EEE -COURSE STRUCTURE
(R-26)

MALLA REDDY ENGINEERING COLLEGE FOR WOMEN
(Autonomous Institution-UGC, Govt. of India)
Accredited by NAAC with 'A+' Grade | Programmes Accredited by NBA
NIRF Institutional Ranking 2025 – Rank band (201-300), MHRD, Govt. of India
Approved by AICTE, Affiliated to JNTUH, ISO 9001:2015 Certified Institution
Maisammaguda, Dhulapally, Secunderabad 500100.

B.Tech. Electrical and Electronics Engineering

(Course Structure & Syllabus(R-26 Regulations)
Applicable from AY 2026-2027

I YEAR I -SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	2600BS01	Matrices and Calculus	3	1	0	4
2	2600BS04	Advanced Engineering Physics	3	0	0	3
3	2605ES01	Programming for Problem Solving	3	1	0	4
4	2602ES03	Electrical Circuits - I	2	0	0	2
5	2603ES01	Computer Aided Engineering Graphics	2	0	2	3
6	2604PC03	Analog Electronics	2	0	0	2
7	2600BS62	Advanced Engineering Physics Lab	0	0	2	1
8	2605ES61	Programming for Problem Solving Lab	0	0	2	1
9	2603ES61	Engineering Workshop	0	0	2	1
		Induction Program				
		Total Credits	**16**	**1**	**08**	**21**

I YEAR II SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1	2600BS03	Ordinary Differential Equations and Vector Calculus	3	1	0	4
2	2600BS02	Engineering Chemistry	3	0	0	3
3	2605ES02	Python Programming	3	0	0	3
4	2605ES03	Data Structures	3	0	0	3
5	2600HS01	English for Skill Enhancement	3	0	0	3
6	2600BS61	Engineering Chemistry Lab	0	0	2	1
7	2605ES62	Python Programming Lab	0	0	2	1
8	2605ES63	Data Structures Lab	0	0	2	1
9	2600HS61	English Language and Communication Skills Lab	0	0	2	1
		Total Credits	**15**	**1**	**8**	**20**

II –YEAR I -SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.	2600BS06	Numerical Methods and Complex Variables	3	0	0	3
2.	2602PC01	Electrical Machines - I	3	0	0	3
3.	2602ES04	Electrical Circuits - II	3	0	0	3
4.	2602PC02	Power Systems - I	3	0	0	3
5.	2602PC03	Electrical Measurements and Sensors	3	0	0	3
6.	2600HS04	Innovation and Entrepreneurship	2	0	0	2
7.	2602PC61	Electrical Machines - I Lab	0	0	2	1
8.	2600BS64	Computational Mathematics Lab using python	0	0	2	1
9.	2602ES63	Electrical& Electronics Circuits lab	0	0	2	1
10.	2602SD01	Design of Electrical Systems using Auto CAD	0	0	2	1
11	2600ES01	Environmental Science	1	0	0	0
		Total Credits	**18**	**0**	**8**	**21**

II YEAR II -SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.	2602PC04	Electromagnetic fields	3	0	0	3
2.	2602PC05	Electrical Machines - II	3	1	0	4
3.	2602PC06	Power Systems - II	3	0	0	3
4.	2602PC07	Digital Electronics	2	0	0	2
5.	2602PC08	Control Systems	3	0	0	3
6.	2602PC63	Electrical Measurements and Sensors Lab	0	0	2	1
7.	2602IP01	Innovative Product Development	0	0	2	1
8.	2602PC64	Electrical Machines - II Lab	0	0	2	1
9.	2602PC65	Control Systems Lab	0	0	2	1
10	2602SD02	PCB Design lab	0	0	2	1
		Total Credits	**14**	**0**	**12**	**20**

III YEAR-I SEMESTER

S.No.	Course Code	Course Title	L	T	P	Credits
1.	2602PC09	Power Electronics	3	1	0	4
2.	2602PC10	Microprocessors and Microcontrollers	3	0	0	3
3.	2602PC11	Power System Protection	3	0	0	3
4.		Professional Elective-I	3	0	0	3
5.		Open Elective-I	2	0	0	2
6.	2602PC66	Power Electronics Laboratory	0	0	2	1
7.	2602PC67	Digital Electronics Lab	0	0	2	1
8.	2602PC68	Power System Lab	0	0	2	1
9.	2602PR01	Field-Based Research Project	0	0	4	2
10.	2602SD03	Robotics	0	0	2	1
11.	2600MC01	Indian Knowledge System	1	0	0	0
		Total Credits	**15**	**1**	**12**	**21**

III YEAR II-SEMESTER

S.No	Course Code	Course Title	L	T	P	Credits
1	2602PC12	Power System Operation and Control	3	1	0	4
2	2604PC04	Signals and Systems	3	0	0	3
3	2600HS03	Business Economics and Financial Analysis	2	1	0	3
4		Professional Elective-II	3	0	0	3
5		Open Elective – II	2	0	0	2
6	2604PC76	Signals and Systems Lab	0	0	2	1
7	2602PC69	Power System Simulation Lab	0	0	2	1
8	2602PC70	Microprocessors and Microcontrollers Lab	0	0	2	1
9	2600HS63	English for employability Skills lab	0	0	2	1
10	2602SD04	Design of Solar Power System	0	0	2	1
11	2600MC02	Gender Sensitization */ Human Values and Professional Ethics*	1	0	0	0
		Total Credits	**14**	**2**	**10**	**20**

***Note: For the courses Gender Sensitization and Human Values and Professional Ethics –**
One hour of instruction will be conducted on alternate weeks. For example, if a one-hour class for Gender Sensitization is conducted this week, then a one-hour class for Human Values and Professional Ethics will be conducted in the following week.

IV YEAR I-SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1	2602PC13	Power Electronics for Renewable Energy Systems	3	0	0	3
2	2602PC14	Hybrid Electric Vehicles	3	0	0	3
3	2600HS02	Fundamentals of Management	3	0	0	3
4		Professional Elective-III	3	0	0	3
5		Professional Elective – IV	3	0	0	3
6		Open Elective – III	2	0	0	2
7	2602PC71	Electrical and Electronics Design Lab	0	0	2	1
8	2602PC72	Power Electronics for Renewable Energy Systems Lab	0	0	2	1
9	2602PR02	Industry Oriented Mini Project/ Internship	0	0	4	2
10	2600MC03	Research Methodology & IPR	**1**	**0**	**0**	**0**
		Total Credits	**18**	**0**	**8**	**21**

IV-YEARII-SEMESTER

S. No.	Course Code	Course Title	L	T	P	Credits
1.		Professional Elective – V	3	0	0	3
2.		Professional Elective – VI	3	0	0	3
3.	2602PR03	Project Work	0	0	36	12
4.	2600IP02	Innovative Startup	0	0	4	2
		Total Credits	**6**	**0**	**40**	**20**

PROFESSIONAL ELECTIVES:

Professional Elective-I

2602PE01	Utilization of Electrical Energy
2602PE02	Electrical Estimation& Costing
2602PE03	VLSI Design
2602PE04	IoT Applications in Electrical Engineering
2602PE05	Special Electrical Machines
2602PE06	Energy Auditing and Demand side management

Professional Elective-II

2602PE07	Power Semiconductor Drives
2602PE08	Digital Control Systems
2602PE09	Programmable Logic Controllers
2602PE10	Advanced Semiconductor Devices
2602PE11	Computer aided Electrical Machine Design
2602PE12	AI & ML applications to Power electronics

Professional Elective-III

2602PE13	Energy Storage Systems
2602PE14	Power Quality
2602PE15	Digital Signal Processing
2602PE16	High Voltage Engineering
2602PE17	Neural Networks & Fuzzy Logic
2602PE18	Modern Control Theory

Professional Elective-IV

2602PE19	Battery Management Systems
2602PE20	Smart Grid Technologies
2602PE21	AI and ML for Electrical Engineering Applications
2602PE22	Renewable Energy Systems
2602PE23	Line Commutated Active Rectifiers
2602PE24	Power Systems Deregulation

Professional Elective-V

2602PE25	EV Charging Infrastructure
2602PE26	HVDC Transmission
2602PE27	Embedded Systems
2602PE28	Industrial IOT
2602PE29	Smart Grid Technologies
2602PE30	Sustainable and Green Technologies

Professional Elective-VI

2602PE31	Electrical Distribution and Automation
2602PE32	Smart Metering and Communication Protocols
2602PE33	Energy Conservation and Audit
2602PE34	Power Quality &FACTS Devices
2602PE35	Artificial Intelligence& Machine learning
2602PE36	EHV AC Transmission Systems

OPENELECTIVES

Department	Open Elective-I	Open Elective-II	Open Elective-III
EEE	1)Fundamentals of Electric Vehicles (26020E01)	1) Digital Energy(26020E05)	1) Sustainable Energy (26020E09)
	2)Industrial Automation and Control (26020E02)	2) Energy Audit (26020E06)	2) Smart Grid Systems (26020E10)
	3)Elements of Electrical Engineering (26020E03)	3) Energy Management and Conservation (26020E07)	3) Principles of Analog Electronics (26020E11)
	4) Battery Management Systems (26020E04)	4) Industrial IOT(26020E08)	4) operation research(26020E12)

MALLA REDDY ENGINEERING COLLEGE FOR WOMEN

An Autonomous Institute, Affiliated to JNTUH

B.Tech. in ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABUS

(R26 Regulations)

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

2600BS01: MATRICES AND CALCULUS

UNIT-I: Matrices

Rank of a matrix by Echelon form and Normal form - Inverse of Non-singular matrices by Gauss-Jordan method. System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations. Gauss Seidel Iteration Method.

UNIT-II: Eigen values and Eigen vectors

Linear Transformation and Orthogonal Transformation: Eigen values - Eigen vectors and their properties (without proofs) - 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 tocanonical form by Orthogonal Transformation.

UNIT-III: Single Variable Calculus

Limit and Continuous of functions and its properties. 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 (All the theorems without proof).

UNIT-IV: Multivariable Calculus (Partial Differentiation and Applications)

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.

UNIT-V: Multivariable Calculus (Integration)

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

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition, 2017.
2. R. K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons,9thEdition,2013.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,38th Reprint, 2022.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 9thEdition, Reprint, 2002.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2008.
5. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, S Chand andCompany Limited, New Delhi.

B.Tech. I Year I Sem.

L/T/P/C
3/0/0/3

2600BS04: ADVANCED ENGINEERING PHYSICS

UNIT - I: Crystallography & Materials Characterization

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravaislattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance; defects in crystals (Qualitative): point defects, line defects, surface defects and volume defects. Concept of nanomaterials: surface to volume ratio, X -ray diffraction: Bragg's law, powder method,calculation of average crystallite size using Debye Scherrer's formula.

UNIT - II: Quantum Mechanics

Introduction, de-Broglie hypothesis, Heisenberg uncertainty principle, physical significance of wave function, postulates of quantum mechanics: operators in quantum mechanics, eigen values and eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Bloch's theorem (qualitative), Kronig-Penney model(qualitative): E-k diagram, formation of energy bands, origin of band gap, classification of solids, concept of discrete energy levels and quantum confinement in nanomaterials.

UNIT - III: Quantum Computing

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits,Qubits, multiple Qubit system, quantum computing system for information processing,evolution of quantum systems, quantum measurements, entanglement, quantum gates,challenges and advantages of quantum computing over classical computation, quantum algorithms: Deutsch-Jozsa, Shor, Grover (qualitative).

UNIT - IV: Magnetic and Dielectric Materials

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, synthesis of ferromagnetic materials using sol-gel method, applications: magnetic hyperthermia for cancer treatment, magnets for EV, Giant Magneto Resistance (GMR)device.

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic &orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications:Ferroelectric Random-Access Memory (Fe-RAM), load cell and fire sensor.

UNIT - V: Laser and Fibre Optics

Introduction to laser, characteristics of laser, Einstein coefficients and their relations,metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO2laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.
Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, applications: optical fibre for communication system, sensor for structural health monitoring.

TEXT BOOKS:

1. Walter Borchardt-Ott, Crystallography: An Introduction, Springer.
2. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons, Inc.
3. Thomas G. Wong, Introduction to Classical and Quantum Computing, Rooted Grove
4. A Textbook of Advanced Engineering Physics, Dr. T.V.S Arun Murthy, Dr. M. N. Avadhanulu, S. Chand,First edition, 2026.
5. Engineering Physics by P.K. Palanisamy, SciTech Publications.

REFERENCE BOOKS:

1. Jozef Gruska, Quantum Computing, McGraw Hill
2. Michael A. Nielsen & Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press.
3. John M. Senior, Optical Fiber Communications Principles and Practice, Pearson Education Limited.

USEFUL LINKS

• https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fiber-communications-principles-and-pr.pdf
• https://www.geokniga.org/bookfiles/geokniga-crystallography_0.pdf
•https://dpbck.ac.in/wp-content/uploads/2022/10/Introduction-to-Solid-State-PhysicsCharles-Kittel.pdf
• https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf
•https://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf

B.Tech. I Year I Sem.

2605ES01: PROGRAMMING FOR PROBLEM SOLVING **L/T/P/C 3/1/0/4**

UNIT - I:
Overview of C:C Language Elements, Variable Declarations and Data Types, Executable Statements, General Form of a C Program, Arithmetic Expressions. Selection Structures: Control Structures, Conditions, if Statement, if Statements with Compound Statements, Decision Steps in Algorithms. Repetition and Loop Statements: Repetition in Programs, Counting Loops and the while Statement, computing a Sum or Product in a Loop, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement.

UNIT - II:
Top-Down Design with Functions: Building Programs from Existing Information, Library Functions, Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.
Pointers and Modular Programming: Pointers and the Indirection Operator, Functions withOutput Parameters, Formal Output Parameters as Actual Arguments.

UNIT - III:
Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Searching and Sorting an Array, Enumerated Types, Multidimensional Arrays. Strings: String Basics, String Library Functions: Assignment and Substrings, String Comparison.

UNIT - IV:
Recursion: The Nature of Recursion, Tracing a Recursive Function,Structure and Union Types: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Union Types.

UNIT - V:
Text and Binary File Pointers: Input/ Output Files - Review and Further Study,Binary Files. Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms).

TEXT BOOKS:
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, (3rd Edition).

REFERENCE BOOKS:
1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI India.
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill.
3. YashavantKanetkar, Let Us C, 18th Edition, BPB.
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression).
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition.
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.

B.Tech. I Year I Sem.

2602ES03: ELECTRICAL CIRCUIT –I **L/T/P/C 2/0/0/2**

UNIT-I:

Network Elements & Laws: Active elements- Independent and dependent sources, Passive elements- R, Land C, Energy stored in Inductance and Capacitance, Kirchhoff's laws, Source transformation, Star-Delta transformation, Node voltage method, and Mesh current method.

UNIT-II:

Single-Phase Circuits: RMS and average values of periodic sinusoidal phasor representation, j-Notation, Steady-state analysis of series, parallel circuits. Impedance, Admittance, Active and Reactive Powers, Complex Power. Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT-III:

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

UNIT-IV:

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millman's theorem and Reciprocity theorem

UNIT-V:

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

TEXTBOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, Revised-3rd Edition, 2019.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 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", McGraw Hill, 5thEdition, 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", McGraw Hill,6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", DhanpatRai& Co., First Edition, 1999.

Online Recourses:

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/106/108106172/

B.Tech. I Year I Sem.

2603ES01: COMPUTER AIDED ENGINEERING GRAPHICS

L/T/P/C
2/2/0/3

UNIT-I

Introduction to AutoCAD Software: Menu Bar, Ribbon – Draw and Modify Toolbar, Dimension, Status Bar, Command Bar, etc., basic geometrical constructions using Auto CAD commands.

Introduction to Engineering Drawing: Principles of Engineering drawing and their significance, Conventions.

Conic Sections: Construction of Ellipse, Parabola, Hyperbola – General method only. Scales, Plainand Diagonal.

Cycloidal Curves: Cycloid, Epicycloids and Hypocycloid.

UNIT-II

Principles of Orthographic Projections: Conventions; Projections of Points; Projections oflines - Parallel to one Plane and Perpendicular to other Plane, Inclined to one Plane andParallel to other Plane, inclined to both the planes.

UNIT-III

Projections of Planes: Surface Parallel to one Plane and Perpendicular to other Plane, Surface Inclined to one Plane and Perpendicular to other Plane, Surface Inclined to both the Planes.

UNIT-IV

Projection of Regular Solids: Prisms, Pyramids, Cylinder and Cone – Axis parallel to one plane and perpendicular to other plane, Axis Inclined to one plane and parallel to other plane. Development of Surfaces: Prism, Cylinder, Pyramid and Cone.

UNIT-V

Principles of Isometric projection: Isometric Scale,Isometric Views,Conventions;Isometric Views of lines, Planes, Simple Solids only. Conversion of Isometric Views to Orthographic View and Vice-versa, Conventions. Introduction to Solid Modeling: Creation of simple solid models relevant to the domain.

TEXT BOOKS

1. Engineering Drawing, N.D. Bhatt – N.D. Bhatt & V.M Panchal, 48th Edition, 2005 Charotar Publishing House, Gujarat.
2. Engineering Drawing / Basant Agarwal and MC Agarwal / McGraw Hill

REFERENCES

1. Engineering drawing – P.J. Shah .S.Chand Publishers.
2. Engineering Drawing- Johle/Tata Macgraw Hill Book Publisher.
3. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. InternationalPublishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.
4. "Computer Aided Engineering Drawing"by Dr. M H Annaiah, Dr C N Chandrappa and DrB SudheerPremkumar Fifth edition, New Age International Publishers.
5. Engineering Drawing by K.VenuGopal&V.Prabu Raja New Age Publications.

B.Tech. I Year I Sem

2604PC03: ANALOG ELECTRONICS

L/T/P/C
2/0/0/2

UNIT - I
Diode: PN junction as a Diode, V-I characteristics, Diode resistance, Transition and Diffusion capacitance, Diode equivalent circuit, Specifications. Diode Applications: Rectifiers - Half-wave, Full-wave (center-tap and bridge), and Capacitor filterfor rectifiers.

UNIT - II:
Bipolar Junction Transistor (BJT): Structure and working principle of BJT, Current components and transistor action, Configurations: Common Base (CB), Common Emitter (CE), Common Collector (CC), Input and output characteristics

UNIT - III
MOSFET Circuits: MOSFET structure and I-V characteristics. MOSFET as a switch. smallsignal equivalent circuits - gain, input and output impedances.

UNIT - IV
Feedback Amplifiers: Concepts of feedback – Classification of feedback amplifiers –General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations.
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: 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,2ndedition2010
2. Op-Amps&LinearICs– RamakanthA.Gayakwad,PHI,2003.

REFERENCEBOOKS:

1. ElectronicDevicesConventionalandcurrentversion -ThomasL.Floyd2015,Pearson.
2. J.Millman andA.Grabel,“Microelectronics”,McGrawHillEducation,1988.
3. P. HorowitzandW. Hill,“TheArt ofElectronics”,CambridgeUniversityPress,1989.
4. P.R.Gray, R.G.MeyerandS.Lewis,“AnalysisandDesignofAnalogIntegrated Circuits”,John Wiley & Sons,2001.

B.Tech. I Year I Sem

2600BS62: ADVANCED ENGINEERING PHYSICS LABORATORY

List of Experiments:

L/T/P/C
0/0/2/1

1. Synthesis of magnetite (Fe_3O_4) powder using sol-gel method.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concentration of a given semiconductor.
4. To determine the magnetic induction at the centre and at several points on the axis of a circular coil
5. Study of B-H curve of a ferro magnetic material.
6. Study of P-E loop of a given ferroelectric crystal.
7. Determination of dielectric constant of a given material.
8. Determination of Curie's temperature of a given ferroelectric material.
9. Study of V-I & L-I characteristics of a given laser diode.
10. a. Determination of numerical aperture of a given optical fibre.

b. Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.

B.Tech. I Year I Sem

2605ES61: PROGRAMMING FOR PROBLEM SOLVING LAB

PRACTICE SESSIONS:

L/T/P/C

Expression Evaluation: **0/0/2/1**

a) 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).

b) Write a program that finds if a given number is a prime number.

c) Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.

d) 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.

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 prints a multiplication table for a given number and the number ofrows in the table. For example, for a number 5 and rows = 3, the output should be:

5 x 1 = 5
5 x 2 = 10
5 x 3 = 15

d) Write a program that shows the binary equivalent of a given positive number between 0 to 255.

Arrays, Pointers and Functions:

a) Write a C program to find the minimum, maximum and average in an array of integers.

b) Write a C program that uses functions to perform the following:

I. Addition of Two Matrices

II. Multiplication of Two Matrices

c) Write a program for reading elements using a pointer into an array and display the values using the array.

d) Write a program for display values reverse order from an array using a pointer.

Files:

a) Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.

b) 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 that uses functions to perform the following operations:

I.To insert a sub-string into a given main string from a given position.

II. To delete n Characters from a given position in a given string

b) 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.)

c) Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

d) Write a C program to count the lines, words and characters in a given text.

Sorting and Searching:

a) Write a C program that uses non-recursive function to search for a Key value in a given listof integers using linear search method.

b) Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.

c) Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

d) Write a C program that sorts the given array of integers using selection sort in descending order

e) Write a C program that sorts the given array of integers using insertion sort in ascending order
f) Write a C program that sorts a given array of names.

TEXT BOOKS:

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

B.Tech. I Year I Sem

2603ES61: ENGINEERING WORKSHOP

L/T/P/C
0/0/2/1

TRADES FOR EXERCISES:

I. Carpentry

1. T- Lap Joint
2. Dovetail Lap Joint

II. Fitting

1. Semi-circular Fitting
2. V- Fitting

III. Tin Smithy

1. Rectangular Tray
2. Square Tin

IV. House Wiring

1. Two bulbs controlled by two independent switches (Series and parallelconnection)
2. One bulb controlled by two-two way switches (Stair case connection).

V. Foundry

1. Single piece pattern
2. Split piece pattern

VI. Black Smithy

1. Round to Square
2. S - Hook

Trades for Demonstration:

1. Plumbing
2. Welding
3. Machine Shop
4. Power tools

TEXT BOOKS:

1. Workshop Manual, P. Kannaiah and K. L. Narayana, 3rd Edition, Scitech,2015
2. Elements of Workshop Technology Vol.1 & 2, S. K. Hajra Choudhury, A. K. Hajra Choudhury and Nirjhar Roy, 13th Edition, Media Promoters & Publishers Pvt. Ltd., 2010.

REFERENCE BOOKS:

1. Workshop Manual / Venkat Reddy/ BSP
2. Workshop Manual / K VenuGopal / Anuradha

B.Tech. I Year II Sem.

2600BS03: ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

L/T/P/C
3/1/0/4

UNIT-I: First Order ODE

Exact differential equations - Equations reducible to exact differential equations - linear and Bernoulli's equations - Orthogonal Trajectories (only in Cartesian Coordinates). Newton's law of cooling.

UNIT-II: Ordinary Differential Equations of Higher Order

Higher order linear differential equations with constant coefficients: Non-Homogeneous terms of thetype e^{ax}, ,sinax , cosax polynomials in x, $e^{ax}V(x)$ &x V(x) - Method of variation of parameters.

UNIT-III: Laplace Transforms

Laplace Transform of standard functions - First shifting theorem - Laplace transforms of functions multiplied by 't' and divided by 't' - Laplace transforms of derivatives and integrals of function - Evaluation of integrals by Laplace transforms - Inverse Laplace transform, convolution theorem (All theorems without proof). Applications: solving Initial value problems (Linear ODEs with constant coefficients) by Laplace Transform.

UNIT-IV: Vector Differentiation

Vector Differentiation: Vector point functions and scalar point functions – Gradient – Directional derivatives -Divergence and Curl - Solenoidal and Irrotational vectors - Scalar potential functions

UNIT-V: Vector Integration

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

TEXTBOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44thEdition, 2017.
2. R. K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th Edition, 2016.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons,9thEdition,2013.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,38thReprint, 2022.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 9thEdition,Reprint, 2002.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, LaxmiPublications, Reprint, 2008.
5. H. K. Dass and Er. RajnishVerma, Higher Engineering Mathematics, S Chand andCompany Limited, New Delhi.

B.Tech. I Year IISem

2600BS02: ENGINEERING CHEMISTRY **L/T/P/C 3/0/0/3**

UNIT-I: Water and its treatment:

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) - Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and breakpoint chlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges 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 brackish water –Reverse Osmosis.

UNIT-II: Electrochemistry and Corrosion:

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, Types of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode. Construction, working and determination of pH of unknown solution using SHE and Calomel electrode, Glass electrode-Construction, working and determination of pH of unknown solution using glass electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion – Theories of corrosion,chemical and electrochemical theories of corrosion, Types of corrosion: galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosion control methods - Cathodic protection Methods – Sacrificial anode and impressed current methods.

UNIT–III: Energy sources:

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. Construction, working and applications of Zn-air and Lithium ion battery. FuelCells – Differences between a battery and a fuel cell, Construction and applications of Direct Methanol Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Solid fuels-classification, analysis of coal– proximate and ultimate analysis and their significance. Fossil fuels: Introduction,Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bedcatalytic cracking. LPG and CNG composition and uses.Synthetic Fuels: Fischer-Tropsch process, Introduction and applications of Hythane and GreenHydrogen.

UNIT - IV: Polymers:

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerization - Addition (free radical addition mechanism) and condensation polymerization.

Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6).Differences between thermoplastics and thermo setting plastics, Fiber reinforced plastics (FRP).

Conducting polymers: Definition and Classification with examples - Mechanism of conduction intranspoly-acetylene and applications of conducting polymers. Biodegradable polymers: Polylactic acid and its applications.

UNIT-V- Advanced Functional Materials:

Engineering Applications of Chemistry:Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol,

Piezoelectric materials – quartz and their engineering applications.

Biosensor - Definition, Amperometric Glucose monitor sensor.

Interpretative spectroscopic applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrared detection), Raman spectroscopy (application) - Tumour detection in medical applications.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr. P. Aparna and Rath, Cengage learning, 2025.

REFERENCE BOOKS:

1. Engineering Chemistry: by Thirumala Chary Laxminarayana&Shashikala, Pearson Publications (2020)
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen by Editors: Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine, https://www.worldscientific.com/doi/epdf/10.1142/13094
7. E-Content- https://doi.org/10.1142/13094 | October 2023
8. E-books: https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u

B.Tech. I Year IISem

2605ES02: PYTHON PROGRAMMING

L/T/P/C
3/0/0/3

UNIT-1 – Introduction to Python and Basics of Programming

Introduction to Python: Features, Applications, Installation, IDEs, Python Syntax,Indentation, Comments, Variables, Data Types, Type Casting, Operators: Arithmetic,Relational, Logical, Assignment, Membership, Identity, Bitwise, Input/Output functions(input(), print()), Control Structures: if, if-else, if-elif-else, Nested Conditions, Looping:for, while, Nested Loops, break, continue, pass.

UNIT-2 – Data Structures in Python

Strings: Creation, Indexing, Slicing, Methods, String Formatting, Lists: Creation,Indexing, Slicing, List Comprehension, Methods, Tuples: Properties, Indexing, Methods,Sets: Creation, Operations, Methods, Dictionaries: Creation, Access, Methods, Dictionary Comprehension, Iterating over data structures.

UNIT-3 – Functions and Modules

Functions: Defining, Calling, Parameters, Return Values, Types of Arguments: Positional, Keyword, Default, Variable Length, Scope of Variables: Local and Global, Lambda Functions, Map, Filter, Reduce, Recursion in Python, Modules: Importing, Creating User-defined Modules, Standard Modules (math, random, datetime), Packages in Python.

UNIT-4 – File Handling and Exception Handling

File Handling: Opening, Reading, Writing, Appending, File Modes, File Methods, Working with CSV and JSON Files, Exception Handling: try, except, else, finally, Built-in Exceptions, Raising Exceptions.

UNIT-5 – Object-Oriented Programming and Applications

OOP Basics: Classes, Objects, Attributes, Methods, Constructor (init), self-keyword, Inheritance: Single, Multiple, Multilevel, Hierarchical, Method Overriding, Method Overloading (conceptual), Encapsulation and Polymorphism, Application Development: Data Processing Script, Basic Calculator.

TEXT BOOKS:

1. Python Programming: Using Problem Solving Approach by Reema Thareja.
2. Python Crash Course by Eric Matthes, Learning Python by Mark Lutz.

REFERENCE BOOKS:

1. Introduction to Python Programming by Gowrishankar S., Veena A.
2. Python Cookbook by David Beazley and Brian K. Jones.
3. Fluent Python by Luciano Ramalho, Automate the Boring Stuff with Python by Al Sweigart.

B.Tech. I Year IISem

2605ES03: DATA STRUCTURES

L/T/P/C
3/0/0/3

UNIT – I

Introduction to Data Structures: Basic Terminology, Classification of Data Structures, Operation on Data Structures, abstract data types, selecting a Data Structure, Linear list – Introduction, singly linked list, Circular Linked Lists, Doubly Linked List, Stacks- Operations, Stackalgorithm, Stack ADT, Stack applications, Queues- operations, Queue Algorithm, Queue ADT,Queue Applications.

UNIT - II

Trees: Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing aBinary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion,BST ADT, BST Applications, Threaded Binary Trees, AVL Trees.

UNIT – III

Multi way Search Trees: Introduction, B Trees, B Trees ADT, B+ Trees. Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps. Applications Searching: Introduction, Interpolation Search, Jump search.

UNIT - IV

Graphs: Introduction, Directed Graphs, Bi connected Components, Representation of Graphs,Graph Traversal Algorithms, Graph ADT, Applications of Graphs Sorting: Heap sort, merge sort, quick sort.

UNIT – V

Hashing and Collision: Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files,Basic File Operations, File Organization, Indexing.

TEXTBOOKS:

1. Data Structures: A Pseudocode Approach with C, 2 nd Edition, R. F. Gilberg andB.A.Forouzan, Cengage Learning
2. Data Structure using C– ReemaThareja, 3rd Edition, Oxford University Press.

REFERENCE:

1. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein,PHI/Pearson Education.

B.Tech. I Year IISem

2600HS01: ENGLISH FOR SKILL ENHANCEMENT

L/T/P/C
3/0/0/3

UNIT –I

Theme: Perspectives

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articlesand Prepositions – Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

UNIT –II

Theme: Digital Transformation

Lesson on 'Emerging Technologies' from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

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

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence –Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People,Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing -Writing Introduction and Conclusion.

UNIT –III

Theme: Attitude and Gratitude

Poems on 'Leisure' by William Henry Davies and 'Be Thankful' - Unknown Author from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

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

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas - Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

UNIT –IV

Theme: Entrepreneurship

Lesson on 'Why a Start-Up Needs to Find its Customers First' by Pranav Jain from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts - Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

UNIT –V

Theme: Integrity and Professionalism

Lesson on 'Professional Ethics' from the prescribed textbook titled English for the Young in the Digital World published by Orient Black Swan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech - Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

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

Prescribed Textbook:

1. Board of Editors. 2025. English for the Young in the Digital World. Orient Black Swan Pvt. Ltd.

REFERENCE BOOKS:

1. Swan, Michael. (2016). Practical English Usage. Oxford University Press. New Edition.
2. Karal, Rajeevan. 2023. English Grammar Just for You. Oxford University Press. New Delhi
3. 2024. Empowering with Language: Communicative English for Undergraduates. Cengage Learning India Pvt. Ltd. New Delhi
4. Sanjay Kumar & PushpLata. 2022. Communication Skills – A Workbook. Oxford University Press.New Delhi
5. Wood,F.T. (2007). Remedial English Grammar. Macmillan.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. McGraw-Hill Education India Pvt. Ltd.

B.Tech. I Year IISem

2600BS61: ENGINEERING CHEMISTRY LAB

L/T/P/C
0/0/2/1

List of Experiments:

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

II. Conductometry: Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. Potentiometry: Estimation of concentration of Fe+2ion by Potentiometry using K2Cr2O7.

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

V. Colorimetry: Verification of Lambert-Beer's law using KMnO4.

VI. Preparations:

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

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

VIII. Lubricants:

1. Determination of surface tension of a given liquid using stalagmometer.
2. Determination of viscosity of lubricant oil by using Ostwald's viscometer.

IX. Virtual lab experiments:

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

REFERENCE BOOKS:

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

B.Tech. I Year IISem

2605ES62: PYTHON PROGRAMMING LAB

L/T/P/C
0/0/2/1

List of Experiments:

1.
   I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   II. Start the Python interpreter and type help() to start the online help utility.
2. Start a Python interpreter and use it as a Calculator.
3. Write a program to calculate compound interest when principal, rate and number of periods are given.
4. Read the name, address, email and phone number of a person through the keyboard and print the details.
5. Print the below triangle using for loop. 5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
6. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
7. Python program to print all prime numbers in a given interval (use break)
8. Write a program to convert a list and tuple into arrays.
9. Write a program to find common values between two arrays.
10. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function lento check the length of a string.
11. Write a function called is sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
12. Write a function called has duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.
13. Write a function called remove duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
14. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
15. Write a python code to read dictionary values from the user. Construct a function toinvert its content. i.e., keys should be values and values should be keys.
16. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
17. Remove the given word in all the places in a string?
18. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
19. Writes a recursive function that generates all binary strings of n-bit length
20. Write a python program that defines a matrix and prints
21. Write a python program to perform multiplication of two square matrices
22. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
23. Use the structure of exception handling all general-purpose exceptions.
24. Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
25. Add an attribute named color to your Rectangle objects and modify draw rectangle so that it uses the color attribute as the fill color.
26. Write a function called draw point that takes a Canvas and a Point as arguments and draws a

representation of the Point on the Canvas.
27. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw circle that draws circles on the canvas.
28. Write a python code to read a phone number and email-id from the user and validate it for correctness.
29. Write a Python code to merge two given file contents into a third file.
30. Write a Python code to open a given file and construct a function to check forgiven words present in it and display on found.
31. Write a Python code to Read text from a text file, find the word with most number of occurrences
32. Write a function that reads a file file1and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
33. Import NumPy, PlotPy and SciPy and explore their functionalities.
34. Install NumPy package with pip and explore it.
35. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
36. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

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 Web Applications, SheetalTaneja, Naveen Kumar, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wiley publications
6. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech press
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press

B.Tech. I Year IISem

2605ES63: DATA STRUCTURES LAB

L/T/P/C
0/0/2/1

List of Experiments

1. Write a program that uses functions to perform the following operations on singly linked list.:

   i) Creation ii) Insertion iii) Deletion iv) Traversal

2. Write a program that uses functions to perform the following operations on doubly linked list.:

   i) Creation ii) Insertion iii) Deletion iv) Traversal

3. Write a program that uses functions to perform the following operations on circular linked list.:

   i) Creation ii) Insertion iii) Deletion iv) Traversal

4. Write a program that implement stack (its operations) using

   i) Arrays ii) ADT

5. Write a program that implement Queue (its operations) using

   i) Arrays ii) ADT

6. Write a program that implements the following sorting methods to sort a given list of integers in ascending order

   i) Heap sort, ii) Merge Sort, iii) Quick Sort

7. Write a program to implement the tree traversal methods (Recursive and Non-Recursive).

8. Write a program to implement

   i) Binary Search tree ii) B Trees iii) B+ Trees iv) AVL trees

9. Write a program to implement the graph traversal methods.

10. Write a program to implement the following Hash Functions: i) Division Method, ii) Multiplication Method, iii) Mid-square Method, iv) Folding Method

TEXT BOOKS:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and SusanAnderson Freed, Universities Press.
2. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein,PHI/Pearson Education.

REFERENCE BOOK:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.

B.Tech. I Year IISem

2600HS61: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

L/T/P/C
0/0/2/1

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

a. Computer Assisted Language Learning (CALL) Lab which focuses on listening skills
b. Interactive Communication Skills (ICS) Lab which focuses on speaking skills

Listening Skills:

Objectives

1. To enable students develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the speech of people from different linguistic backgrounds.

Speaking Skills:

3. To improve their pronunciation and neutralize accent
4. To enable students express themselves fluently and appropriately
5. To practice speaking in social and professional contexts.

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

Exercise – I

CALL Lab:

Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers-
Active Listening

Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) - Testing Exercises ICS Lab:

❖ **Diagnostic Test – Activity titled 'Express Your View'**

Instruction: Spoken and Written language - Formal and Informal English - Greetings - Introducing Oneself andOthers

Practice: Any Ice-Breaking Activity

Exercise – II

CALL Lab:

Instruction: Listening vs. Hearing - Barriers to Listening

Practice: Listening for General Information - Multiple Choice Questions - Listening Comprehension

Exercises (It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: Features of Good Conversation – Strategies for Effective Communication

Practice: Role Play Activity - Situational Dialogues –Expressions used in Various Situations –Making Requests
and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise -III

CALL Lab:

Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)

Practice: Differences between British and American Pronunciation –Listening Comprehension Exercises

ICS Lab:

Instruction: Describing Objects, Situations, Places, People and Events

Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People
and Events (A wide range of Materials / Handouts are to be made available in the lab.)

Exercise – IV

CALL Lab:

Instruction: Techniques for Effective Listening

Practice: Listening for Specific Details - Listening - Gap Fill Exercises - Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.) ICS Lab:

Instruction: How to Tell a Good Story - Story Star- Sequencing-Creativity

Practice: Activity on Telling and Retelling Stories - Collage

Exercise – V

CALL Lab:

Instruction: Identifying the literal and implied meaning

Practice: Listening for Evaluation - Write the Summary – Listening Comprehension Exercises

(It is essential to identify a suitable passage with exercises for practice.)

ICS Lab:

Instruction: Understanding Non-Verbal Communication

Practice: Silent Speech - Dumb Charades Activity

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

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

System Requirement (Hardware component):

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

i) Computers with Suitable Configuration

ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

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 University Press.

• English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.

• TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

REFERENCE BOOKS:

1. Shobha, KN &Rayen, J. Lourdes. (2019). Communicative English – A workbook. Cambridge University Press

2. Board of Editors. (2016). ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities.Orient BlackSwan Pvt. Ltd.

3. Mishra, Veerendra et al. (2020). English Language Skills: A Practical Approach. CambridgeUniversity Press(2022).

4. English Language Communication Skills – Lab Manual cum Workbook. Cengage LearningIndia Pvt. Ltd.

5. Ur, Penny and Wright, Andrew. 2022. Five Minute Activities – A Resource Book for LanguageTeachers. Cambridge University Press.

B.Tech.II Year I Sem.

2600BS06: NUMERICAL METHODS AND COMPLEX VARIABLES

L/T/P/C
3/0/0/3

UNIT-I: Fourier Series& Fourier Transforms

Fourier series -Dirichlet's Conditions – Half-range Fourier series - Fourier Transforms: Fourier Integral Theorem (Only statements), Fourier Sine and Cosine transforms (Elementaryillustrations).

UNIT-I: Fourier Series& Fourier Transforms

UNIT-II: Numerical Methods-I

Solution of polynomial and transcendental equations: Bisection method - Iteration Method - Newton- Raphson method. Finite differences: forward differences - backward differences - central differences - symbolic relations - Interpolation using Newton's forward and backward difference formulae - Lagrange's method of interpolation.

UNIT-III: Numerical Methods-II

Numerical integration: Trapezoidal rule - Simpson's 1/3rd and 3/8th rules.Ordinary differential equations: Taylor's series - Euler's method - Runge-Kutta method offourth order for first order ODE.

UNIT-IV: Complex Differentiation

Differentiation of Complex functions - Analyticity - Cauchy-Riemann equations (without proof) - Harmonic Functions - Finding harmonic conjugate - Milne-Thomson method.

UNIT-V: Complex Integration

Line integral - Cauchy's theorem - Cauchy's Integral formula - Zeros of analytic functions - Singularities - Taylor's series - Laurent's series. Residues - Cauchy Residue theorem (Alltheorems without Proof).

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.

REFERENCES:

1. Murray R. Spiegel, Ph.D., Seymour Lipschutz, Ph.D., John J. Schiller, Ph.D., DennisSpellman, Ph.D., Complex Variables (Schaum's outline)
2. M. K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical methods for Scientific and EngineeringComputations, New Age International publishers.
3. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley &Sons, 2006.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Edition, Mc-Graw Hill, 2004.

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B.Tech.II Year I Sem

2602PC01: ELECTRICAL MACHINES – I

L/T/P/C
3/0/0/3

UNIT -I:

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings (elementary treatment only) – EMF Equation.Concept of Armature reaction and commutation – Cross magnetizing and de-magnetizing AT/pole. Methods of Excitation – separately excited and self-excited generators – build-up of EMF - critical field resistance and critical speed. Performance Characteristics of shunt, series and compound generators and applications.

UNIT -II:

DC Motors: Principle of operation – Back EMF. - Torque equation – characteristics and application ofshunt, series and compound motors.3-point starter, Speed control of DC shunt and series motors - Armature voltage and field flux control methods.Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.Testing of DC Machines: Methods of Testing – Direct, Indirect, and Regenerative Testing – Brake Test –Swinburne's Test – Hopkinson's Test.

UNIT -III:

Single Phase Transformers: Types - constructional details-minimization of hysteresis and eddy current losses- EMF equation - operation on no-load and on load - phasor diagrams and Applications.

UNIT -IV:

Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency& supply voltage on iron losses.Testing of Transformers: Open Circuit and Short Circuit tests - Sumpner's Test - predetermination of efficiency and regulation-separation of losses test.

UNIT -V:

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.

TEXT BOOKS:

1. P. S. Bimbhra, "Electrical Machinery", Khanna Publishers, Revised Edition, 2021.
2. I.J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

REFERENCE BOOKS:

1. PrithwirajPurkait, IndrayudhBandyopadhya, "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.

Online Recourses:

1. https://nptel.ac.in/courses/108/105/108105155/
2. https://nptel.ac.in/courses/108/105/108105017/
3. https://nptel.ac.in/courses/108/106/108106071/

B.Tech. II Year I Sem.

2602ES04: **ELECTRICAL CIRCUITS – II** **L/T/P/C 3/0/0/3**

UNIT-I:

Transient analysis:Significance of Initial conditions of R, L and C elements, Transient response of series RL, RC and RLC circuits using integro-differential approach for DC and Sinusoidal excitations.Transient response of parallel RL, RC and RLC circuits using integro-differential approach for DC and Sinusoidal excitations.

UNIT-II:

Electrical circuit Analysis using Laplace Transforms: Laplace Transforms of step, ramp, exponential, impulse functions (inputs). Transient response of series RL, RC and RLC circuits using Laplace Transforms approach for DC. Transient response of parallel RL, RC and RLC circuits using Laplace Transforms approach for DC and Sinusoidal excitations

UNIT-III: Network Topology Graph, tree, chord, Tie-set, cut-set, incident matrices, Problems on Tie-set and cut-set matrices.

UNIT-IV:

Two port network parameters: Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks.

UNIT-V:

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

TEXTBOOKS:

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3rd Edition, 2019.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGraw Hill, 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”, McGraw Hill, 5th
Edition, 2017.
4. JaganN.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”, McGraw Hill,6th Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, DhanpatRai & Co., First Edition, 1999.

Online Recourses:

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/106/108106172/
3. https://www.digimat.in/nptel/courses/video/108105159/L01.html
4. https://www.digimat.in/nptel/courses/video/108102042/L01.htm

B.Tech. II Year I Sem.

L/T/P/C
3/0/0/3

2602PC02: POWER SYSTEMS - I

UNIT - I

Generation of Electric Power: Operation of Hydel, Thermal, Nuclear and Gas Power plant with layouts -Description of components-Choice of site - advantages and disadvantages, Introduction and description of components- renewable energy sources and plants (solar and wind).

UNIT - II:

Economics of Power Generation: Introduction, definitions of connected load, maximum demand, demand factor, load factor, diversity factor, Load curve, Load duration curve, number and size of generator units.Base load and peak load plants. Cost of electrical energy-fixed cost, running cost,

UNIT - III:

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.

UNIT - IV

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:

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

TEXT BOOKS:

1. C. L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 2nd Edition, New AgeInternational, 2009.
2. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering",DhanpatRai Publishing Company (P) Ltd, 2008.
3. J. B. Gupta, A Course in Power Systems" Katson Books, 11th Edition, 2016.

REFERENCE BOOKS:

1. C.L. Wadhwa, "Electrical Power Systems", 5th Edition, New Age International, 2009.
2. M.V. Deshpande, "Elements of Electrical Power Station Design", 3rd Edition, Wheeler Pub. 1998.
3. H. Cotton & H. Barber, "The Transmission and Distribution of Electrical Energy", 3rd Edition, 1970.
4. W. D. Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984.
5. V. K. Mehta and Rohit Mehta, "Principles of Power Systems", S. Chand & Company Ltd, New Delhi,2004.

Online Recourses:

1. https://nptel.ac.in/courses/108/102/108102047/
2. https://nptel.ac.in/content/storage2/courses/108105053/pdf/L-2(TB)(ET) ((EE)NPTEL).pdf
3. https://onlinecourses.nptel.ac.in/noc20_ee67/preview

B.Tech. II Year I Sem.

2602PC03: ELECTRICAL MEASUREMENTS AND SENSORS **L/T/P/C 3/0/0/3**

UNIT - I:

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

UNIT - II:

Potentiometers & Instrument Transformers: Principle and operation of DC Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. AC Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors (Qualitative approach).

UNIT - III:

Measurement of Power & Energy: Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using RSS meter. Three phase energy meter – tri-vector meter, maximum demand meters (Qualitative approach).

UNIT - IV:

DC & AC Bridges: Method of measuring low, medium and high resistance – sensitivity of Wheat-stone'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. Measurement of capacitance and loss angle –De Sauty's Bridge - Wien's bridge – Schering Bridge. (Qualitative approach)

UNIT - V:

Sensors(elementary treatment)- Classification of transducers- Temperature sensors- Proximity sensor- Pressure sensor- IR sensors Motion detection sensors- Ultrasonic sensors- Rotor Position Sensors. Operation of Strain Gauge, Thermocouples, construction and working of LVDT, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes-Applications.

TEXTBOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", DhanpatRai& 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.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011. Online Recourses:
1. https://nptel.ac.in/courses/108/105/108105153/
2. https://www.cdac.in/index.aspx?id=pe_pe_PEG_SMARTENERGY

B.TechII YearI Sem.

2600HS04: INNOVATION AND ENTREPRENEURSHIP

L/T/P/C
2/0/0/2

Unit I: Fundamentals of Innovation and Entrepreneurship

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation.

Entrepreneurship: Introduction, types of entrepreneurship attributes, mindset of entrepreneurial and entrepreneurial leadership, Role of entrepreneurs in economic development. Woman Entrepreneurship, Importance of on-campus startups. Understanding to build entrepreneurial mindset, attributes and networks individuals while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries tochoose from), Venture Activity.

Unit II: Problem and Customer Identification

Identification of gap, problem, analyzing the problem from a industry perspective, real-world problems, market and customer segmentation, validation of customer problem fit, Iterating problem-customer fit, Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model.Idea generation, Ideation techniques: Brainstorming, Brain writing, Round robin, and SCAMPER, Design thinking principles, Mapping of solution to problem.

Core Teaching Tool: Several types of activities including: Class, game, Gen AI, 'Get out of the Building' andVenture Activity.

Unit III: Opportunity assessment and Prototype development

Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity. Understanding prototyping and Minimum Viable Product (MVP). Developing a prototype: Testing, and validation. Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

Unit IV: Business & Financial Models :Introduction to Business Model and types, Lean Canvas Approach: 9-block lean canvas model, building leancanvas for your startup. Business planning: components of Business plan- Sales plan, People plan and financial plan, Financial Planning: Types of costs, preparing a financial plan for profitability using a financial template, understanding the basics of Unit economics, Economies of Scale and analyzing financial performance. Go-To-Market (GTM) approach – Selecting the Right Channel, creating digital presence, and building customer acquisition strategy.Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities

Unit V: Startups and IPR

Startup requirements, building founding team members and mentors, pitch preparation, start-up registration process, funding opportunities and schemes, institutional support to entrepreneurs, startup life cycle, documentation, legal aspects in startup, venture pitching readiness, National Innovation Startup Policy (NISP)and its features.

Patents, Designs, Patentability, Procedure for grants of patents. Indian Scenario of Patenting, International Scenario: International cooperation on Intellectual Property. Patent Rights: Scope of Patent Rights. Copyright, trademark, and GI. Licensing and transfer of technology.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

Suggested Readings:

1. John R Bessant, Joe Tidd, Innovation and Entrepreneurship, 4E, Wiley, Latest Edition.
2. Ajay Batra, TheStratup Launch Book- A Practical Guide for Launching Customer Centric Ventures,Wiley, 2020. (For Core Teaching Tool).
3. Entrepreneurship Development and Small Business Enterprises, Poornima M Charantimath, 3E, Pearson, 2018.
4. D.F. Kuratko and T.V. Rao, Entrepreneurship: A South-Asian Perspective, Cengage Learning, 2013.
5. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha (2020). Entrepreneurship, McGrawHill, 11th Edition.
6. NISP -Brochure inside pages - startup_policy_2019.pdf

B.Tech.II Year I Sem

2602PC61: ELECTRICAL MACHINES - I LAB

L/T/P/C
0/0/2/1

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 (Predetermination of efficiency)
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. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
4. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
5. Speed control of DC shunt motor
6. Modeling of DC Machine using simulation tools.
7. Equivalent circuit of Transformer using simulation tools.

TEXT BOOKS:

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. PrithwirajPurkait, IndrayudhBandyopadhyay, "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.

B.Tech.II Year I Sem

2600BS64: COMPUTATIONAL MATHEMATICS LAB USING PYTHON

L/T/P/C
0/0/2/1

Visualize all solutions Graphically through programmes

UNIT - I: Eigen values and Eigenvectors:

Programs:

- Finding real and complex Eigen values.
- Finding Eigen vectors.

UNIT-II: Solution of Algebraic and Transcendental Equations

Bisection method, Newton Raphson Method

Programs:

- Root of a given equation using Bisection method.
- Root of a given equation Newton Raphson Method.

UNIT-III: Linear system of equations:

Jacobi's iteration method and Gauss-Seidal iteration method

Programs:

- Solution of given system of linear equations using Jacobi's method
- Solution of given system of linear equations using Gauss-Seidal method

UNIT-IV: First-Order ODEs

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

Programs:

- Solving exact and non-exact equations
- Solving exponential growth/decay and Newton's law of cooling problems

UNIT-V: Higher order linear differential equations with constant coefficient

Programs:

- Solving homogeneous ODEs
- Solving non-homogeneous ODEs

TEXT BOOKS:

1. Kenneth A. Lambert, The fundamentals of Python: First Programs, 2011, CengageLearnings.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing. 4. Introductionto Python Programming, William Mitchell, PovelSolin, Martin Novak et al., NCLabPublic Computing, 2012.
5. Introduction to Python Programming, ©Jacob Fredslund,2007.

REFERENCE BOOKS:

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, ©Dave Kuhlman, 2008.

B.Tech.II Year I Sem

2602ES63: ELECTRICAL & ELECTRONIC CIRCUITS LAB

L/T/P/C
0/0/2/1

The following experiments are required to be conducted compulsorily:

1. Verification of Series and Parallel Resonance
2. Determination of Time response of first order RL and RC circuit for periodic non – sinusoidal inputs– Time Constant and Steady-state error
3. Determination of Two port network parameters – Z, Y, Transmission and Hybrid parameters.
4. Measurement of 3-phase power in balanced Star connected load using Two-Wattmeter method.
5. PN Junction diode characteristics A) Forward bias B) Reverse bias.
6. Input and Output characteristics of BJT (CB, CE, CC configurations)
7. RC Phase shift Oscillator
8. Integrator CircuitusingIC741.

In addition to the above eight experiments, at least any two of the experiments from the Following list is required to be conducted.

1. Measurement of Active Power for Delta connected balanced loads.
2. Measurement of Reactive Power for Star and Delta connected balanced loads.
3. Frequency domain analysis of Band-pass filters.
4. Frequency domain analysis of Band-stop filters
5. Differentiator circuit using Op Amp
6. Full Wave Rectifier with & without filters

TEXT BOOKS:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 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", McGraw Hill, 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", McGraw Hill,6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", DhanpatRai& Co., First Edition, 1999.

Online Recourses:

1. https://nptel.ac.in/courses/108/104/108104139/
2. https://nptel.ac.in/courses/108/106/108106172/
3. https://ocw.mit.edu/search/ocwsearch.htm?q=laboratory

B.Tech.II Year I Sem

2602SD01: DESIGN OF ELECTRICAL SYSTEMS USING AUTOCAD

L/T/P/C
0/0/2/1

Module I: Introduction to AutoCAD for Electrical Design Overview of AutoCAD interface and tools

- Layers, blocks, and annotation in AutoCAD
- Electrical symbols: IEC/ANSI/IS standards
- Drawing and modifying basic electrical elements

Lab Experiments:

- Creating simple electrical circuit diagrams using AutoCAD
- Use of layers and blocks for electrical layouts

Module II: House Wiring and Lighting System Design

- Design of single-line diagrams (SLDs)
- Layout of internal wiring for residential buildings
- Load calculation and cable selection
- Earthing and protection system basics

Lab Experiments:

- Preparation of residential wiring layout
- Switchboard and lighting plan for 1BHK/2BHK house

Module III: Commercial and Industrial Electrical Layouts

- Design of power circuits and lighting for commercial buildings
- Distribution board design and component placement
- Panel board and busbar layout

Lab Experiments:

- Design and drafting of distribution system for a small commercial building
- Electrical room layout with control panels

Module IV: Substation and Control Circuit Design

- Single-line diagram of substations
- Control circuit schematics
- Relay control and contactor wiring diagrams
- Cable routing and tray layout

Lab Experiments:

- Drawing of 11kV/440V substation SLD
- Panel wiring diagram for DOL/Star-Delta motor starter

Module V: Mini Project and Professional Practice

- Project planning, drawing standards, title block, and BOM
- Design and documentation of a small-scale electrical system
- Printing, plotting, and exporting drawings

Lab Activity:

- Mini-project: Design and documentation of electrical system for a small apartment, lab, or factory

setup Software Requirements:

- AutoCAD Electrical (Student or Institutional License)
- Optional: E-Plan, Draft Sight, or similar tools for advanced users

TEXT BOOKS:

1. K.B. Raina and S.K. Bhattacharya “Electrical Design Estimating and Costing” New Age International.
2. Prof. Sham Tickoo “AutoCAD Electrical 2023 for Electrical Control Designers” CADCIM Technologies.
3. Surjit Singh “Basic Electrical Engineering Drawing” DhanpatRai& Co.

REFERENCE BOOKS:

1. Frederic P. Hartwell and Herbert P. Richter “Practical Electrical Wiring” Park Publishing.
2. James A. Leach and Shawna Lockhart “AutoCAD 2023 Instructor” SDC Publications.
3. Ray C. Mullin and Phil Simmons “Electrical Wiring Residential” Cengage Learning.
4. IS 732: Code of Practice for Electrical Wiring Installations.
5. National Electrical Code (NEC) – India.

Online Resources:

1. Autodesk Knowledge Network: https://knowledge.autodesk.com.
2. NPTEL: Basic Electrical Drawing and CAD-related modules (search under "Electrical Engineering").

B.Tech.II Year I Sem

2600ES01: ENVIRONMENTAL SCIENCE

L/T/P/C
1/0/0/0

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, Bio magnification, ecosystem value, services and carrying capacity, Field visits.

UNIT - II

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

UNIT - III

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

UNIT - IV

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

Overview of air pollution control technologies, Concepts of bioremediation. Global Environmental Issues andGlobal 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. NAPCC-GoI Initiatives.

UNIT - V

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act-1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure,methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio- economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan(EMP). Contemporary Environmental Issues Climate change; Sustainable development goals (SDGs); Global environmental challenges; Environmental policies and international agreements.

TEXT BOOKS:

1. Introduction to Environmental Science by Y. Anjaneyulu, BS. Publications.
2. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission.

3. Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.

2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008PHI Learning Pvt. Ltd.

3. Environmental Science by Daniel B. Botkin& Edward A. Keller, Wiley INDIA edition.

4. Environmental Studies by AnubhaKaushik, 4th Edition, New age international publishers.

5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

B.Tech. II Year II Sem.

2602PC04: ELECTROMAGNETIC FIELDS

L/T/P/C
3/0/0/3

UNIT-I:

Static Electric Field: 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.

UNIT-II:

Conductors, Dielectrics and Capacitance: 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.

UNIT-III:

Static Magnetic Fields and Magnetic Forces: Biot-Savart Law, Ampere Circuital 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: Faraday's laws of Electromagnetic induction, Displacement current, Point form of Maxwell's equation, Integral form of Maxwell's equations, Motional Electromotive forces.

UNIT-V:

Electromagnetic Waves: 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.

TEXT BOOKS:

1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2019.
2. W. Hayt, "Engineering Electromagnetics", McGraw Hill Education, 2017.

REFERENCE BOOKS:

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

Online Recourses:

1. https://nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/115/101/115101005/
3. https://nptel.ac.in/courses/108/106/108106023

2602PC05: ELECTRICAL MACHINES – II

L/T/P/C
3/1/0/4

UNIT - I:

Three Phase Induction Machines: Constructional details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and Power factor at standstill and during operation. Rotor power input, rotor copper loss and mechanical power developed and their inter relation. Torque equation-expressions for maximum torque and starting torque –torque-slip characteristics.

UNIT - II:

Characteristics of Induction Machines: 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 Generator (Alternator): 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 – EMF Equation. Harmonics in generated EMF – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – phasor diagram – load characteristics.

UNIT - IV:

Regulation of Synchronous Generator: Synchronous impedance method, MMF method, ZPF method and ASA methods – two reaction theory– Determination of Xd and Xq (Slip test) Phasor diagrams – Regulation of salient pole alternators.

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

UNIT - V:

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.

Single Phase Machines: Single phase induction motor – Constructional Features-Double revolving field theory – split-phase motors – Shaded pole motor and Applications.

TEXT BOOKS:

1. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2021.
2. I.J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2018.

REFERENCE BOOKS:

1. PrithwirajPurkait, IndrayudhBandyopadhyay, “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.

Online Recourses:

1. https://nptel.ac.in/courses/108/105/108105131/
2. https://nptel.ac.in/courses/108/106/108106072/

2602PC06: POWER SYSTEMS – II **L/T/P/C 3/0/0/3**

UNIT - I

Overhead Transmission Lines: Line conductors, Composite conductor's transposition, bundled conductors,Inductance and capacitance of single phase and three phase lines with symmetrical spacing, 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 - II:

Performance of Lines: 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, Advantages and Disadvantages of corona, interference between power and Communication lines.

UNIT - III:

Voltage Control & Power Factor Improvement: Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, power factor improvement methods. Compensation in Power Systems: Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line.

UNIT - IV

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 of per unit system. Travelling Waves on Transmission Lines: Production of travelling waves, open circuited line, short-circuited line, line terminated through a resistance, line connected to a cable, Reflection and Refraction coefficients.

UNIT - V:

Symmetrical Components and Fault Calculations: 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.

TEXT BOOKS:

1. C. L. Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", 3rd Edition, New Age International, 2009.
2. D.P. Kothari and I.J. Nagrath, "Modern Power System Analysis", Tata McGraw Hill Pub. Co., New Delhi, Fourth edition, 2011.

REFERENCE BOOKS:

1. A. Chakrabarti, M.L. Soni, P.V. Gupta, U.S. Bhatnagar, "A Text book on Power System Engineering",DhanpatRai Publishing Company (P) Ltd, 2008.
2. W. D. Stevenson, "Elements of Power System Analysis", 4th Edition, McGraw Hill, 1984.
3.John J. Grainger & W.D. Stevenson, "Power System Analysis", McGraw Hill International,1994.
4. Hadi Sadat, "Power System Analysis", Tata McGraw Hill Pub. Co. 2002.

Online Recourses:

1. https://nptel.ac.in/courses/108/102/108102047/
2. https://nptel.ac.in/courses/108/107/108107112/

B.Tech. II Year II Sem.

2602PC07: DIGITAL ELECTRONICS

L/T/P/C
2/0/0/2

UNIT - I

Fundamentals of Digital Systems and Logic Families: Digital signals, Digital circuits, AND, OR, NOT,NAND, NOR and Exclusive-OR operations, Boolean algebra, Examples of IC gates, Number systems-binary,Signed binary, Octal hexadecimal number, Binary arithmetic, One's and Two's complements arithmetic.

UNIT - II:

Combinational Circuits-I: 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: Adders, Subtractors, Carry look ahead adder, Digital comparator, Paritychecker/generator, Code converters, Priority encoders, Decoders/, Q-M method offunction realization.

UNIT - IV:

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

UNIT - V:

Semiconductor Memories and Programmable Logic Devices: 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).

TEXT BOOKS:

1. A. 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.

B.Tech. II Year II Sem.

2602PC08: CONTROL SYSTEMS

L/T/P/C
3/0/0/3

UNIT - I:

Mathematical modelling of physical systems: Open – loop and Closed loop Systems, Concept of Feedback Control, Benefits of Feedback and Effects of feedback, Linear, Non-Linear, Time Variant and Time Invariant systems, Mechanical and Electrical Systems. Transfer function, Block-Diagram Techniques, Signal flow graph, DC Servo motors, AC Servomotors, Synchro's.

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, Concept of Bode plots and construction. Polar plots, Nyquist stability criterion. Relative stability using Nyquist criterion – gain and phase margin

UNT - IV:

Classical Controllers and Compensators: Proportional, Integral and Derivative Controllers- PI, PD and PID controllers, Lead, Lag and Lead-Lag compensators (elementary treatment only).

UNT - V:

State Variable Analysis: Concept of State, State variables and State model. State Representation, Transformation of State variables, Solution of state equations and Complete response of the Systems. Concept of controllability and observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009.
2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.
3. Norman S Nise, "Control Systems Engineering", Wiley, 2019 8th Edition.

REFERENCE BOOKS:

1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.
2. K. R. Varmah, "Control Systems", McGraw Hill Education, 2010.

Online Recourses:

1. https://www.controleng.com
2. https://www.mathworks.com 3. https://nptel.ac.in/courses/108/102/108102043

B.Tech. II Year II Sem.

2602PC63: ELECTRICAL MEASUREMENTS AND SENSORS LAB

L/T/P/C
0/0/2/1

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 DC Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric testing of oil using HT 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.
8. Demonstration of different sensors using trainer kit

TEXT BOOKS:

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", DhanpatRai&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 CompanyLtd., 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 AgeInternational (P) Limited Publishers, 1st Edition 2010.
6. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifthEdition, Wheeler Publishing, 2011.

B.Tech. II Year II Sem.

2602PC64: ELECTRICAL MACHINES-II LAB

L/T/P/C
0/0/2/1

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 & MMF 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. Brake Test on three phase Induction Motor
8. Regulation of three-phase alternator by ZPF and ASA 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. Measurement of sequence impedance of a three-phase alternator.
5. Scott Connection of transformer

TEXT BOOKS:

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. PrithwirajPurkait, IndrayudhBandyopadhyay, "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.

B.Tech. II Year II Sem.

2602PC65: CONTROL SYSTEMS LAB

L/T/P/C
0/0/2/1

The following experiments are required to be conducted compulsory experiments:

1. Time response of Second order system
2. Characteristics of Synchro's
3. Effect of feedback on DC servo motor
4. Transfer function of DC motor
5. Transfer function of DC generator
6. Lag and lead compensation – Magnitude and phase plot
7. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using simulation tools.
8. State space model for classical transfer function using simulation tools.

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

1. Characteristics of AC servo motor
2. Temperature controller using PID
3. Effect of P, PD, PI, PID Controller on a second order systems
4. (a) Simulation of P, PI, PID Controller.

(b) Linear system analysis (Time domain analysis, Error analysis) using suitable software

5. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions, and application of speed control of motor.
6. Design of Lead-Lag compensator for the given system and with specification using suitable software

TEXT BOOKS:

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.

B.Tech. II Year II Sem.

2602SD02: PCB DESIGN

L/T/P/C
0/0/2/1

Module I: Fundamentals of PCB Design

- Types of PCBs: Single-layer, Double-layer, Multilayer
- PCB materials and manufacturing process
- PCB design rules and standards (IPC standards)
- Introduction to EDA tools (e.g., KiCad, Eagle, Altium, EasyEDA)

Lab Activity:

- Exploring the user interface of PCB design software
- Setting up design rules

Module II: Schematic Design

- Creating circuit schematics using PCB CAD tools
- Component library management
- Electrical rule checking (ERC)
- Netlist generation

Lab Activity:

- Designing a basic power supply or LED flasher circuit
- Performing ERC and generating netlist
- Module III: PCB Layout and Routing
- Importing netlist to layout editor
- Footprint assignment and component placement
- Manual vs auto-routing
- Design Rule Check (DRC)

Lab Activity:

- Placing components and routing for the schematic designed earlier
- Performing DRC and correcting errors

Module IV: PCB Output Files and Fabrication

- Generating Gerber files, drill files, and BOM
- Understanding layers (Top, Bottom, Soldermask, Silkscreen)
- PCB printing, photoresist method, and etching
- Introduction to SMD and through-hole assembly

Lab Activity:

- Generate Gerber files and preview using Gerber viewer
- Fabricate a basic single-layer PCB (simulation or actual lab process)

Module V: Mini Project and Testing

- Assembling components on fabricated PCB
- Soldering and de soldering techniques
- Continuity testing and troubleshooting

Mini-project: Design a simple power supply, logic gate trainer, or timer circuit

Lab Activity:

- Complete mini project: From schematic to testing of PCB
-

TEXT BOOKS:

1. Walter C. Bosshart “Printed Circuit Board Design and Technology” Tata McGraw Hill
2. Clyde F. Coombs “Printed Circuit Boards: Design and Technology”: McGraw-Hill
3. Peter Dalmaris “PCB Design Using KiCad 6”

REFERENCE BOOKS:

1. Kraig Mitzner “Complete PCB Design Using OrCAD Capture and PCB Editor”
2. James Angus “Electronic Product Design”IPC Standards:
1. IPC-2221: Generic Standard on Printed Board Design
2. IPC-7351: Generic Requirements for Surface Mount DesignSoftware Tools (Free/Open Source Recommended):
1. KiCad(Open-source) .
2. EasyEDA(Online tool),
3. Eagle CAD (Free for education)
4. LTSpice / Tinkercadfor circuit simulation (optional)