: District's Administration head: Role and Importance, Municipalities Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level Role of Elected and Appointed officials, Importance of grass root democracy		
UNIT-VI		**Classes:13**
Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.		

TEXTBOOKS

1. H.M. Seervai: Constitutional Law of India
2. M.P. Jain: Indian Constitutional Law
3. Mahendra P. Singh: V. N. Shukla's Constitution of India
4. Granville Austin: The Indian Constitution: Cornerstone of a Nation

REFERENCE BOOKS

1. A. Sarveswarareddy, K. Sathish, K. Sudha, Constitution of India, M/S Spectrum Publications, First Edition 2021.
2. An Introduction to the Constitution of India by Dr.Durga Das Basu
3. An Introduction to the Constitution of India by M.V.Pylee
4. Indian Constitutional Law by M.P. Jain

WEB REFERENCES

1. https://www.wdl.org/en/item/2672/
2. https://nptel.ac.in/courses/109103135/24

E -TEXTBOOKS

1. https://iasexamportal.com/ebook/the-constitution-of-india
2. https://www.india.gov.in/my-government/documents/e-books

MOOCS COURSE

1. http://nludelhi.ac.in/images/moocs/moocs-courses.pdf
2. https://www.classcentral.com/tag/constitutional-law

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER ELECTRONICS

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE501PC	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

1. To understand the various power semiconductor devices operations.
2. To know the AC-DC, AC-AC power conversions.
3. To know the DC-DC, DC-AC power conversions.

COURSE OUTCOMES: At the end of this course, students will be able to:

1. Understand the differences between signal level and power level devices.
2. Analyze controlled rectifier circuits.
3. Analyze the operation of DC-DC choppers and 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, gate drive circuits for BJT and MOSFETs

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. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007

REFERENCE BOOKS

1. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007.
2. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

WEB REFERENCES

1. “Power Electronics: Converter, Applications and Design” by N Mohan and W P Robbins.
2. “Power Electronics: Circuits, Devices and Applications” by Rashid.
3. https://electricalbaba.com › best-book-power-electronics.
4. https://easyengineering.net › power-electronics-books.

E -TEXTBOOKS

1. Power Electronic Converters: Dynamics and Control in Conventional and Renewable Energy Applications By Teuvo Suntio, Tuomas Messo, Joonas Puukko First published:12 October 2017Print ISBN:9783527340224 |Online ISBN:9783527698523 |DOI:10.1002/9783527698523
2. Digital Power Electronics and Applications by Fang Lin Luo Hong Ye Muhammad Rashid, Hardcover ISBN: 9780120887576,Paperback ISBN: 9781493300037,eBook ISBN: 9780080459028

MOOCS COURSES

1. https://nptel.ac.in/courses/108101126/Fundamentals of Power Electronics
2. https://nptel.ac.in/courses/108101038/Power Electronics

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CONTROL SYSTEMS

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE502PC	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

1. Understand the mathematical modeling of physical systems.
2. Comprehend the representation of dynamical systems through input-output models, including transfer functions and state-space models.
3. Understand the design of controllers and compensators to enhance the performance and stability of dynamical systems

COURSE OUTCOMES: At the end of this course, students will be able to:

1. Find the transfer function and state-space representation of linear time-invariant dynamical systems.
2. Analyze the performance and stability of linear time-invariant systems in both time and frequency domains.
3. Design classical controllers/compensators to improve the performance and stability of linear time-invariant systems.

UNIT-I	MODELING OF PHYSICAL SYSTEMS AND THEIR REPRESENTATIONS	

Industrial and domestic Control examples. Mathematical modeling of physical systems: Mechanical and Electrical Systems, Concept of Control Systems Configurations: Open – loop and Closed loop Systems, Introduction to types of Systems: Linear, Non-Linear, Time Varying and Time Invariant. Representation of Linear time-invariant Systems through Input-output Models: Transfer function, Block-diagram Techniques, Signal flow graph. Concept of Feedback Control, Benefits of Feedback and Effects of feedback. Controller Components: DC Servo motors, AC Servomotors, Synchros.

UNIT-II	TIME – DOMAIN ANALYSIS WITH INPUT-OUTPUT MODELS	

Time response of first and second order systems for standard test inputs. Analysis of standard Second order systems with step input, Types of System, Error Analysis for Linear time Invariant Systems, Design specifications for second-order systems based on the time-response.
Concept of Stability. Routh-Hurwitz Criteria. Relative Stability analysis. Root-Locus technique. Construction of Root-loci.

UNIT-III	FREQUENCY DOMAIN ANALYSIS	

Introduction to frequency response, Relationship between time and frequency response, Polar plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin. Concept of Bode plots and construction. Closed-loop frequency response.

UNIT – IV	INTRODUCTION TO DESIGN OF CLASSICAL CONTROLLERS AND COMPENSATORS	

Stability, steady-state accuracy, transient accuracy, disturbance rejection, insensitivity and robustness of control systems. Root-loci method of feedback controller design. Design specifications in frequency-domain. Frequency-domain methods of design. Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs. Analog and Digital implementation of controllers.

UNIT-V	STATE VARIABLE ANALYSIS AND DESIGN	

Concept of State, State variables and State model. State – State Representation, Transformation of State variables, Solution of state equations and Complete response of the Systems. Stability Analysis of Linear Systems. Concept of controllability and observability. Design of State feedback Controllers through Pole-placement.

TEXTBOOKS

1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.

REFERENCE BOOKS

1. CH. Srinivas, T. Naveen Kumar, "Control Systems", Spectrum Publications, 2023.
2. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
3. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.

WEB REFERENCES

1. https://www.tutorialspoint.com/control_systems/control_systems_state_space_model.htm
2. https://www.tutorialspoint.com/control_systems/control_systems_compensators.htm
3. https://www.tutorialspoint.com/control_systems/control_systems_nyquist_plots.htm
4. https://www.tutorialspoint.com/control_systems/control_systems_root_locus.htm
5. https://www.electrical4u.com/transfer-function/

E -TEXTBOOKS

1. https://easyengineering.net/control-systems-engineering-by-nagrath-nw/
2. https://kupdf.net/download/automatic-control-systems-by-benjamin-c-kuo_5af5906fe2b6f523475ddf8c_pdf
3. https://civildatas.com/download/control-systems-engineering-by-i-j-nagrath

MOOCS COURSES

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MICROPROCESSORS & MICROCONTROLLERS

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC507PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

To learn

1. To develop an understanding of the operations of microprocessors and micro controllers
2. To understand machine language programming and interfacing techniques.
3. To gain knowledge about input output and memory systems.

UNIT-I	8086 ARCHITECTURE	

8086 Architecture-Pin diagram, Register Organization, Memory Segmentation, Programming Model, Modes of operation, Timing diagrams, Memory addresses, Physical Memory Organization, 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, Software Debugging tools, MDS.

UNIT-II	I/O INTERFACE AND INTERFACING WITH ADVANCED DEVICES	

I/O Interface: 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing.

Interfacing With Advanced Devices: 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control).

UNIT-III	COMMUNICATION INTERFACE	

Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Troubleshooting

UNIT – IV	INTRODUCTION TO MICRO CONTROLLERS & INTERRUPTS COMMUNICATION	

Introduction To Micro Controllers: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051

Interrupts Communication: Interrupts - Timer/Counter and Serial Communication, Interrupt Priority in the 8051, Programming of 8051- Timers, Counters and Interrupts.

UNIT-V	INTERFACING AND INDUSTRIAL APPLICATIONS	

Applications of Micro Controllers, Interfacing 8051 to LED's, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing, Stepper Motor Interfacing

TEXTBOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS

1. B. Harikrishna, G. UdayaSree, D. Basava, Microprocessors and Microcontrollers, Spectrum Education, 2023.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
3. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
4. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
5. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.

WEB REFERENCES

1. https://nptel.ac.in/noc/individual_course.php?id=noc18-ec03.
2. https://nptel.ac.in/noc/individual_course.php?id=noc19-ee1
3. http://www.infocobuild.com/education/audio-videocourses/electronics/MicroprocessorsMicrocontrollers-IIT-Kharagpur/lecture-44.html
4. http://www.infocobuild.com/education/audio-videocourses/electronics/MicroprocessorsMicrocontrollers-IIT-Kharagpur/lecture-49.html

E -TEXTBOOKS

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

MOOCS COURSES

1. https://onlinecourses.nptel.ac.in/noc18_ec03
2. https://www.youtube.com/watch?v=liRPtvj7bFU
3. https://www.mooc-list.com/course/introduction-arm-ost
4. https://www.mooc-list.com/tags/microprocessors
5. https://www.mooc-list.com/tags/microcontroller
6. https://freevideolectures.com/course/3018/microprocessors-and-microcontrollers
7. http://e-box.co.in/micro-processor-and-micro-controller.shtml
8. https://ieeexplore.ieee.org/document/7020281
9. https://ict.iitk.ac.in/product/microprocessors-and-microcontrollers/
10. https://www.classcentral.com/course/nptel-microprocessors-and-microcontrollers-9894

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

IOT APPLICATIONS IN ELECTRICAL ENGINEERING

Professional Elective - I

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE511PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To learn about a few applications of Internet of Things and distinguish between motion less and motion detectors as IoT applications
2. To know about Micro Electro Mechanical Systems (MEMS) fundamentals in design and fabrication process
3. To understand about applications of IoT in smart grid and new concept of IoE for various applications

UNIT-I SENSORS

Definitions, Terminology, Classification, Temperature sensors, Thermo resistive, Resistance, temperature detectors, Silicon resistive thermistors, Semiconductor, Piezoelectric, Humidity and moisture sensors. Capacitive, Electrical conductivity, Thermal conductivity, time domain reflectometer, Pressure and Force sensors: Piezoresistive, Capacitive, force, strain and tactile sensors, Strain gauge, Piezoelectric.

UNIT-II OCCUPANCY AND MOTION DETECTORS

Capacitive occupancy, Inductive and magnetic, potentiometric - Position, displacement and level sensors, Potentiometric, Capacitive, Inductive, magnetic velocity and acceleration sensors, Capacitive, Piezoresistive, piezoelectric cables, Flow sensors, Electromagnetic, Acoustic sensors -Resistive microphones, Piezoelectric, Photo resistors.

UNIT-III MEMS

Basic concepts of MEMS design, Beam/diaphragm mechanics, electrostatic actuation and fabrication, Process design of MEMS based sensors and actuators, Touch sensor, Pressure sensor, RF MEMS switches, Electric and Magnetic field sensors.

UNIT-IV	IOT FOR SMART GRID	

Driving factors, Generation level, Transmission level, Distribution level, Applications, Metering and monitoring applications, Standardization and interoperability, Smart home.

UNIT-V	INTERNET OF ENERGY	

Concept of Internet of Energy, Evaluation of IoE concept, Vision and motivation of IoE, Architecture, Energy routines, information sensing and processing issues, Energy internet as smart grid.

TEXTBOOKS

1. 1.Jon S. Wilson, "Sensor Technology Hand book", Newnes Publisher, 2004
2. Tai Ran Hsu, "MEMS and Microsystems: Design and manufacture", 1st Edition, McGraw hill Education, 2017
3. Ersan Kabalci and Yasin Kabalci, "From Smart grid to Internet of Energy", 1st Edition, Academic Press, 2019.

REFERENCE BOOKS

1. Raj Kumar Buyya and Amir Vahid Dastjerdi, "Internet of Things: Principles and Paradigms",Kindle Edition, Morgan Kaufmann Publisher, 2016
2. Yen Kheng Tan and Mark Wong, "Energy Harvesting Systems for IoT Applications":Generation, Storage and Power Management, 1st Edition, CRC Press, 2019
3. RMD Sundaram Shriram, K. Vasudevan and Abhishek S. Nagarajan, "Internet of Things",Wiley, 2019.

WEB REFERENCES

1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/
2. https://www.coursera.org/lecture/dsp/5-3-c-the-sampling-theorem-DcFxD

E -TEXTBOOKS

1. Internet of things security: principles and practices, quango Tang, fan du.

MOOCS COURSES

1. https://www.youtube.com/watch?v=LlhmzVL5bm8
2. https://www.youtube.com/watch?v=6mBO2vqLv38

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

HIGH VOLTAGE ENGINEERING

Professional Elective - I

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE512PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES:

1. To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and soliddielectrics
2. To inform about generation and measurement of High voltage and current
3. To introduce High voltage testing methods

COURSE OUTCOMES:

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

1. Understand the basic physics related to various breakdown processes in solid, liquid andgaseous insulating materials, generation and measurement of D. C., A.C., & Impulse voltages.
2. Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.
3. Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

UNIT-I INTRODUCTION

Breakdown In Gases: Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

Breakdown In Liquid And Solid Insulating Materials: Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials

UNIT-II GENERATION OF HIGH VOLTAGES:

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators..

UNIT-III	MEASUREMENTS OF HIGH VOLTAGES AND CURRENTS	

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements

UNIT – IV	LIGHTNING AND SWITCHING OVER-VOLTAGES	

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching overvoltage's, Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT-V	HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS AND HIGH VOLTAGE LABORATORIES	

Various standards for HV Testing of electrical apparatus, IS, IEC standards, testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs**.**

TEXTBOOKS

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013.
2. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

REFERENCE BOOKS

1. Dr. P. Santosh Kumar Patra, P. Priyanka, High Voltage Engineering, Amaravathi Publications, 2023
2. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
3. E. Kuffel, W. S. Zaengl and J. Kuffel, "High Voltage Engineering Fundamentals", Newnes Publication, 2000.
4. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
5. Various IS standards for HV Laboratory Techniques and Testing.

WEB REFERENCES

1. https://www.mv.helsinki.fi/home/tpaulin/Text/hveng.pdf
2. http://www.basicsofelectricalengineering.com/
3. https://www.sciencedirect.com/book/9780750636346/high-voltage-engineering-fundamentals

E -TEXTBOOKS

1. https://easyengineering.net/ High Voltage Engineering -by-wadhwa/
2. https://easyengineering.net/ High Voltage Engineering -by- M. S. Naidu and V. Kamaraju /

MOOCS COURSES

1. https://nptel.ac.in/courses/19278076/1
2. https://nptel.ac.in/courses/109564146/
3. https://nptel.ac.in/courses/108/104/108104048/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COMPUTER AIDED ELECTRICAL MACHINE DESIGN

Professional Elective - I

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE513PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To know the major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings,
2. To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
3. To understand the design of machines and CAD design concepts

COURSE OUTCOMES:

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

1. Understand the construction and performance characteristics of electrical machines.
2. Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
3. Understand the principles of electrical machine design and carry out a basic design of an ac machine using software tools

UNIT-I INTRODUCTION

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines

UNIT-II TRANSFORMERS

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

UNIT-III	INDUCTION MOTORS	
: Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.		
UNIT-IV	**SYNCHRONOUS MACHINES**	
Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of airgap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design		
UNIT-V	**COMPUTER AIDED DESIGN (CAD):**	
Limitations (assumptions) of traditional designs need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to complex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines.		

TEXTBOOKS

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 1970.
2. M.G. Say, "Theory & Performance & Design of A.C. Machines", ELBS London.

REFERENCE BOOKS

1. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
2. K. L. Narang, "A Text Book of Electrical Engineering Drawings", Satya Prakashan, 1969.
3. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
4. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

WEB REFERENCES

1. https://www.electrical4u.com/
2. https://www.oreilly.com › library › view › electrical-machines-2nd › 25_ref
3. https://swayam.gov.in › nd1_noc19_ee602.https://circuitglobe.com/
4. https://www.sanfoundry.com › best-reference-books-advance-electrical-machines
5. https://www.scribd.com › doc › Electrical-Machines-2-AC-Machines
6. https://www.slideshare.net › karthi1017 › electrical-machines-II
7. https://www.cet.edu.in › notice files › 226_Electrical_Machine-II

E -TEXTBOOKS

1. Electrical Machines-I By U.A.Bakshi, V.U.Bakshi Technical Publications, 2009 PrintISBN:9783527340224 OnlineISBN:9783527698523 |DOI:10.1002/9783527698523
2. https://easyengineering.net/objective-electrical-technology-by-mehta/
3. Electrical Machines - II. Authors, U.A.Bakshi, M.V. Bakshi. Publisher, Technical

4. Publications, 2009. ISBN, 8184316070, 9788184316070.
5. Electrical Machines 2 by J b Gupta. ISBN: 9350141604, 9789350141601

MOOCS COURSES

1. https://nptel.ac.in/courses/108105017/
2. https://swayam.gov.in/nd1_noc19_ee60/preview
3. https://www.classcentral.com/course/swayam-electrical-machines-II-12948.
4. https://nptel.ac.in/courses/108106072/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
BE504MS	B. Tech	3	0	0	3	40	60	100

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 and 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 and 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 (Simple Problems).

UNIT-V FINANCIAL RATIOS ANALYSIS

Concept of Ratio Analysis, Importance and Types of Ratios, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems)

TEXTBOOKS

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 Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

REFERENCE BOOKS

1. K. Sudha, K. Sathish, A. Sarweswara Reddy, Business Economics and Financial Analysis, Spectrum Publications, 2022.
2. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
3. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

WEB REFERENCES

1. https://nptel.ac.in/courses/110106050/17
2. https://nptel.ac.in/courses/110106050/39
3. https://nptel.ac.in/courses/110106050/38

E -TEXTBOOKS

1. https://www.sciencedirect.com/book/9780750644549/business-economics
2. http://www.freebookcentre.net/Business/Economics-Books.html

MOOCS COURSES

1. https://nptel.ac.in/courses/110106050/
2. https://nptel.ac.in/courses/110106050/11

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MICROPROCESSORS & MICROCONTROLLERS LABORATORY

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC508PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

To learn

1. To develop an understanding of the operations of microprocessors and micro controllers;
2. To develop assembly language programming to perform various applications.
3. To understand the interfacing of various external devices to the processor and controllers

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

1. Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers.
2. Understands the interfacing techniques to 8086 and 8051 and can develop assembly language
3. programming to design microprocessor/ micro controller-based systems. Develop programs for interfacing various external devices

LIST OF EXPERIMENTS

The following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits

1. Programs for 16-bit arithmetic operations 8086(using various addressing modes)
2. Programs for sorting an array for 8086.
3. Programs for searching for a number of characters in a string for 8086.
4. Programs for string manipulation for 8086.
5. Programs for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using arithmetic, logical and bit manipulation instructions of 8051.

11. Program and verify Timer/Counter in 8051.

12. Program and verify interrupt handling in 8051.

13. UART operation in 8051.

14. Communication between 8051 kit and PC

15. Interfacing LCD to 8051

16. Interfacing Matrix/Keyboard to 8051

17. Data transfer from peripheral to memory through DMA controller 8237/8257

TEXTBOOKS

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, MHE, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.

REFERENCE BOOKS

1. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
2. Microprocessors and Interfacing, D. V. Hall, MGH, 2nd Edition 2006.
3. Introduction to Embedded Systems, Shibu K.V, MHE, 2009
4. The 8051 Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER ELECTRONICS LABORATORY

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE503PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

1. To apply the concepts of power electronic converters for efficient conversion
2. To control of power converters power flow from source to load.
3. To Design the power converter with suitable switches meeting a specific load requirement

COURSE OUTCOMES: At the end of this course, students will be able to:

1. Understand the operating principles of various power electronic converters.
2. Use power electronic simulation packages& hardware to develop the power converters.
3. Analyse and choose the appropriate converters for various applications

LIST OF EXPERIMENTS

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

TEXTBOOKS

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

WEB REFERENCES

1. "Power Electronics: Circuits, Devices and Applications" by Rashid.
2. Power Electronics Design Testing and Simulation Laboratory Manual (Pb2017) Paperback 2017By Varmah K R (Author)

E -TEXTBOOKS

1. Simulation of Power Electronic Circuits Paperback – 1 Dec2009 by M. B. Patil (Author)
2. Power Electronics: Converters Applications and Design, Media Enhanced, 3ed Paperback – 2007 by Mohan, Undeland, Robbins (Author)

MOOCS COURSES

1. https://www.iitk.ac.in/new/power-electronics-laboratory
2. http://www.ee.iitkgp.ac.in/faci_pe.php

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ADVANDED ENGLISH COMMUNICATION SKILLS LABORATORY

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EN506HS	B. Tech	0	0	2	1	40	60	100

1. INTRODUCTION

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

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

1. Gathering ideas and information to organise ideas relevantly and coherently.
2. Making oral presentations.
3. Writing formal letters.
4. Transferring information from non-verbal to verbal texts and vice-versa.
5. Writing project/research reports/technical reports.
6. Participating in group discussions.
7. Engaging in debates.
8. Facing interviews.
9. Taking part in social and professional communication

COURSE 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, with a focus on vocabulary
2. To enable them to listen to English spoken at normal conversational speed by educated English speakers
3. To respond appropriately in different socio-cultural and professional contexts
4. To communicate their ideas relevantly and coherently in writing
5. To prepare the students for placements.

LIST OF EXPERIMENTS

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

1. Activities on Listening and Reading Comprehension: Active Listening – Development of Listening Skills Through Audio clips - Benefits of Reading – Methods and Techniques of Reading – Basic Steps to Effective Reading – Common Obstacles – Discourse Markers or Linkers - Subskills of reading - Reading for facts, negative facts and Specific Details- Guessing Meanings from Context, Inferring Meaning - Critical Reading — Reading Comprehension – Exercises for Practice.

2. Activities on Writing Skills: Vocabulary for Competitive Examinations - Planning for Writing – Improving Writing Skills - Structure and presentation of different types of writing – Free Writing and Structured Writing - Letter Writing –Writing a Letter of Application –Resume vs. Curriculum Vitae – Writing a Résumé – Styles of Résumé - e-Correspondence – Emails – Blog Writing - (N)etiquette – Report Writing – Importance of Reports – Types and Formats of Reports– Technical Report Writing– Exercises for Practice.

3. Activities on Presentation Skills - Starting a conversation – responding appropriately and relevantly – using the right language and body language – Role Play in different situations including Seeking Clarification, Making a Request, Asking for and Refusing Permission, Participating in a Small Talk – Oral presentations (individual and group) through JAM sessions- PPTs – Importance of Presentation Skills – Planning, Preparing, Rehearsing and Making a Presentation – Dealing with Glossophobia or Stage Fear – Understanding Nuances of Delivery - Presentations through Posters/Projects/Reports – Checklist for Making a Presentation and Rubrics of Evaluation

4. Activities on Group Discussion (GD): Types of GD and GD as a part of a Selection Procedure - Dynamics of Group Discussion- Myths of GD - Intervention, Summarizing - Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas – Do's and Don'ts - GD Strategies – Exercises for Practice.

5. Interview Skills: Concept and Process - Interview Preparation Techniques - Types of Interview Questions – Pre-interview Planning, Opening Strategies, Answering Strategies - Interview Through Tele-conference & Video-conference - Mock Interviews.

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
- One PC with latest configuration for the teacher
- T. V, a digital stereo & Camcorder
- Headphones of High quality

SUGGESTED SOFTWARE:

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

- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **Oxford Advanced Learner's Dictionary**, 10th Edition
- **Cambridge Advanced Learner's Dictionary**
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech

BOOKS RECOMMENDED

1. Rizvi, M. Ashraf (2018). Effective Technical Communication. (2nd ed.). McGraw Hill Education (India) Pvt. Ltd.
2. Suresh Kumar, E. (2015). Engineering English. Orient BlackSwan Pvt. Ltd.
3. Bailey, Stephen. (2018). Academic Writing: A Handbook for International Students. (5th Edition). Routledge.

4. Koneru, Aruna. (2016). Professional Communication. McGraw Hill Education (India) Pvt. Ltd.
5. Raman, Meenakshi & Sharma, Sangeeta. (2022). Technical Communication, Principles and Practice. (4TH Edition) Oxford University Press.
6. Anderson, Paul V. (2007). Technical Communication. Cengage Learning Pvt. Ltd. New Delhi.
7. McCarthy, Michael; O'Dell, Felicity & Redman, Stuart. (2017). English Vocabulary in Use Series. Cambridge University Press
8. Sen, Leela. (2009). Communication Skills. PHI Learning Pvt Ltd., New Delhi.
9. Elbow, Peter. (1998). Writing with Power. Oxford University Press.
10. Goleman, Daniel. (2013). Emotional Intelligence: Why it can matter more than IQ. Bloomsbury Publishing.

WEB REFERENCES

1. https://www.asha.org/PRPSpecificTopic.aspx?folderid=8589935321&section=References
2. Argyle, Michael F., Alkema, Florisse, & Gilmour, Robin. "The communication of friendly and hostile attitudes: Verbal and nonverbal signals." European Journal of Social Psychology, 1, 385- 402:1971
3. Blumer, Herbert. Symbolic interaction: Perspective and method. Engle wood Cliffs; NJ: Prentice Hall.1969

E -TEXTBOOKS

1. Mc corry Laurie Kelly Mc Corry Jeff Mason, Communication Skills forthest Healthcare Professional, 1 edition, ISBN:1582558140, ISBN-13:9781582558141
2. Robert E Owens, Jr, Language Development, 9th edition, ISBN:0133810364, 9780133810363

MOOCS COURSES

1. https://www.coursera.org/specializations/improve-english
2. https://www.edx.org/professional-certificate/upvalenciax-upper-intermediate-english

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

INTELLECTUAL PROPERTY RIGHTS

III B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
IP510MC*	B. Tech	3	0	0	0	100	-	100

COURSE OBJECTIVES

1. Significance of intellectual property and its protection
2. Introduce various forms of intellectual property

COURSE OUTCOMES:

1. Distinguish and Explain various forms of IPRs.
2. Identify criteria to fit one's own intellectual work in particular form of IPRs.
3. Apply statutory provisions to protect particular form of IPRs.
4. Appraise new developments in IPR laws at national and international level

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 COPYRIGHTS & LAW OF PATENTS	

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

UNIT – IV	TRADE SECRETS	

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

UNIT-V	NEW DEVELOPMENT OF INTELLECTUALPROPERTY	

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

TEXTBOOKS

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.

REFERENCE BOOKS

1. K. Sudha, K. Sathish, B. Kanakalaxmi, Intellectual Property Rights, Spectrum Publications, 2023.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.

WEB REFERENCES

1. http://libgen.rs/book/index.php?md5=C4A6559ECCAEFC767CE71BD91A1BAD41
2. http://libgen.rs/book/index.php?md5=6463CAD16544B347B19335FB19D6917C

E -TEXTBOOKS

1.http://libgen.rs/book/index.php?md5=13C4B3A45B1C95B4A388F94729CCCFBC
2.https://maklaw.in/intellectualpropertyrights/?gclid=EAIaIQobChMIsprsv_WI7QIVilVgCh29HwPzEAAYASAAEgK5YvD_BwE

MOOCS COURSES

1. https://nptel.ac.in/courses/110/105/110105139/
2. https://nptel.ac.in/courses/109/106/109106137/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CYBER-PHYSICAL SYSTEMS

Professional Elective - II

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE621PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To gain insight into the seamless integration of computational algorithms and physical processes within cyber-physical systems.
2. To develop proficiency in analyzing and managing the dynamic interactions between the cyber and physical components in diverse applications.
3. To explore practical applications, focusing on the design, implementation, and optimization of cyber-physical systems for real-world

COURSE OUTCOMES:

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

1. Achieve a thorough understanding of the core principles that form the foundation of Cyber- Physical Systems.
2. Apply the knowledge to successfully identify safety specifications and critical properties crucial for ensuring the safety of CPS.
3. Develop proficiency in utilizing abstraction techniques for system designs, and effectively express pre- and post-conditions as well as invariants for CPS models.

UNIT-I INTRODUCTION TO CYBER-PHYSICAL SYSTEMS (CPS)

Cyber-Physical Systems in the real world, Basic principles of design and validation of CPS, Industry 4.0 and its implications, Auto SAR and IIOT (Industrial Internet of Things), Applications in Building Automation and Medical CPS.

UNIT-II CPS PLATFORM COMPONENTS

CPS Hardware platforms: Processors, Sensors, Actuators, CPS Network: Wireless Hart, CAN, Automotive Ethernet, CPS Software stack: Real-Time Operating Systems (RTOS), Scheduling, Overview of CPS Software components and their mapping to ElectronicControl Units (ECUs).

UNIT-III	PRINCIPLES OF AUTOMATED CONTROL DESIGN:	

Dynamical Systems and Stability, Controller Design Techniques, Stability Analysis using Common Lyapunov Functions (CLFs) and Multiple Lyapunov Functions (MLFs), Performance analysis under Packet drop and Noise

UNIT-IV	CPS IMPLEMENTATION AND PERFORMANCE ANALYSIS	

Translating features into software components, Mapping software components to ECUs, Performance Analysis of CPS, considering scheduling, bus latency, and faults, Network congestion and its impact on control performance.

UNIT-V	FORMAL METHODS, SOFTWARE ANALYSIS, AND SECURE DEPLOYMENT	

Advanced Automata-based modeling and analysis, Timed and Hybrid Automata for CPS, Formal Analysis techniques: Flow pipe construction, reachability analysis, Analysis of CPS Software: Weakest Pre-conditions, Bounded Model Checking, Frama-C, CBMC, Secure Deployment of CPS: Attack models, Secure Task mapping, and Partitioning, State estimation for attack detection. **Case Studies in CPS Automotive Case Study:** Vehicle ABS hacking, **Power Distribution Case Study:** Attacks on Smart Grids

TEXTBOOKS

1. Raj Rajkumar, Dionisio De Niz, and Mark Klein, *Cyber-Physical Systems*, Eddison-Wesley Professional
2. Rajeev Alur, *Principles of Cyber-Physical Systems*, MIT Press, 2015.

REFERENCE BOOKS

1. André Platzer, Logical Analysis of Hybrid Systems: Proving Theorems for Complex Dynamics., Springer, 2010. 426 pages, ISBN 978-3-642-14508-7.
2. Jean J. Labrosse, Embedded Systems Building Blocks: Complete and Ready-To-Use Modules in C, The publisher, Paul Temme, 2011.
3. Introduction to Embedded Systems - A Cyber-Physical Systems Approach, by E. A. Lee and S.A. Seshia, 2014. The book is available in two forms: a free PDF download and low-cost paperback.

WEB REFERENCES

1. https://en.wikipedia.org/wiki/Cyber%E2%80%93physical_system
2. https://www.splunk.com/en_us/blog/learn/cyber-physical-systems.html

E -TEXTBOOKS

1.https://library.oapen.org/bitstream/id/a8afe12b-4cc9-4af5-9db0-184f4e725f92/2021_Book_Cyber-PhysicalSystemsAModel-Ba.pdf

2.https://ptgmedia.pearsoncmg.com/images/9780321926968/samplepages/9780321926968_sample.pdf

MOOCS COURSES

1.https://www.mooc-list.com/tags/cyber-physical-systems

2.https://www.coursera.org/learn/cyber-physical-systems-1

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SEMICONDUCTOR DRIVES

Professional Elective - II

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE622PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

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

COURSE OUTCOMES:

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

1. Identify the drawbacks of speed control of motor by conventional methods.
2. Differentiate Phase controlled and chopper-controlled DC drives speed-torque characteristics merits and demerits
3. Understand Ac motor drive speed–torque characteristics using different control strategies its merits and demerits and describe Slip power recovery schemes.

UNIT-I CONTROL OF DC MOTORS

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

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

Control of DC Motors by Choppers: Single quadrant, two quadrant and four quadrant chopper fed dc separately excited and series motors – Continuous current operation – Output voltage and current wave forms – Speed and torque expressions – speed-torque characteristics – Problems on Chopper fed D.C Motors – Closed Loop operation (Block Diagram Only)

UNIT-III	CONTROL OF INDUCTION MOTOR	

Variable voltage characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics.
Variable frequency characteristics-Variable frequency control of induction motor by Voltage source and current source inverter and cyclo-converters- PWM control – Comparison of VSI and CSI operations – Speed torque characteristics – numerical problems on induction motor drives – Closed loop operation of induction motor drives (Block Diagram Only)

UNIT-IV	ROTOR SIDE CONTROL OF INDUCTION MOTOR	

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

UNIT-V	CONTROL OF SYNCHRONOUS MOTORS	

Separate control and self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI, CSI and 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 based VSI& CSI

TEXTBOOKS

1. "G K Dubey", Fundamentals of Electric Drives, CRC Press, 2002.
2. "Vedam Subramanyam", Thyristor Control of Electric drives, Tata McGraw Hill Publications, 1987.

REFERENCE BOOKS

1. Dr. P. Santosh Kumar Patra, T. V. Sai Kalyani, Spectrum Publications, 2023.
2. "S K Pillai", A First course on Electrical Drives, New Age International (P) Ltd. 2nd Edition. 1989
3. "P. C. Sen", Thyristor DC Drives, Wiley-Blackwell, 1981
4. "B. K. Bose", Modern Power Electronics, and AC Drives, Pearson 2015.
5. "R. Krishnan", Electric motor drives - modelling, Analysis and control, Prentice Hall PTR, 2001.

WEB REFERENCES

1. https://www.electrical4u.com/
2. http://www.nptelvideos.in/2012/11/advanced-electric-drives.html
3. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-334-powerelectronics-spring-2007/
4. https://www.freevideolectures.com

E -TEXTBOOKS

1. https://www.freeengineeringbooks.com
2. https://www.pdfdrive.com/textbook-of-electrical-technology-ac-and-dc-machinesd184089760.html

MOOCS COURSES

1. https://nptel.ac.in/courses/108108077/
2. http://www.nptelvideos.in/2012/11/advanced-electric-drives.html

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

WIND AND SOLAR ENERGY SYSTEMS

Professional Elective - II

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE623PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To study the physics of wind power and energy, understanding the principles governing wind generator operation.
2. To gain knowledge about solar power resources, analyze solar photovoltaic cells, and discuss solar thermal power generation.
3. To identify and understand network integration issues associated with renewable energy sources like wind and solar power

COURSE OUTCOMES:

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

1. Understand the energy scenario and the consequent growths of the power generate renewable energy sources.
2. Understand the basic physics of wind and solar power generation.
3. Understand the power electronic interfaces for wind and solar generation and grid-integration issues.

UNIT-I PHYSICS OF WIND POWER

History of wind power, Indian and Global statistics, Wind physics, Betz limitratio, stall and pitch control, Wind speed statistics-probability distributions, and Wind power-cumulativedistribution functions

UNIT-II WIND GENERATOR TOPOLOGIES

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

UNIT-III	THE SOLAR RESOURCE	

Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.
Solar Photovoltaic: Technologies-Amorphous, mono-crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power point Tracking (MPPT) algorithms. Converter Control

UNIT-IV	NETWORK INTEGRATION ISSUES	

Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

UNIT-V	SOLAR THERMAL POWER GENERATION	

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

TEXTBOOKS

1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.

REFERENCE BOOKS

1. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
2. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
3. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
4. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991.

WEB REFERENCES

1. https://www.energy.gov/energysaver/hybrid-wind-and-solar-electric-systems
2. https://energsustainsoc.biomedcentral.com/articles/10.1186/s13705-020-0240-1
3. https://www.sciencedirect.com/science/article/abs/pii/S1364032115016068

E -TEXTBOOKS

1. https://easyengineering.net/ Principles of Thermal Collection and Storage -by S. P. Sukhatme
2. https://easyengineering.net/objective- Renewable Energy Applications - G. N. Tiwari

MOOCS COURSES

1. https://nptel.ac.in/courses/108/105/108105058/
2. https://nptel.ac.in/courses/103/103/103103206/
3. https://nptel.ac.in/courses/108/108/108108078/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DIGITAL SIGNAL PROCESSING

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC608PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. Provide foundational knowledge for the analysis and processing of digital signals.
2. Explore the relationships between continuous-time and discrete-time signals and systems, emphasizing time, frequency, and Z-plane analysis.
3. Introduce real-world signal processing applications while studying the design and structures of digital filters, including IIR and FIR, and addressing finite word length effects.

UNIT-I	INTRODUCTION& REPRESENTATION OF DISCRETE TIME SIGNALS AND SYSTEMS	

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain **Representation of Discrete Time Signals and Systems**

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

UNIT-II	DISCRETE FOURIER TRANSFORMS& FAST FOURIER TRANSFORMS	

Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT, and FFT with General Radix-N.

UNIT-III	IIR DIGITAL FILTERS	

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT-IV	FIR DIGITAL FILTERS	

Characteristics of FIR Digital Filters, Frequency Response, and Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT-V	MULTI-RATE DIGITAL SIGNAL PROCESSING& FINITE WORD LENGTH EFFECTS	

Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling, Applications of Multi Rate Signal Processing.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round off Noise, Methods to Prevent Overflow, Tradeoff between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXTBOOKS

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009.

REFERENCE BOOKS

1. K. Vishwanath, G. Ramesh Reddy, D. Thirupathi, Dr. B. Harikrishna, Spectrum Education, 2023.
2. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009
3. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
4. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
5. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachorand Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

WEB REFERENCES

1. ttps://freevideolectures.com/course/2339/digital-signal-processing-iitkharagpur/17
2. http://study.aisectonline.com/DisplaySub2SubCategory.aspx?Sub2Cat=10141
3. https://nptel.ac.in/noc/individual_course.php?id=noc18-ee30 4. http://www.infocobuild.com/education/audio-video courses/electronics/DiscreteTimeSignalProcessing-IIT-Kharagpur/lecture-06.html

E -TEXTBOOKS

1. https://www.google.co.in/books/edition/DIGITAL_SIGNAL_PROCESSING/cLAbjISN7qQC?hl=en&gbpv=1&dq=inauthor:%22NAGOORKANI%22&printsec=frontc over
2. https://fmipa.umri.ac.id/wp-content/uploads/2016/03/Andreas-Intoniou-Digital signal-processing.9780071454247.31527.pdf
3. https://www.riverpublishers.com/pdf/ebook/RP_E9788792982032.pdf

MOOCS COURSES

1. https://nptel.ac.in/courses/108105055/10

2. http://freevideolectures.com/Course/2339/Digital-z transforms-IITKharagpur

3. http://study.aisectonline.com/Login.aspx?CID=CoursesSelect.aspx?courseid=11589#https://www.youtube.com/watch?v=V-kLaH4139o 4. https://cosmolearning.org/video-lectures/digital-filter-**design-12020**

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEM PROTECTION

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE601PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To introduce all kinds of circuit breakers and relays for protection of Generators, Transformers and feeder bus bars from Over voltages and other hazards.
2. To describe neutral grounding for overall protection.
3. To understand the phenomenon of Over Voltages and its classification.

UNIT-I	PROTECTIVE RELAYS& OPERATING PRINCIPLES AND RELAY CONSTRUCTION	

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.

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

UNIT-II	OVER-CURRENT PROTECTION& DISTANCE PROTECTION	

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& AC MACHINES AND BUS ZONE PROTECTION	

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& MICROPROCESSOR BASED RELAYS	

Static Relays: Amplitude and Phase comparators, Duality between AC and PC, 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.

UNIT-V	CIRCUIT BREAKERS& FUSES	

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 DC breakers, ratings of circuit breakers, testing of circuit breakers.

Fuses: Introduction, fuse characteristics, types of fuses, application of HRC fuses, discrimination.

TEXTBOOKS

1. 1. Badriram and D.N. Vishwakarma, Power System Protection and Switchgear, TMH 2001.
2. 2. U. A. Bakshi, M. V. Bakshi: Switchgear and Protection, Technical Publications, 2009.

REFERENCE BOOKS

1. Dr. P. Santosh Kumar Patra, T. V. Sai Kalyani, K. V. Govardhan Rao, Power System Protection, Sunraise International Publications, 2023.
2. C. Russel Mason – "The art and science of protective relaying, Wiley Eastern, 1995
3. L. P. Singh "Protective relaying from Electromechanical to Microprocessors", New Age
4. International

WEB REFERENCES

1. https://www.electrical4u.com/protection-system-in-power-system/
2. https://www.cet.edu.in/noticefiles/228_POWER_SYSTEM_PROTECTION.pdf
3. https://na.eventscloud.com/file_uploads/aaf42a76a5588f69c7a1348d6f77fe0f_Introduction_to_System_Protection-_Protection_Basics.pdf 4. https://pcmp.springeropen.com/articles/10.1186/s41601-016-0012-2

E -TEXTBOOKS

1. https://books.google.com.bd/books?id=AZLbHTJEDFIC&printsec=copyright#v=onepa ge&q&f=false
2. https://www.ebooksfree4u.com/2018/10/power-system-by-cl-wadhwa-pdf download.html
3. https://www.scribd.com/document/439299065/switchgear-and-protection-by-jb-gupta-pdf

MOOCS COURSES

1. https://nptel.ac.in/courses/108/101/108101039/
2. https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ee73/
3. https://pe.gatech.edu/courses/power-system-relaying-theory-and-applications

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEM OPERATION AND CONTROL

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE602PC	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. Understand the principles and significance of real power control, emphasizing the importance of frequency control in power systems.
2. Analyze various methods for effective reactive power control in power systems.
3. Grasp the concepts of unit commitment, economic load dispatch, and real-time control, highlighting their importance in power system operation

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	PF 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, 3rd Edn, New Age International Publishing Co., 2001.
2. D. P. Kothari and I. J. Nagrath, Modern Power System Analysis, 4th Edn, Tata McGraw Hill Education Private Limited 2011.

REFERENCE BOOKS

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.

WEB REFERENCES

1. https://www.electrical4u.com/protection-system-in-power-system/
2. https://www.cet.edu.in/noticefiles/228_POWER_SYSTEM_PROTECTION.pdf
3. https://na.eventscloud.com/file_uploads/aaf42a76a5588f69c7a1348d6f77fe0f_Introduction_to_System_Protection-_Protection_Basics.pdf 4. https://pcmp.springeropen.com/articles/10.1186/s41601-016-0012-2

E -TEXTBOOKS

1. https://books.google.com.bd/books?id=AZLbHTJEDFIC&printsec=copyright#v=onepage&q&f=false
2. https://www.ebooksfree4u.com/2018/10/power-system-by-cl-wadhwa-pdf download.html
3. https://www.scribd.com/document/439299065/switchgear-and-protection-by-jb-gupta-pdf

MOOCS COURSES

1. https://nptel.ac.in/courses/108/101/108101039/
2. https://nptel.ac.in/noc/courses/noc20/SEM2/noc20-ee73/
3. https://pe.gatech.edu/courses/power-system-relaying-theory-and-applications

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEM LAB

III B. TECH- II SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE603PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

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

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 YBUS.
2. Load Flow Analysis using Gauss Seidel (GS) Method.
3. Load Flow Analysis using Fast Decoupled (FD) Method.
4. Formation of ZBUS.
5. Simulation of Compensated Line

TEXTBOOKS

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.

REFERENCE BOOKS

1. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CONTROL SYSTEMS LAB

III B. TECH- II SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE604PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

- Understand system representations like transfer function and state space, and assess system dynamic response.
- Evaluate system performance using both time and frequency domain analyses, identifying methods to enhance performance.
- Design controllers and compensators to improve system performance based on the assessments from time and frequency domain analyses.

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 servo motor
5. Transfer function of DC motor
6. Transfer function of DC generator
7. Characteristics of AC servo motor
8. Lag and lead compensation – Magnitude and phase plot

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

9. Temperature controller using PID
10. Effect of P, PD, PI, PID Controller on a second order systems
11. (a) Simulation of P, PI, PID Controller.
    (b) Linear system analysis (Time domain analysis, Error analysis) using suitable software
12. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using suitable software
13. State space model for classical transfer function using suitable software -Verification.
14. Design of Lead-Lag compensator for the given system and with specification using suitable software

TEXTBOOKS
1. M. Gopal, “Control Systems: Principles and Design”, McGraw Hill Education, 1997. 2. B. C. Kuo, “Automatic Control System”, Prentice Hall, 1995.
REFERENCE BOOKS
1. K. Ogata, “Modern Control Engineering”, Prentice Hall, 1991. 2. I. J. Nagrath and M. Gopal, “Control Systems Engineering”, New Age International, 2009.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DIGITAL SIGNAL PROCESSING LAB

III B. TECH- II SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EC609PC	B. Tech	0	0	2	1	40	60	100

COURSE OBJECTIVES

- To implement Linear and Circular Convolution.
- To implement FIR and IIR filter and architecture of DSP processor.
- To demonstrate Finite word length effect.

List of experiments:

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. To find DFT / IDFT of given DT Signal
3. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
4. Implementation of FFT of given Sequence
5. Determination of Power Spectrum of a given Signal(s).
6. Implementation of LP FIR Filter for a given Sequence/Signal.
7. Implementation of HP FIR Filter for a given Sequence/Signal
8. Implementation of LP IIR Filter for a given Sequence/Signal
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Sinusoidal Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Audio application such as to plot a Time and Frequency display of Microphone plus a Cosine using DSP. Read a .wav file and match with their respective spectrograms.
16. Noise Removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
17. Impulse Response of First order and Second Order Systems.

(The above Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors) Note: - Minimum of 12 experiments has to be conducted.

TEXTBOOKS
1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris 2. G. Manolakis, Pearson Education / PHI, 2007. 3. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009.
REFERENCE BOOKS
1. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009 2. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008 3. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007 4. Digital Signal Processing - A Practical approach, Emmanuel C. If each orand Barrie W. Jervis, 2nd Edition, Pearson Education, 2009
WEB REFERENCES
1. NPTEL DSP Course: Lectures, notes, and lab assignments for DSP (NPTEL DSP Course) 2. DSP Course on edX: Video lectures, lab assignments, and quizzes (DSP Course on edX) 3. https://sjce.ac.in/wp-content/uploads/2021/11/dsp-lab-manual-2021-22.pdf

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ENVIRONMENTAL SCIENCE

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
ES607MC*	B. Tech	3	0	0	0	100	-	100

COURSE OBJECTIVES

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

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 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 Problems and Global Efforts:** Climate 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.

UNIT-V	ENVIRONMENTAL POLICY, LEGISLATION & EIA	

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 (EMP).

Towards Sustainable Future: Concept of Sustainable Development, 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.

TEXTBOOKS

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

1. Dr. Hemambika, Dr. Saumyapriya Acharya, N.N.V Pandurangarao, Environmental Science, Spectrum Publications, 2023.
2. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
3. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
4. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
5. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.
6. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

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1. https://www.britannica.com/science/ecosystem

2. https://ocw.mit.edu/resources/#EnvironmentandSustainability

E -TEXTBOOKS

1. P N Palanisamy Environmental Science ISBN:9788131773253, eISBN:97899332509771 Edition: Second edition

2. Environmental Studies. Author, Dr. J. P. Sharma. Publisher, Laxmi Publications, 2009 ISBN, 8131806413, 9788131806418.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER ELECTRONIC APPLICATIONS TO RENEWABLE ENERGY SYSTEMS

IV B. TECH- I SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE701PC	B. Tech	3	1	0	4	40	60	100

COURSE OBJECTIVES

- To impart knowledge on different types of renewable energy systems.
- To analyze the operation of electrical generators used for the wind energy conversion
- Systems.
- To know the operation of power converters and PV systems operation.

UNIT-I	SOLAR CELLS AND THEIR MEASUREMENT	

Solar cell characteristics and their measurement, PV Module, PV array, Partial shading of a solar cell and a module, the diode, Power conditioning unit, maximum power point tracker, Implementation of Perturb and Observe Method, Incremental Conductance Method, Battery charger/discharge controller.

UNIT-II	PV CELLS AND INVERTERS	

Centralized Inverters, String Inverters, Multi-string Inverters, Module Integrated Inverter/Micro-inverters, Inverter Topology, Model of Inverter, Sizing Batteries and Inverters for a Solar PV System. Types of PV Systems: Grid-Connected Solar PV System, Stand-Alone Solar PV System.

UNIT-III	WIND AND TYPES OF WIND GENERATORS	

Introduction to wind: Characteristics, Wind Turbine, Fixed and Variable-Speed Wind Turbines, Components of WECS, Description of Components, Types of Wind Turbine Generators, Economics of Wind Energy Conversion Systems, Linking Wind Turbines onto the Grid, Power Converter Topologies for Wind Turbine Generators.

UNIT-IV	WIND GENERATORS	

Modeling of Permanent Magnet Synchronous Generators, Doubly Fed Induction Generators, Squirrel cage Induction Generators wind turbine, Control of Power converters for WECS.

UNIT-V	HYBRID ENERGY SYSTEMS	

Hybrid Energy Systems, Need for Hybrid Energy Systems, Range and types of Hybrid systems, Hybrid Solar PV/Wind Energy System, Architecture of Solar-Wind Hybrid System and Grid connected issues.

TEXTBOOKS

1. S. N. Bhadra, D. Kastha, S. Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.
2. S. N. Bhadra, D. Kastha, & S. Banerjee “Wind Electrical Systems”, Oxford University Press, 2009.
3. Rashid. M. H, “Power Electronics Hand book”, Academic Press, 2001.

REFERENCE BOOKS

1. Rai. G. D, “Non-conventional energy sources”, Khanna Publishers, 1993.
2. Rai. G.D,” Solar energy utilization”, Khanna Publishes, 1993.
3. Gray, L. Johnson, “Wind energy system”, Prentice Hall of India, 1995.
4. B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2nd Edition, 2009

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1. https://www.researchgate.net
2. https://www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. “Power Electronics: Converter, Applications and Design” by N Mohan and W P Robbins.
5. “Power Electronics: Circuits, Devices and Applications” by Rashid.
6. https://electricalbaba.com › best-book-power-electronics.
7. https://easyengineering.net › power-electronics-books.

E -TEXTBOOKS

1. https://www.jntubook.com/
2. https://www.freeengineeringbooks.co
3. Power Electronic Converters: Dynamics and Control in Conventional and Renewable Energy Applications By Teuvo Suntio, Tuomas Messo, Joonas Puukko First published:12 October 2017Print ISBN:9783527340224 |Online ISBN:9783527698523 |DOI:10.1002/9783527698523
4. Digital Power Electronics and Applications by Fang Lin Luo Hong Ye Muhammad Rashid, Hardcover ISBN: 9780120887576, Paperback ISBN: 9781493300037, eBook ISBN: 9780080459028

MOOCS COURSES

1.https://nptel.ac.in/courses/108101126/Fundamentals of Power Electronics

2. https://nptel.ac.in/courses/108101038/Power Electronics

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MOBILE APPLICATION DEVELOPMENT

Professional Elective-III

IV B. TECH- I SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE731PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improves their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

UNIT-I INTRODUCTION TO ANDROID OS

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

UNIT-II ANDROID USER INTERFACE

Android User Interface: Measurements – Device and pixel density independent measuring unit - s Layouts – Linear, Relative, Grid and Table Layouts User Interface (UI) Components –Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers Event Handling – Handling clicks or changes of various UI components Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

UNIT-III INTENTS AND BROADCASTS

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity Notifications – Creating and Displaying notifications, Displaying Toasts

UNIT-IV PERSISTENT STORAGE

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

UNIT-V	INTRODUCTION TO SQL	
Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)		

TEXTBOOKS

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox), 2012.

REFERENCE BOOKS

1. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013.
2. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

WEB REFERENCES

1. https://en.wikipedia.org/wiki/Software_engineering

E -TEXTBOOKS

1.https://books.google.co.in/books?id=bL7QZHtWvaUC&printsec=frontcover&dq=software+engineering+by+roger+pressman+vth+edition+free+download&hl=en&sa=X&ved=0ahUKEwiLkOzpL_TAhWIuI8KHZSxD2cQ6AEIMDAC#v=onepage&q&f=false

MOOCS COURSES

1. https://www.fita.in/mobile-app-development-course/ 2. https://alison.com/tag/app-development

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SIGNALS AND SYSTEMS

Professional Elective-III

IV B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE732PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To develop ability to analyze linear systems and signals
2. To develop critical understanding of mathematical methods to analyze linear systems and signals
3. To know the various transform techniques and sampling principle

COURSE OUTCOMES:

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

1. Understand the concepts of continuous time and discrete time systems.
2. Analyze systems in complex frequency domain.
3. Understand sampling theorem and its implications.

UNIT-I INTRODUCTION TO SIGNALS AND SYSTEMS:

Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, reliability. Examples.

UNIT-II BEHAVIOUR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS:

Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT-III	FOURIER TRANSFORMS:	

Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT-IV	LAPLACE AND Z- TRANSFORMS:	

Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis

UNIT-V	SAMPLING AND RECONSTRUCTION	

The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

TEXTBOOKS

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2006.
3. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
4. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed

REFERENCE BOOKS

1. Signals and Systems – Simon Haykin and Van Veen, Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE
5. Signals and Systems – K. Deergha Rao, Birkhauser, 2018

WEB REFERENCES

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2. https://nptel.ac.in/courses/108106075/8
3. https://nptel.ac.in/courses/117105134/13
4. https://nptel.ac.in/courses/117102059/4

E -TEXTBOOKS

1. SIGNALS & SYSTEMS 2nd Edition Paperback – 1 Jul 2017by H Hsu (Author), R Ranjan (Author)
2. Signals and Systems 2nd edition 2nd Edition (English, Paperback, Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab)

MOOCS COURSES
1. https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/ 2. https://www.coursera.org/lecture/dsp/5-3-c-the-sampling-theorem-DcFxD

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRIC AND HYBRID VEHICLE

Professional Elective-III

IV B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE733PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

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

COURSE OUTCOMES:

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

1. Understand the models to describe hybrid vehicles and their performance.
2. Understand the different possible ways of energy storage.
3. 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).

TEXTBOOKS

1. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.
3. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
4. James Larminie, "Electric Vehicle Technology Explained", John Wiley & Sons, 2003
5. Iqbal Hussain, "Electric & Hybrid Vehicles – Design Fundamentals", Second Edition, CRC Press, 2011

REFERENCE BOOKS

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2004.
2. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.
3. Hybrid Vehicles and the future of personal transportation, Allen Fuhs, CRC Press, 2011.
4. Vehicle Power Management: Modelling, Control and Optimization, Xi Zhang, Chris Mi, Springer, 2011.

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2. http://www.basicsofelectricalengineering.com/
3. https://www.khanacademy.org/science/physics/circuits-topic/circuits4. https://circuitglobe.com/

E -TEXTBOOKS

1. https://easyengineering.net/ Electric and Hybrid Vehicles Design Fundamentals byIqbal Hussain /
2. https://easyengineering.net/ History of Electrical Vehicle-by- Dr Sangeet Dwivedi/

MOOCS COURSES

1. https://nptel.ac.in/courses/108108076/1
2. https://nptel.ac.in/courses/108102146/
3. https://nptel.ac.in/courses/108108076/35

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

HVDC TRANSMISSION

Professional Elective-IV

IV B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE741PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To compare EHV AC and HVDC and understand Graetz circuit with 6 and 12 pulse operation
2. To control HVDC systems with various methods and to perform power flow analysis in AC/DC systems
3. To describe various protection methods for HVDC systems and Harmonics

COURSE OUTCOMES: At the end of this course, students will be able to:

1. Compare EHV AC and HVDC system and to describe various types of DC links
2. Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems
3. Describe various protection methods for HVDC systems and classify Harmonics and design different types of filters

UNIT-I INTRODUCTION

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 AND REACTIVE POWER CONTROL IN HVDC

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 reactive power- Static VAR Compensators, Reactive power control during transients.

UNIT-III	POWER FLOW ANALYSIS IN AC/DC SYSTEMS:	
Modelling 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 AND FILTERS**	
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.		

TEXTBOOKS

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", EHVAC and HVDC Transmission Engineering and Practice, Khanna publications, 3rdEdition 1999.
2. "Jos Arrillaga", HVDC Transmission, The institution of electrical engineers, IEE power & energy series 29, 2nd edition 1998.
3. "E. W. Kimbark", Direct Current Transmission, John Wiley and Sons, volume 1, 1971.
4. "E. Uhlmann", Power Transmission by Direct Current, B. S. Publications, 2009

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2. http://www.basicsofelectricalengineering.com/
3. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470822975
4. https://www.accessengineeringlibrary.com/content/book/9780071771917/chapter/chapter11

E -TEXTBOOKS

1. https://onlinelibrary.wiley.com/doi/book/10.1002/9780470822975
2. https://easyengineering.net/hvdc-power-transmission-systems-by-padiyar/
3. https://www.geniuspublications.com/our-books/Engineering-Books/EE-Branch/ehv-ac-dc

MOOCS COURSES

1. https://nptel.ac.in/courses/108/104/108104013/
2. https://wireless.education/study/hvdc-transmission-substation-in-detail-engineeringonline-course-by-udemy/
3. https://npti.gov.in/hvdc-transmission-systems

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEM RELIABILITY

Professional Elective-IV

IV B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE742PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

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

COURSE OUTCOMES:

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

1. Describe merging generation and load models
2. Estimate loss of load and energy indices for generation systems model
3. Apply various indices for distribution system and 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	

Operating Reserve Evaluation

Basic concepts - risk indices – PJM methods – security function approach – rapid start and hot reserve units — Modeling 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.

Interconnected 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

TEXTBOOKS

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

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2. https://www.aar.faculty.asu.edu/classes
3. https://www.facstaff.bucknell.edu/
4. https://www.electrical4u.com

E -TEXTBOOKS

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2. https://www.freeengineeringbooks.com

MOOCS COURSES
1. https://nptel.ac.in/courses/108/104/108104013/ 2. https://wireless.education/study/hvdc-transmission-substation-in-detail-engineeringonline-course-by-udemy/ 3. https://npti.gov.in/hvdc-transmission-systems

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

EMBEDDED SYSTEMS APPLICATIONS

Professional Elective-IV

IV B. TECH- I SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE743PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To equip with the basic concepts of embedded system, applications in which they are used,
2. To describe tools and methodologies needed for embedded system design.
3. To know RTOS concepts and familiar with the characteristics of latency in real-time systems.

COURSE OUTCOMES:

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

1. Understand the microprocessor architecture and its components used in embedded systems
2. Write the 8051-assembly language code and Embedded 'C' code for interfacing various devices.
3. Develop simple embedded systems for real time operations

UNIT-I	EMBEDDED SYSTEMS BASICS:	

Introduction to Embedded systems, Examples of embedded systems, Typical Hardware, Gates, Timing Diagrams, Memory, Microprocessors, Buses, Direct Memory Access, Interrupts, Microprocessor Architecture, and Interrupt Basics

UNIT-II	THE 8051 ARCHITECTURES	

Introduction, 8051 Micro controller Hardware, Input/output Pin Ports and Circuits, External Memory, Serial data Input/output, Interrupts.

UNIT-III	EMBEDDED C PROGRAMMING	

Overview of the C standard library, Embedded System Oriented Topics, MISRA C — Designing Safer C Programs, Basics of event driven programming.
Basic Assembly Language Programming Concepts: The Assembly Language Programming Process, Programming Tools and Techniques, Programming the 8051.

UNIT-IV	MOVING DATA	

Moving Data: Introduction, Addressing Modes, External Data Moves, Code Memory ReadOnly Data Moves, Push and Pop Opcodes, Data Exchanges.
Basic Design Using a Real-Time Operating System: Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment

UNIT-V	COMBINED COMPENSATORS	

Applications: Introduction, keyboards, Human Factor, Key Switch Factors, Keyboard Configurations, Displays, Seven-Segment Numeric Display, D/A and A/D Conversions.
Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System.

TEXTBOOKS

1. An Embedded Software Primer, David E. Simon, Pearson Education.
2. The 8051 Microcontroller, Third Edition, Kenneth J.Ayala, Thomson.

REFERENCE BOOKS

1. Embedded Microcomputer Systems Real Time Interfacing, Jonathan W.Valvano, Cengage Learning.
2. 8051 Microcontrollers, Satish Shah, Oxford Higher Education.
3. Micro Controllers, Ajay V Deshmukhi, TMH.
4. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley.
5. Microcontrollers, Raj kamal, Pearson Education.

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1. http://nptel.ac.in/courses.php b. http://jntuk- coeerd.in/
2. http://laboratorios.fi.uba.ar/lse/seminario/bibliografia-y-referencias.html?hl=en
3. https://ptolemy.berkeley.edu/projects/chess/eecs149/references.html
4. https://www.sanfoundry.com/best-reference-books-embedded-systems/
5. https://www.embeddedrelated.com/books-11/nf/all/all.php

E -TEXTBOOKS

1. https://www.e-booksdirectory.com/details.php?ebook=5392
2. https://books.google.co.in/books/about/Embedded_Systems_World_Class_Designs.html?id=-U_Kt_8EpuwC&redir_esc=y

MOOCS COURSES

1. https://www.mooc-list.com/tags/embedded-systems
2. https://onlinecourses.nptel.ac.in/noc20_cs14/preview

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FUNDAMENTALS OF MANAGEMENT FOR ENGINEERS

IV B. TECH- I SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
FM702MS	B. Tech	2	0	0	2	40	60	100

COURSE OBJECTIVES

To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

UNIT-I INTRODUCTION TO MANAGEMENT

Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach.

UNIT-II PLANNING AND DECISION MAKING

General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Production Planning and Control. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT-III ORGANIZATION AND HRM

Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change. Human Resource Management & Business Strategy: Job Satisfaction, Job Enrichment, Job Enlargement, Talent Management, Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal.

UNIT-IV LEADING AND MOTIVATION

Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Leadership. Motivation - Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT-V CONTROLLING

Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency and Methods.

TEXTBOOKS

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCE BOOKS

1. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
2. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
3. Industrial Engineering and Management: Including Production Management, T. R. Banga, S.C Sharma, Khanna Publishers.

WEB REFERENCES

1. Concepts of management & evolution: https://nptel.ac.in/courses/122/108/122108038/
2. Nature and scope of HRM: https://nptel.ac.in/courses/122/105/122105020/
3. Operations management: https://nptel.ac.in/courses/112/107/112107238/

E -TEXTBOOKS

1. library genesis: http://libgen.rs/book/index.php?md5=57DA3CF68A3570281FCD2001B5997585
2. http://www.freebookcentre.net/Business/Management-and-Leadership-Books.htm

MOOCS COURSES

1. http://nptel.ac.in/courses/110105074/6
2. http://nptel.ac.in/courses/110105033/14
3. http://nptel.ac.in/courses/122108038/37

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SIMULATION OF RENEWABLE ENERGY SYSTEMS LAB

IV B. TECH- I SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE703PC	B. Tech	0	0	4	2	40	60	100

COURSE OBJECTIVES

- Develop proficiency in modeling the steady-state and dynamic characteristics of photovoltaic (PV), fuel cell, and wind energy sources.
- Understand and analyze power converter topologies for stand-alone and grid-connected PV, fuel cell, and wind energy systems.
- Explore advanced topics in power electronics, including maximum power point tracking, power factor correction, switched capacitor DC-DC converters, ZVS/ZCS configurations, compensation schemes, and new power converter topologies.

List of experiments:

1. Modelling the steady state and dynamic characteristics of the following
   (i) PV,
   (ii) Fuel cell and
   (iii) Wind energy sources
2. Power converter topologies for stand –alone and grid connected
   (i) PV,
   (ii) Fuel cell and
   (iii) Wind energy sources
3. Maximum Power Point Tracking Schemes
4. Power factor correction techniques for AC to DC systems
5. Switched capacitor DC – DC power converters
6. ZVS, ZCS configurations
7. Compensation Schemes for VAR, harmonics and phase imbalance Power conversion and Electric Drives
8. New power converter topologies and their analysis, modelling and simulation
9. High frequency link power conversion
10. Radiation effects on power electronic systems and components EMI/EMC
11. Analysis, measurement and mitigation of EMI in Electronic and power electronic systems
12. Microgrid Power Quality

Note: Perform the simulation of the above list of experiments with MATLAB/any Simulation software.

TEXTBOOKS
1. S. N. Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005. 2. S.N.Bhadra, D. Kastha, & S. Banerjee “Wind Electrical Systems”, Oxford University Press, 2009. 3. Rashid.M. H, “Power Electronics Hand book”, Academic Press, 2001.
REFERENCE BOOKS
1. Rai. G.D, “Non-conventional energy sources”, Khanna Publishers, 1993. 2. Rai. G.D,” Solar energy utilization”, Khanna Publishes, 1993. 3. Gray, L. Johnson, “Wind energy system”, Prentice Hall of India, 1995. 4. B.H.Khan "Non-conventional Energy sources", Mc Graw-hill, 2nd Edition, 2009

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER QUALITY & FACTS

Professional Elective-V

IV B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE851PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. Define power quality and explore various terms associated with it. Study voltage-related power quality issues, focusing on short and long interruptions.
2. Conduct a detailed study on characterizing voltage sags, with a specific emphasis on magnitude and three-phase unbalanced voltage sags. Understand how power quality issues affect the behaviour of power electronics loads and rotating machinery.
3. Gain an understanding of FACTS controllers, their controllable parameters, and types. Explore the importance of shunt and series compensation, focusing on the control and comparison of STATCOM and SVC, and the functioning and regulation of other FACTS devices like GCSC, TSSC, and TCSC.

COURSE OUTCOMES:

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

1. Develop an awareness of the severity of power quality issues in distribution systems, focusing on their impact and challenges.
2. Understand the concept of transforming voltage sags from upstream (higher voltages) to downstream (lower voltage) in the distribution system.
3. Demonstrate competence in selecting controllers based on specific applications and system requirements. Thoroughly understand various systems and their requirements, including the control circuits of shunt controllers (SVC & STATCOM) and series controllers (GCSC, TSSC, and TCSC) for enhancing transient stability, preventing voltage instability, and damping power oscillations.

UNIT-I POWER QUALITY PROBLEMS IN DISTRIBUTION SYSTEMS

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

UNIT-II TRANSMISSION LINES AND SERIES/SHUNT REACTIVE POWER COMPENSATION:

Basics of AC Transmission. Analysis of uncompensated AC transmission lines. Passive Reactive Power Compensation. Shunt and series compensation at the mid-point of an AC line. Comparison of Series and Shunt Compensation.

UNIT-III	STATIC SHUNT COMPENSATORS	
Objectives of shunt compensation, Methods of controllable VAR generation, Static Var Compensator, its characteristics, TCR, TSC, FC-TCR configurations, STATCOM, basic operating principle, control approaches and characteristics,		
UNIT-IV	**STATIC SERIES COMPENSATORS**	
Objectives of series compensator, variable impedance type of series compensators, TCSC, TSSC-operating principles and control schemes, SSSC, Power Angle characteristics, Control range and VAR rating, Capability to provide reactive power compensation, external control.,		
UNIT-V	**COMBINED COMPENSATORS**	
Introduction to Unified Power Flow Controller, Basic operating principles, Conventional control capabilities, independent control of real and reactive power		

TEXTBOOKS

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

REFERENCE BOOKS

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

WEB REFERENCES

1. https://www.power qualityworld.com/
2. https://www.researchgate.net.
3. https://www.aar.faculty.asu.edu/classes.

E -TEXTBOOKS

1. Arindam Ghosh, Gerard Ledwich, Power quality enhancement using custom power devices, Kluwer
academic publishers, 2002.
2. https://www.freebookcentre.net.

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1. 1. https://nptel.ac.in/courses/108/102/108102179

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SOLAR POWER BATTERIES

Professional Elective-V

IV B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE852PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To understand the PV systems and the solar power batteries operation
2. To analyze the solar PV system storage with batteries.
3. To understand Grid Tie vs. Off-Grid Solar Battery System

COURSE OUTCOMES:

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

1. Know operating principes of different types of solar power batteries
2. Use the batteries for effective storage of solar PV.
3. Gain the knowledge on environmental impacts of solar power batteries .

UNIT-I	INTRODUCTION	

Introduction to solar PV systems, basics of Storage for solar PV systems, Storage for solar PV systems: the batteries, Introduction to Solar Power Batteries, terminology associated, understanding Solar Battery Specifications, working principle, Series Vs. Parallel, Charging parameters, cycle life,

UNIT-II	BATTERIES	

Primary and Secondary batteries, Classification of Secondary batteries, i.e Lead-Acid, Lead-Antimony, Lead-Calcium, Lead-Acid Battery Chemistry, Nickel-Cadmium Batteries and their type

UNIT-III	SOLAR BATTERIES	
AC Coupled Storage vs. DC Coupled Storage, working of Solar Batteries with a Solar Power System and Hybrid Inverter, Main Degradation mechanisms of Solar Batteries, Battery Strengths and Weaknesses, Battery System Design and Selection Criteria, Life Expectancy, Battery standards, Safety precautions,		
UNIT-IV	**SOLAR BATTERIES PERFORMANCE**	
Solar Battery Costs, Declining Cost, factors contribute to the performance of solar battery, selection of suitable batteries based on the application, Grid Tie vs. Off-Grid Solar Battery System, Benefits and disadvantages of using solar batteries,		
UNIT-V	**THE ENVIRONMENTAL IMPACTS OF BATTERIES:**	
Introduction, Service life of the components, Energy requirements for production and transport of the PV-battery system components, Contributing components, Influence of different user conditions, Uncertainties, Future research, Energy return factor, The overall battery efficiency, Different efficiency measures and battery design, The Future of Solar Battery Storage..		

TEXTBOOKS

1. S. Sumathi and L. Ashok Kumar, Solar PV and Wind Energy Conversion Systems: An Introduction to Theory, Modeling with MATLAB/SIMULINK, and the Role of Soft Computing Techniques, Springer 2011
2. H.A. Kiehne, "Battery Technology Handbook" by Publisher: CRC Press 2003

REFERENCE BOOKS

1. Cristina Archer and S. Lovejoy, Battery Technology for Electric Vehicles: Public Science and Private Innovation, Springer 2015
2. Soteris A. Kalogirou, "Solar Energy Engineering: Processes and Systems" by, Academic Press,Year: 2009

WEB REFERENCES

1. https://core.ac.uk/download/pdf/30044842.pdf
2. Handbook on Battery Energy Storage System https://www.adb.org/sites/default/files/publication/479891/handbook-battery-energy-storage- system.pdf
3. https://files.bregroup.com/bre-co-uk-file-library copy/filelibrary/nsc/Documents%20Library/NSC%20Publications/88031-RE_Solar-Consumer- Guide-A4-12pp.pdf
4. https://www.sunwize.com/tech-notes/solar-battery-basics/
5. https://palmetto.com/learning-center/blog/how-does-a-solar-battery-work
6. https://www.letsgosolar.com/faq/what-is-a-solar-battery/
7. https://www.purevolt.ie/domestic-solar/equipment/solar-storage-batteries.php

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1. https://www.advan-kt.com/principlesofsolarengi.pdf
2. https://courses.edx.org/c4x/DelftX/ET.3034TU/asset/solar_energy_v1.1.pdf

MOOCS COURSES

1. https://www.mooc-list.com/course/lithium-based-batteries-coursera

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

AI TECHNIQUES IN ELECTRICAL ENGINEERING

Professional Elective-V

IV B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE853PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
2. To observe the concepts of FFN and concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
3. To analyze genetic algorithm, genetic operations and genetic mutations.

COURSE OUTCOMES:

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

1. Understand feed forward neural networks, feedback neural networks and learning techniques.
2. Understand fuzziness involved in various systems and fuzzy set theory.
3. Develop fuzzy logic control and genetic algorithm for applications in electrical engineering.

UNIT-I ARTIFICIAL NEURAL NETWORKS:

Introduction, Models of Neuron Network-Architectures –Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning –Competitive learning-Boltzmann learning, supervised learning-Unsupervised learning–Reinforcement Learning-Learning tasks

UNIT-II ANN PARADIGMS:

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

UNIT-III	FUZZY LOGIC	
Introduction –Fuzzy versus crisp, Fuzzy Sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy Cartesian Product, Operations on Fuzzy relations –Fuzzy logic–Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.		
UNIT-IV	**GENETIC ALGORITHMS**	
Introduction-Encoding –Fitness Function-Reproduction operators, Genetic Modeling –Genetic Operators-Cross over-Single site cross over, two points cross over –Multi point cross over Uniform cross over, Matrix cross over-Cross over Rate-Inversion & Deletion, Mutation operator –Mutation –Mutation Rate-Bit-wise operators, Generational cycle-convergence of Genetic Algorithm		
UNIT-V	**APPLICATIONS OF AI TECHNIQUES:**	
Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, Speed control ofDC and AC Motors.		

TEXTBOOKS

1.S. Rajasekaran and G.A.V.Pai Neural Networks, Fuzzy Logic & Genetic Algorithms, PHI, New Delhi, 2003.
2.Rober J. Schalkoff, Artificial Neural Networks, Tata McGraw Hill Edition, 2011.

REFERENCE BOOKS

1. P. D. Wasserman; Neural Computing Theory & Practice, Van Nostrand Reinhold, New York, 1989.
2. Bart Kosko; Neural Network & Fuzzy System, Prentice Hall, 1992
3. D. E. Goldberg, Genetic Algorithms, Addison-Wesley 1999

WEB REFERENCES

1. https://www.nptel.ac.in/courses/108101005
2. https://epdf.tips/restructured-electrical-power-systems-power.

E -TEXTBOOKS

1. shodhganga.inflibnet.ac.in/bitstream/10603/17295/13/13_chapter3.pdf

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1. https://www.mooc-list.com/tags/artificial-intelligence

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SMART GRID TECHNOLOGIES

Professional Elective-VI

IV B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE861PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To defend smart grid design to meet the needs of a utility
2. To select issues and challenges that remain to be solved
3. To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

COURSE OUTCOMES:

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

1. Understand the features of small grid in the context of Indian grid.
2. Understand the role of automation in transmission and distribution.
3. Apply evolutionary algorithms for smart grid and understand operation, 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 –Micro grids–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

TEXTBOOKS

1.Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013
2.Gil Masters, 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 Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2005.

WEB REFERENCES

1. https://www.electrical4u.com/
2. http://www.basicsofelectricalengineering.com/
3. https://www.electricaldeck.com
4. https://circuitglobe.com/

E -TEXTBOOKS

1. http://www.freepdfbook.com/smart-grids-infrastructure-technology-and-solutions-by-stuartborlase/
2. https://www.routledgehandbooks.com/pdf/doi/10.1201/9781351228480
3. http://www.a-ghadimi.com/files/Courses/Renewable%20Energy/REN_Book.pdf

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1. https://nptel.ac.in/courses/108/107/108107113/
2. https://nptel.ac.in/courses/108/108/108108034/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ELECTRICAL DISTRIBUTION SYSTEMS

Professional Elective-VI

IV B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE862PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To understand design considerations of feeders
2. To compute voltage, drop and power loss in feeders
3. To understand protection, PF improvement and voltage control

COURSE OUTCOMES:

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

1. design the feeders and compute power loss and voltage drop of the feeders
2. design protection of distribution systems
3. understand the importance of voltage control and power factor improvement

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, Circuitbreaker 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 andswitched), 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.

TEXTBOOKS

1. Turan Gonen, Electric Power Distribution System Engineering, CRC Press, 3rd Edition 2014.
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, 2nd edition, University press 2004.
2. A.S. Pabla, Electric Power Distribution, Tata McGraw Hill Publishing company, 6th edition, 2013

WEB REFERENCES

1. https://www.nptelvideos.in/2012/11/distribution-automation.html
2. https://www.powersystem.org/distribution-automation
3. https://www.sciencedirect.com

E -TEXTBOOKS

1. https://www.schneider-electric.us/documents/customers/utility/br-distribution-feederautomation.pdf
2. https://www.pdfs.semanticscholar.org/099e/bffd3b296af4aa0ef7b7777721f178be6b28.pdf

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1. https://www.mooc-list.com/tags/electrical-distribution
2. https://archive.nptel.ac.in/noc/courses/noc21/SEM2/noc21-ee69/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

MACHINE LEARNING APPLICATIONS TO ELECTRICAL ENGINEERING

Professional Elective-VI

IV B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE863PE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To develop a foundational understanding of machine learning principles and techniques.
2. To explore and understand how machine learning can be integrated into various electrical engineering applications.
3. To gain hands-on experience in implementing machine learning algorithms to solve real-world electrical engineering problems.

COURSE OUTCOMES:

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

1. Demonstrate proficiency in applying machine learning algorithms to solve real-world problems in electrical engineering
2. Integrate machine learning principles effectively into electrical engineering applications,
3. Enhance problem-solving skills by successfully addressing complex issues in electrical engineering through machine learning.

UNIT-I	INTRODUCTION TO MACHINE LEARNING:	

Definition and types of machine learning, Historical perspective, Basic concepts: supervised learning,unsupervised learning, reinforcement learning.

UNIT-II	FUNDAMENTALS OF ELECTRICAL ENGINEERING RELEVANT TO ML	

Overview of electrical circuits and systems, Signal processing basics, Introduction to control systems.

UNIT-III	DATA PREPROCESSING AND FEATURE ENGINEERING:	
Data cleaning and handling missing values, Feature scaling and normalization, Feature extraction andselection.		
UNIT-IV	**MACHINE LEARNING ALGORITHMS FOR ELECTRICAL ENGINEERING APPLICATIONS**	
Regression and classification algorithms, Decision trees and ensemble methods, Neural networks anddeep learning, Support vector machines, Clustering algorithms for pattern recognition		
UNIT-V	**CASE STUDIES AND APPLICATIONS IN ELECTRICAL ENGINEERING**	
Power system optimization using ML, Fault detection and diagnostics in electrical systems, Smart grid applications, Signal processing with ML, Control system optimization and adaptive control using ML.		

TEXTBOOKS

1. C. Aldrin Renold and Sumathi S., Pattern Recognition and Machine Learning, Wiley India, 2015.
2. S. Rajasekaran and G. Aghila, Machine Learning: An Algorithmic Perspective, Chapman and Hall/CRC,2018
3. Chandra Shekhar Yadav, S. Ramakrishnan, and U. Rajendra Acharya, Machine Learning: Concepts, Methodologies, Tools and Applications, Springer 2018

REFERENCE BOOKS

1. Ethem Alpaydin, Introduction to Machine Learning, MIT Press 2010
2. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
3. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press 2012.

WEB REFERENCES

1. Introduction to Machine Learning with Python Paperback – 7 Oct 2016 byAndreas C. Mueller (Author), Sarah Guido
2. https://www.w3schools.com/ai/ai_whatis.asp
3. https://www.digitalocean.com/community/tutorials/an-introduction-to-machinelearning
4. https://www.geeksforgeeks.org/machine-learning/

E -TEXTBOOKS

1. https://aitskadapa.ac.in/e-books/AI&ML/MACHINE%20LEARNING/Machine%20Learning%20(%20etc.)%20(z-lib.org).pdf
2. https://ocw.mit.edu/courses/6-036-introduction-to-machine-learning-fall-2020/

MOOCS COURSES

1. https://www.udemy.com/course/introduction-to-machine-learning-in-python/
2. https://www.coursera.org/learn/machine-learning
3. https://github.com/microsoft/ML-For-Beginners

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OPEN ELECTIVES OFFERED BY DEPARTMENT

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

RENEWABLE ENERGY SOURCES
(Open Elective - I)

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE611OE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To recognize the awareness of energy conservation in students
2. To identify the use of renewable energy sources for electrical power generation
3. To collect different energy storage methods and detect about environmental effects of energy conversion

COURSE OUTCOMES:

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

1. Understand the principles of wind power and solar photovoltaic power generation, fuel cells.
2. Assess the cost of generation for conventional and renewable energy plants
3. Design suitable power controller for wind and solar applications and analyze the issues involved in the integration of renewable energy sources to the grid.

UNIT-I INTRODUCTION

Renewable Sources of Energy-Grid-Supplied Electricity-Distributed Generation-Renewable Energy Economics-Calculation of Electricity Generation Costs – Demand side Management Options –Supply side Management Options-Modern Electronic Controls of Power Systems.

WIND POWER PLANTS: Appropriate Location -Evaluation of Wind Intensity - Topography -Purpose of the Energy Generated - General Classification of Wind Turbines-Rotor Turbines-Multiple-Blade Turbines Drag Turbines -Lifting Turbines-Generators and Speed Control used in Wind Power Energy Analysis of Small Generating Systems.

UNIT-II PHOTOVOLTAIC POWER PLANTS AND FUEL CELLS

Solar Energy-Generation of Electricity by Photovoltaic Effect -Dependence of a PV Cell Characteristic on Temperature-Solar cell Output Characteristics-Equivalent Models and Parameters for Photovoltaic Panels-Photovoltaic Systems-Applications of Photovoltaic Solar Energy-Economical Analysis of Solar Energy.

The Fuel Cell-Low and High Temperature Fuel Cells-Commercial and Manufacturing Issues Constructional Features of Proton Exchange-Membrane Fuel Cells – Reformers-Electrolyzer Systems and Related Precautions-Advantages and Disadvantages of Fuel Cells-Fuel Cell Equivalent Circuit- Practical Determination of the Equivalent Model Parameters -Aspects of Hydrogen as Fuel.

UNIT-III	INDUCTION GENERATORS	

Principles of Operation-Representation of Steady-State Operation-Power and Losses Generated-Self- Excited Induction Generator-Magnetizing Curves and Self-Excitation Mathematical Description of the Self-Excitation Process-Interconnected and Stand-alone operation -Speed and Voltage Control - Economical Aspects.

UNIT-IV	STORAGE SYSTEMS	

Energy Storage Parameters-Lead–Acid Batteries-Ultra Capacitors-Flywheels –Superconducting Magnetic Storage System-Pumped Hydroelectric Energy Storage - Compressed Air Energy Storage -Storage Heat -Energy Storage as an Economic Resource

UNIT-V	INTEGRATION OF ALTERNATIVE SOURCES OF ENERGY	

Principles of Power Injection-Instantaneous Active and Reactive Power Control Approach Integration of Multiple Renewable Energy Sources-Islanding and Interconnection Control-DG Control and Power Injection.

Interconnection Of Alternative Energy Sources with the Grid:

Interconnection Technologies -Standards and Codes for Interconnection-Interconnection Considerations -Interconnection Examples for Alternative Energy Sources.

TEXTBOOKS

1. Felix A. Farret, M. Godoy Simoes, “Integration of Alternative Sources of Energy”, John Wiley& Sons, 2006.
2. Solanki: Renewable Energy Technologies: Practical Guide For Beginneers, PHI Learning Pvt. Ltd., 2008.

REFERENCE BOOKS

1. D. Mukherjee: Fundamentals of Renewable Energy Systems, New Age International publishers, 2007.
2. Remus Teodorescu, Marco Liserre, Pedro Rodríguez: Grid Converters for Photovoltaic and Wind Power Systems, John Wiley & Sons, 2011.
3. Gilbert M. Masters: Renewable and Efficient Electric Power Systems, John Wiley & Sons, 2004.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

FUNDAMENTAL OF ELECTRIC VEHICLES
(Open Elective - I)

III B. TECH- II SEMESTER (R 22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE612OE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

1. To understand the fundamentals of Electric Vehicles (EVs), especially in Indian Context.
2. To examine technology associated with each element of EV drive-train;
3. To get into the economics of EVs in India vis-à-vis petrol vehicles.

COURSE OUTCOMES:

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

1. Understand the fundamentals of Electric Vehicles.
2. Design of batteries, EV motors and Power electronic controllers for EV systems.
3. Analyze the economics of EV market and EV data using Analytical tools.

UNIT-I INTRODUCTION

Overview of Electric Vehicles in India, India's EV program, Charging and Swapping Infrastructure, brief introduction of batteries, Lithium for batteries, EV Subsystems

UNIT-II VEHICLE DYNAMICS

Forces acting when a vehicle move, Aerodynamic drag, Rolling Resistance and Uphill Resistance, Power and Torque to accelerate.

Drive Cycle: Concept of Drive Cycle, Drive Cyclesand Energy used per km.

UNIT-III	EV POWERTRAIN	

Design of EV Drive Train, Introduction to Battery Parameters, Why Lithium Ion Battery? Batteries in Future, Li-Ion Battery Cells, SoH and SoC estimation and Self Discharge, Battery Pack Development, Computation of Effective cost of battery, Charging Batteries.

Fundamentals of EV Battery Pack design: Mechanical, Thermal and Electrical Design, BMS Designof Electric Vehicle.

UNIT-IV	EV MOTORS AND CONTROLLERS:	

Fundamentals and Design, Understanding Flow of Electricity, Magnetism and Heat, Power and Efficiency, Torque Production, Speed and Back EMF, the d-q Equivalent circuit, Field-oriented Control, Understanding Three phase AC and DC to AC conversion systems, Understanding the thermal design of the motors, Engineering Considerations, Future Frontiers

UNIT-V	EV CHARGING:	

Introduction, Slow or Fast EV Chargers, Battery Swapping, Standardization and On board Chargers, Public Chargers, Bulk Chargers/Swap Stations, Economics of Public Chargers in context, Analytics and Tools for EV systems.

TEXTBOOKS

1. Electric Powertrain - Energy Systems, Power electronics and drives for Hybrid, electric and fuel cell vehicles by John G. Hayes and A. Goodarzi, Wiley Publication
2. Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004
3. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003

REFERENCE BOOKS

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003
2. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives, John Wiley & Sons Ltd., 2011.

WEB REFERENCES

1. Fundamentals of Electric Vehicles: technology and economics
   https://onlinecourses.nptel.ac.in/noc20_ee99/preview
   https://archive.nptel.ac.in/courses/108/106/108106170/
2. Link to EV101 course — https://www.pupilfirst.school/courses/641/curriculum Link to EV201 course: https://www.pupilfirst.school/courses/643/curriculum

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UTILIZATION OF ELECTRIC ENERGY
(Open Elective -II)

IV B. TECH- I SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE721OE	B. Tech	3	0	0	3	40	60	100

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.

UNIT-I ELECTRICAL HEATING

Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating.

UNIT-II ELECTRIC WELDING

Electric welding equipment, resistance welding and arc welding, comparison between AC and DC welding. Electrolysis process: principle of electrolysis, electroplating, metal extraction and metal processing, electromagnetic stirs.

UNIT-III ILLUMINATION

Terminology, Laws of illumination, coefficient of Utilization and depreciation, Polar curves, Photometry, integrating sphere, sources of light, fluorescent lamps, compact fluorescent lamps, LED lamps discharge lamps, mercury vapor lamps, sodium vapor lamps and neon lamps, comparison between tungsten filament lamps and fluorescent tubes. Basic principles of light control, Types and design of lighting scheme, lighting calculations, factory lighting, street lighting and flood lighting

UNIT-IV ELECTRIC TRACTION

Systems of electric traction and track electrification- DC system, single phase and 3-phase low frequency and high frequency system, composite system, kando system, comparison between AC and DC systems, problems of single-phase traction with current unbalance and voltage unbalance. Mechanics of traction movement, speed – time curves for different services, trapezoidal and quadrilateral speed – time curves, tractive effort, power, specific energy consumption, effect of varying acceleration and braking, retardation, adhesive weight and braking retardation, coefficient of adhesion.

UNIT-V SYSTEMS OF TRAIN LIGHTING

special requirements of train lighting, methods of obtaining unidirectional polarity constant output-single battery system, Double battery parallel block system, coach wiring, lighting by making use of 25KV AC supply.

TEXTBOOKS

1. H. Partab: Modern Electric Traction, Dhanpat Rai & Co, 2007.
2. E. Openshaw Taylor: Utilisation of Electric Energy, Orient Longman, 2010.

REFERENCE BOOKS

1. H. Partab: Art & Science of Utilization of Electric Energy, Dhanpat Rai & Sons, 1998.
2. N.V. Suryanarayana: Utilization of Electrical power including Electric drives and Electric Traction,
3. New Age Publishers, 1997.

WEB REFERENCES

1. https://www.Electric heating .com/
2. http://www. Electric Traction .com/
3. http://www.Utilization of Electric .com

E -TEXTBOOKS

1.https://easyengineering.net/ J.B. Gupta/Utilization of Electric Power & Electric Traction/
2.https://easyengineering.net/ Tarlok Singh /Utilization Of Electric Energy

MOOCS COURSES

1. https://nptel.ac.in/courses/108108076/11
2. https://nptel.ac.in/courses/108102146/12
3. https://nptel.ac.in/courses/108108076/45

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

ENERGY STORAGE SYSTEMS
(Open Elective-II)

IV B. TECH- I SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE722OE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES to prepare the students to

- To introduce generalized storage techniques and analyze the different features of storage systems
- To know the management and applications of energy storage technologies
- To know about electrical energy storage market potential by different forecasting methods

UNIT-I **The Roles Of Electrical Energy Storage Technologies In Electricity Use**

Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable, Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT-II **Types And Features Of Energy Storage Systems**

Classification of EES systems, Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Lead-Acid Batteries, Lithium-Ion Batteries, Flow batteries, Other Batteries in Development, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG), Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES),Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT-III **Applications Of EES**

Present status of applications, Utility use (conventional power generation, grid operation & service), Consumer use (uninterruptable power supply for large consumers), EES installed capacity worldwide, new trends in applications, Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles,

UNIT-IV **Management And Control Hierarchy Of EES**

Internal configuration of battery storage systems, External connection of EES systems, Aggregating EES systems and distributed generation (Virtual Power Plant), “Battery SCADA” – aggregation of many dispersed batteries.

Demand For Energy Storage: Growth in Variable Energy Resources, Relationship between balancing services and variable energy resources, Energy Storage Alternatives, Variable Generator Control, Demand Management, Market Mechanisms, and Longer-Term Outlook.

Valuation Techniques: Overview, Energy Storage Operational Optimization, Market Price Method, Power System Dispatch Model Method, Ancillary Service Representation, Energy Storage Representation, Survey of Valuation Results.

UNIT-V	Forecast Of EES Market Potential By 2030	

EES market potential for overall applications, EES market estimation by Sandia National Laboratory (SNL), EES market estimation by the Boston Consulting Group (BCG), EES market estimation for Li-ion batteries by the Panasonic Group, EES market potential estimation for broad introduction of renewable energies, EES market potential estimation for Germany by Fraunhofer, Storage of large amounts of energy in gas grids, EES market potential estimation for Europe by Siemens, EES market potential estimation by the IEA, Vehicle to grid concept, EES market potential in the future.

TEXTBOOKS

1. Power System Energy Storage Technologies, 1st Edition by Paul Breeze, Academic Press
2. Energy Storage: Systems and Components, by Alfred Rufer, CRC Press, 2017

REFERENCE BOOKS

1. Energy Storage Fundamentals, Materials and Applications, by Huggins and Robert, Springer.
2. www.ecofys.com/com/publications

WEB REFERENCES

1. https://www.electrical4u.com/
2. https://lecturenotes.in/subject/219/energy-storage-systems-es

E -TEXTBOOKS

1. https://indiasmartgrid.org/Electric-Energy-Storage-(EES).php
2. https://www.energy.gov/sites/prod/files/oeprod/DocumentsandMedia/AdvancedMaterials_1 2-30-10_FINAL_lowres. pd

MOOCS COURSES

1. https://youtu.be/j7RaL_XKywk
2. https://youtu.be/dFnu5nSJcr

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CHARGING INFRASTRUCTURE FOR ELECTRIC VEHICLES
(Open Elective - III)

IV B. TECH-II SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE831OE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

- Gain understanding of the various components involved in an electric vehicle charging system.
- Comprehend the different types of electric vehicle chargers, along with the applicable standards governing their design and operation.
- Interpret the diverse communication protocols utilized in electric vehicle Gain understanding of the various components involved in an electric vehicle charging systems and stay familiar with the latest trends in this evolving field

UNIT-I	INTRODUCTION TO EV CHARGING	

Electric Vehicle Charging; Charging Modes; Electric Vehicle Supply Equipment (EVSE): Types, Components of EV Battery Chargers; Challenges in Electric Vehicle Charging

UNIT-II	CHARGER SIZING AND STANDARDS	

Charger Classification; Slow Charging and Fast Charging; DC Charging and AC Charging; Selection and Sizing of Chargers: Charger Connectors and Cables; Charging Standards: Connectors, Supply
Equipment; EMI/EMC; Testing Methods for Chargers and EVSE

UNIT-III	EV CHARGER COMMUNICATIONS PROTOCOLS	

Open Charge Point Protocol (OCPP); Open System Interconnection Layer Model (OSI); Adapted PWM Signal based Low-level Communication; PLC based High-level Communication; CAN Communication; Billing and Authentication

UNIT-IV	PUBLIC CHARGING INFRASTRUCTURE	

Location, Planning and Implementation of Public Charging Stations; Components; Selection and Sizing- HT/LT Equipment & Cables; Protection; Safety Standards: Policy and Regulatory Aspects; EVCharging Station and their Business Models; Economic Aspects; Major Challenges

UNIT-V	FUTURE FRONTIERS IN EV CHARGING	

Bulk Charging; Battery Swapping; Wireless Charging; EVs as Distributed Storage Resources: Grid to Vehicle (G2V) and Vehicle to Grid (V2G), V2X Concept, Integration of Charging Station with Renewable Sources and its Impact on the Grid

TEXTBOOKS

1. Iqbal Husain, "Electric and Hybrid Vehicles: Design Fundamentals", 3rd Edition, CRC Press, 2021
2. Code of Practice for Electric Vehicle Charging Equipment Installation, 4th Edition, IET 2020.

REFERENCE BOOKS

1. Sheldon S. Williamson, "Energy Management Strategies for Electric and Plug-in Hybrid
2. Electric Vehicles", 1st Edition, Springer, 2013.
3. Tom Denton, "Automotive Electrical and Electronic Systems", 5th Edition, Routledge, 2018.
4. Wolfhard Lawrenz, "CAN System Engineering: From Theory to Practical Applications", Springer, 2nd Edition, 2013.

WEB REFERENCES

1. https://www.udemy.com/course/charging-infrastructure-for-electric-vehicles/
2. https://www.pwc.com/us/en/industries/industrial-products/library/electric-vehicles-charging-infrastructure.html
3. https://www.sciencedirect.com/science/article/pii/S2352484722017346
4. https://eeslindia.org/en/electric-vehicles/

E -TEXTBOOKS

1. https://www.niti.gov.in/sites/default/files/2021-08/HandbookforEVChargingInfrastructureImplementation081221.pdf
2. https://www.igi-global.com/book/developing-charging-infrastructure-technologies-electric/258317
3. https://link.springer.com/book/10.1007/978-3-031-05909-4
4. https://onlinelibrary.wiley.com/doi/book/10.1002/9781119771739

MOOCS COURSES

1. https://www.bcit.ca/free-online-learning/industry-courses/mooc-0391-electric-vehicle-charging-infrastructure/
2. https://www.mooc-list.com/tags/electric-vehicles

3. https://online-learning.tudelft.nl/courses/electric-cars-introduction/
4. https://www.my-mooc.com/en/mooc/electric-vehicles-and-mobility/

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

RELIABILITY ENGINEERING
(Open Elective - III)

IV B. TECH- II SEMESTER (R22)

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIE	SEE	Total
EE832OE	B. Tech	3	0	0	3	40	60	100

COURSE OBJECTIVES

- To introduce the basic concepts of reliability, various models of reliability
- To analyze reliability of various systems
- To introduce techniques of frequency and duration for reliability evaluation of repairable systems

UNIT-I	**BASIC PROBABILITY THEORY&BINOMIAL DISTRIBUTION**	

Basic Probability Theory: Elements of probability, probability distributions, Random variables, Density and Distribution functions- Mathematical expected – variance and standard deviation – BINOMIAL DISTRIBUTION: Concepts, properties, engineering applications.

UNIT-II	**NETWORK MODELING AND EVALUATION OF SIMPLE AND COMPLEX SYSTEMS**	

Network Modeling And Evaluation Of Simple Systems: Basic concepts- Evaluation of network Reliability / Unreliability - Series systems, Parallel systems - Series-Parallel systems- Partially redundant systems- Examples.

Network Modeling And Evaluation Of Complex Systems: Conditional probability method- tie set,Cut-set approach- Event tree and reduced event tree methods- Relationships between tie and cut-sets-Examples.

UNIT-III	**PROBABILITY DISTRIBUTIONS IN RELIABILITY EVALUATION& NETWORK RELIABILITY EVALUATION USING PROBABILITY DISTRIBUTIONS**	

Probability Distributions in Reliability Evaluation: Distribution concepts, Terminology of distributions, General reliability functions, Evaluation of the reliability functions, shape of reliability functions –Poisson distribution – normal distribution, exponential distribution, Weibull distribution.

Network Reliability Evaluation Using Probability Distributions: Reliability Evaluation of Series systems, Parallel systems – Partially redundant systems- determination of reliability measure-MTTFfor series and parallel systems – Examples.

UNIT-IV	DISCRETE MARKOV CHAINS& CONTINUOUS MARKOV PROCESSES	

Discrete Markov Chains: Basic concepts- Stochastic transitional probability matrix- time dependent probability evaluation- Limiting State Probability evaluation- Absorbing states – Application.

Continuous Markov Processes: Modelling concepts- State space diagrams- Unreliability evaluation of single and two component repairable systems

UNIT-V	FREQUENCY AND DURATION TECHNIQUES & APPROXIMATE SYSTEM RELIABILITY EVALUATION	

Frequency And Duration Techniques: Frequency and duration concepts, application to multi state
problems, Frequency balance approach.

Approximate System Reliability Evaluation: Series systems – Parallel systems- Network reduction
techniques- Cut set approach- Common mode failures modeling and evaluation techniques- Examples.

TEXT BOOKS

1. Roy Billinton and Ronald N Allan, Reliability Evaluation of Engineering Systems, Plenum Press.
2. E. Balagurusamy, Reliability Engineering by Tata McGraw-Hill Publishing Company Limited

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 Elsayed A. Elsayed, Prentice Hall Publications.

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1. https://corporatefinanceinstitute.com/resources/knowledge/other/binomial-distribution/
2. https://stephens999.github.io/fiveMinuteStats/markov_chains_discrete_intro.html
3. https://www.sciencedirect.com/topics/mathematics/continuous-time-markov-chain
4. https://link.springer.com/chapter/10.1007%2F978-1-4615-7728-7_11

E -TEXTBOOKS

1. https://link.springer.com/chapter/10.1007%2F978-1-4615-7728-7_11
2. https://qpr.buaa.edu.cn/__local/2/AA/B8/BB116BBD20312235B2E7F93FAD2_483F18EF_5132FE.pdf?e=.pdf
3. https://mast.queensu.ca/~stat455/lecturenotes/set5.pdf

MOOCS COURSES

1. https://nptel.ac.in/courses/111/104/111104032/#
2. https://nptel.ac.in/courses/105/108/105108
3. https://nptel.ac.in/courses/115/106/115106089/