ADITYA COLLEGE OF ENGINEERING, MADANAPALLE

(UGC-AUTONOMOUS INSTITUTION & ACCREDITED WITH NAAC A+ GRADE)

Approved by AICTE, New Delhi & Affiliated to JNTUA, Anantapuramu

MADANAPALLE -517325, ANNAMAYYA Dist., A.P.

www.acem.ac.in

ACEM- R24 REGULATION

ELECTRICAL AND ELECTRONICS ENGINEERING

I & II YEAR COURSE STRUCTURE AND SYLLABUS

for

B.Tech (Regular – Full Time)

(Effective for the students admitted into I Year from the Academic Year 2024-25 onwards)

and

B.Tech (Lateral Entry Scheme)

(Effective for the students getting admitted into II year through Later Entry Scheme from the Academic Year 2025-26 onwards)

ADITYA COLLEGE OF ENGINEERING :: MADANAPALLE
Punganur Road, Valasapalle (Post), Madanapalle, Annamayya (Dist.,) – 517325.
(An Autonomous Institution)
Department of Electrical and Electronics Engineering

Institute Vision:

To impart quality in engineering education to meet the technological advances and industrial requirements with global standards.

Institute Mission:

- Provide quality technical education through skill-based trainings and promote research and development, and consultancy services.
- Offer state-of-the-art-infrastructure for supporting technological advances.
- Develop disciplined, creative and globally competent engineers.
- Equip and empower the faculty at all levels to promote innovations and technical advancements in various domains of engineering.

Department Vision:

To produce accomplished engineers through eminence education and become a recognized center of excellence in academics, research and technological services in the area of Electrical and Electronics Engineering and related inter-disciplinary fields.

Department Mission:

- To facilitate the students to work with modern tools, state of art technologies, innovative research capabilities besides inculcating leadership abilities.
- To instigate students for propensity to research and innovation by exposing them to industry and societal needs to creating solutions for contemporary problems.
- To prepare the students professionally skilful, intellectually proficient and socially responsible.

Programme Outcomes (POs):

On Successful completion, the graduate will be able to,

- **PO1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PO2. Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **PO3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **PO4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **PO5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **PO6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

- **PO7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **PO8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **PO9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **PO10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PO11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **PO12. Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs):

On Successful completion, the graduate (Electrical and Electronics Engineering) will be able to,

- Exhibit demonstrable knowledge in the field of Electrical and Electronics Engineering.
- Transform and excel as solution providers for industry and society challenges.

Programme Educational Objectives (PEOs):

After few years of graduation, the graduates of Electrical and Electronics Engineering are expected to

- The graduates exhibit strong knowledge in basic sciences and electrical engineering to enable them for higher learning and employment.
- To prepare the graduates to design electrical, electronics and computing systems innovatively for mankind.
- To inculcate the graduate professionalism, ethics, effective communication skills and capability to succeed in multi-disciplinary fields.
- To motivate the graduates and faculty to do useful and application oriented research.

B.Tech. – Electrical and Electronics Engineering
Course Structure & Syllabus – ACEM R24 Regulations
(Applicable from the academic year 2024-25 onwards)

INDUCTION PROGRAMME

S.No.	Name of the Course	Category	L-T-P-C
1.	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	0-0-6-0
2.	Career Counselling	MC	2-0-2-0
3.	Orientation to all branches -- career options, tools, etc.	MC	3-0-0-0
4.	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	2-0-3-0
5.	Proficiency Modules & Productivity Tools	ES	2-1-2-0
6.	Assessment on basic aptitude and mathematical skills	MC	2-0-3-0
7.	Remedial Training in Foundation Courses	MC	2-1-2-0
8.	Human Values & Professional Ethics	MC	3-0-0-0
9.	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	2-1-2-0
10.	Concepts of Programming	ES	2-0-2-0

Group –A

B.Tech. – I Year I Semester

S. No.	Category	Course code	Name of the Course	L/D	T	P	Credits
1.	BS	24BSHB101T	Linear Algebra & Calculus	2	1	0	3
2.	BS	24BSHB103T	Engineering Physics	2	1	0	3
3.	ES	24ES02101T	Basic Electrical & Electronics Engineering	3	0	0	3
4.	ES	24ES03101T	Engineering Graphics	1	0	4	3
5.	ES	24ES05101T	Introduction to Programming	2	1	0	3
6.	BS	24BSHB103P	Engineering Physics Lab	0	0	2	1
7.	ES	24ES02101P	Electrical & Electronics Engineering Workshop	0	0	3	1.5
8.	ES	24ES05101P	Computer Programming Lab	0	0	3	1.5
9.	ES	24ES05102P	IT Workshop	0	0	2	1
10.	HM	24HMHS103L	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
			Total	**10**	**3**	**15**	**20.5**

B. Tech. – I Year II Semester

S. No.	Category	Course code	Name of the Course	L/D	T	P	Credits
1.	BS	24BSHB102T	Differential Equations & Vector Calculus	2	1	0	3
2.	BS	24BSHB104T	Chemistry	3	0	0	3
3.	HM	24HMHS101T	Communicative English	2	0	0	2
4.	ES	24ES01101T	Basic Civil and Mechanical Engineering	3	0	0	3
5.	PC	24PC02101T	Electrical Circuit Analysis - I	2	1	0	3
6.	BS	24BSHB104P	Chemistry Lab	0	0	2	1
7.	HM	24HMHS101P	Communicative English Lab	0	0	2	1
8.	ES	24ES03102P	Engineering Workshop	0	0	3	1.5
9.	PC	24PC02101P	Electrical Circuit Analysis – I Lab	0	0	3	1.5
10.	HM	24HMHS102L	Health and Wellness, Yoga and Sports	0	0	1	0.5
			Total	**12**	**2**	**11**	**19.5**

B.Tech. – II Year I Semester

S. No.	Category	Course code	Name of the Course	L	T	P	Credits
1.	BS	24BSHB207T	Complex Variables & Numerical Methods	2	1	0	3
2.	HM	24HMHS204L	Universal Human Values–Understanding Harmony and Ethical Human Conduct	2	1	0	3
3.	PC	24PC02203T	Electromagnetic Field Theory	2	1	0	3
4.	PC	24PC02204T	Electrical Circuit Analysis-II	2	1	0	3
5.	PC	24PC02205T	DC Machines & Transformers	2	1	0	3
6.	PC	24PC02204P	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5
7.	PC	24PC02205P	DC Machines & Transformers Lab	0	0	3	1.5
8.	SE	24SE05201S	Data Structures	0	1	2	2
9.	HM	24HMHS205A	Environmental Science	2	0	0	--
			Total	**10+2**	**6**	**8**	**20**

B. Tech. – II Year II Semester

S. No.	Category	Course code	Name of the Course	L/D	T	P	Credits
1.	HM	24HMHS206T	Managerial Economics and Financial Analysis	2	0	0	2
		24HMHS207T	Organizational Behaviour				
		24HMHS208T	Business Environment				
2.	PC	24PC04208T	Analog Circuits	2	1	0	3
3.	PC	24PC02206T	Power Systems-I	2	1	0	3
4.	PC	24PC02207T	Induction and Synchronous Machines	2	1	0	3
5.	PC	24PC02208T	Control Systems	2	1	0	3
6.	PC	24PC02207P	Induction and Synchronous Machines Lab	0	0	3	1.5
7.	PC	24PC02208P	Control Systems Lab	0	0	3	1.5
8.	SE	24SE05202S	Python Programming	0	1	2	2
9.	ES	24ES03102T	Design Thinking & Innovation	1	0	2	2
			Total	**11**	**5**	**10**	**21**
Mandatory Community Service Project (24IPCP301L) of 08 Weeks duration during Summer Vacation							

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB101T	**BS**	**Linear Algebra & Calculus** (Common for all branches of Engineering)	**2**	**1**	**0**	**3**

Pre Requisites: Basic Knowledge of Mathematics

Course Objectives:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Analyze the consistency and solution of systems of linear equations using matrix methods including echelon forms, normal forms, Gauss-Jordan method, and iterative techniques. (L4)

CO2: Apply the concepts of Eigenvalues, Eigenvectors, and orthogonal transformation to solve real-life problems. (L3)

CO3: Interpret the implications of Mean Value Theorems and apply Taylor's and Maclaurin's series to approximate and analyze the behavior of functions in single-variable calculus. (L4)

CO4: Examine functions of several variables using partial derivatives, Jacobians, and series expansions, and determine critical points using methods like Lagrange multipliers. (L4)

CO5: Evaluate double and triple integrals in various coordinate systems and apply them to determine areas and volumes in multivariable contexts. (L4)

Unit I: Matrices:

Rank of a matrix by echelon form, normal form. Cauchy–Binet formulae (without proof). Inverse of non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Jacobi and Gauss Seidel Iteration Methods.

Unit II: Eigen values, Eigenvectors and Orthogonal Transformation:

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

Unit III: Calculus:

Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

Unit IV: Partial differentiation and Applications (Multi variable calculus):

Functions of several variables: Continuity and Differentiability, Partial derivatives, total derivatives, chain rule, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, Functional dependence, maxima and minima of functions of two variables, method of Lagrange multipliers.

Unit V: Multiple Integrals (Multi variable Calculus):

Double integrals, triple integrals, change of order of integration, change of variables to polar, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2017, 44th Edition
2. Advanced Engineering Mathematics, Erwin Kreyszig, John Wiley &Sons, 2018, 10th Edition.

Reference Books:

1. Thomas Calculus, George B. Thomas, Maurice D. Weirand Joel Hass, Pearson Publishers, 2018, 14th Edition.
2. Advanced Engineering Mathematics, R. K. Jainand, S. R. K. Iyengar, Alpha Science International Ltd., 2021 5th Edition (9th reprint).
3. Advanced Modern Engineering Mathematics, Glyn James, Pearson publishers, 2018, 5th Edition.
4. Advanced Engineering Mathematics, Micheael Greenberg, Pearson publishers, 9th edition
5. Higher Engineering Mathematics, H. K Das, Er. Rajnish Verma, S. Chand Publications, 2014, Third Edition (Reprint 2021).

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB103T	BS	**Engineering Physics** (Common for all branches of Engineering)	2	1	0	3

Pre-Requisites: Fundamentals of Physics

Course Objectives:

To bridge the gap between Physics in school at 10+2 level and UG level engineering courses by identifying the importance of optical phenomenon like interference, diffraction, etc, enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Analyze the intensity variation of light due to Interference Diffraction and Polarization. (L4)

CO2: Analyze the properties of crystals and determine the type of structure using the X-ray Diffraction technique. (L4)

CO3: Summarize various types of Polarization of dielectric materials & Classify Magnetic materials. (L4)

CO4: Apply the fundamentals of quantum mechanics & free electron theory to the dimensional motion of particles. (L3)

CO5: Explain the basics concepts in semiconductors and identify the type of semiconductor using Hall effect. (L3)

Unit I: Wave Optics:

Interference: Introduction **-** Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colours in thin films- Newton's Rings, Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit II: Crystallography and X-ray Diffraction:

Space lattice, Basis, Unit Cell and lattice parameters Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes.

X-ray diffraction: Bragg's law - X-ray Diffractometer –crystal structure determination by Laue's and powder methods.

Unit III : Dielectric and Magnetic Materials:

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector – Relation between the electric vectors - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius- Mossotti equation - complex dielectric constant – Frequency dependence of polarization – dielectric loss

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability – Atomic origin of magnetism - Classification of magnetic materials: Dia, para, Ferro,

anti-ferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials.

Unit IV: Quantum Mechanics and Free electron Theory:

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution - Density of states - Fermi energy

Unit V: Semiconductors :

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Fermi level – Extrinsic semiconductors: density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation **--** Direct and Indirect Band gap of semiconductors – Hall effect and its applications.

Text Books:

1. Palanisamy ,"Engineering Physics", Palanisamy, Scitech Publications.
2. K.Thyagarajan ,"Engineering Physics", McGraw Hill Publications.
3. A Text book of Engineering Physics, M. N. Avadhanulu, P.G.K.shirsagar& TVS Arun Murthy, S. Chand Publications, 11th Edition 2019
4 Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

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Reference Books:

1.Introduction to solid state physics , Charles kittel 7th Edition , John Wiley and Sons.
2. Gaur and Gupta, "Engineering Physics", Dhanpatrai Publications.
3. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).
4. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.2010

Reference Website:

1. https://www.youtube.com/watch?v=PEXSH8dB-Uk
2. https://www.youtube.com/watch?v=YvrwVK9ZqQY
3. https://www.digimat.in/nptel/courses/video/115107095/L01.html
4. https://www.youtube.com/watch?v=6QUFuZpCgGw
5.https://nptel.ac.in/courses/115/105/115105122/

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES02101T	ES	**Basic Electrical and Electronics Engineering** (Common to all branches of Engineering)	3	0	0	3

Part - A: Basic Electrical Engineering

Pre-requisites: Fundamentals of Physics

Course Objectives:

To expose to the field of electrical & electronics engineering, laws and principles of electrical/ electronic engineering and to acquire fundamental knowledge in the relevant field.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Apply KVL & KCL to AC & DC Circuits to determine the various electrical parameters. (L3)

CO2: Explain the construction and working principles of electrical machines and measuring instruments, and compare their functions and applications in practical scenarios. (L4)

CO3: Distinguish between various power generation systems and evaluate domestic energy consumption to calculate electricity bills and implement appropriate electrical safety measures. (L4)

Unit I: DC & AC Circuits:

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, Voltage and current relationship with phasor diagrams in R, L, and C circuits, Concept of Impedance, Active power, reactive power and apparent power, Concept of power factor (Simple Numerical problems).

Unit II: Machines and Measuring Instruments:

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator, (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge.

Unit III: Energy Resources, Electricity Bill & Safety Measures:

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various **Power Generation Systems :** Hydel, Nuclear, Solar & Wind power generation.

Electricity bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Equipment Safety Measures: Working principle of Fuse and Miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, Safety Precautions to avoid shock.

Text Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition

Reference Books:

1. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill, 2019, Fourth Edition
2. Basic Electrical Engineering, T. K. Nagsarkar and M. S. Sukhija, Oxford University Press, 2017.
3. Basic Electrical and Electronics Engineering, S. K. Bhatacharya, Pearson Publications, 2018, Second Edition.
4. E. Hughes, Electrical and Electronic Technology, PEARSON , 2010
5. 5. G. Rizzoni, Principles and Applications of Electrical Engineering, TMH , 2017

Web Resources:

1. https://nptel.ac.in/courses/108105053
2. https://nptel.ac.in/courses/108108076
3. https://archive.nptel.ac.in/courses/108/105/108105053

Part-B: Basic Electronics Engineering

Pre-Requisites: Fundamentals of Physics and Boolean Algebra

Course Objectives:

This course provides the student with the fundamental skills to understand the principles of digital electronics, basics of semiconductor devices like diodes & transistors, characteristics and its applications.

Course Outcomes (COs):

On successful completion of the course, Students will be able to

CO1: Apply the concept of science and mathematics to understand the working of diodes, transistors with characteristics. (L3)

CO2: Describe the operation of rectifiers, regulators, and amplifiers, and analyse the functional blocks of power supplies and electronic instrumentation systems for signal processing applications. (L4)

CO3: Interpret number systems and coding schemes, and construct basic combinational and sequential circuits using logic gates and Boolean algebra for digital system design. (L4)

Unit I: Semiconductor Devices:

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN Junction Diode - Zener Effect -Zener Diode and its Characteristics. Bipolar Junction Transistor - CB, CE, CC Configurations and Characteristics- Elementary Treatment of Small Signal CE Amplifier.

Unit II: Basic Electronic Circuits and Instrumentation:

Rectifiers and power supplies: Block diagram description of a DC power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple zener voltage regulator. **Amplifiers:** Block diagram of Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response. **Electronic Instrumentation:** Block diagram of an electronic instrumentation system.

Unit III: Digital Electronics:

Overview of Number Systems, Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code. Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR. Simple combinational
circuits–Half and Full Adder, Introduction to sequential circuits, Flip flops, Registers and counters (Elementary Treatment only)

Text Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009

Reference Books:

1. R. S. Sedha, A Textbook of Electronic Devices and Circuits, S. Chand & Co, 2010.
2. Santiram Kal, Basic Electronics- Devices, Circuits and IT Fundamentals, Prentice Hall, India, 2002.
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Reference Website:

1. https://youtu.be/n9ZytPvXi7w
2. https://youtu.be/ngznoF6z0aw
3. https://youtu.be/S845RG7X70s
4. https://youtu.be/1OM3Bd8GXUo

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES03101T	ES	**Engineering Graphics** (Common to all branches of Engineering)	1	0	4	3

Pre-requisites: Basics of Geometry & Mathematics

Course Objectives:

1. To enable the students with various concepts like dimensioning, conventions and standards related to Engineering Drawing
2. To impart knowledge on the projection of points, lines and plane surfaces
3. To improve the visualization skills for better understanding of projection of solids
4. To develop the imaginative skills of the students required to understand Section of solids and Developments of surfaces.
5. To make the students understand the viewing perception of a solid object in Isometric and Perspective projections.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Construct geometrical shapes, regular polygons, and engineering curves using standard drawing instruments and apply appropriate methods to draw plain, diagonal, and vernier scales. (L3)

CO2: Draw the orthographic projections of points, lines, and planes in various positions using reference planes and apply projection principles to solve related engineering problems. (L3)

CO3: Represent the projections of polyhedral and solids of revolution in different positions, including those inclined to reference planes. (L4)

CO4: Determine sectional views and true shapes of solids and develop their surfaces using appropriate geometric methods. (L4)

CO5: Convert isometric views to orthographic views and vice versa, and demonstrate basic 2D and 3D object modelling using CAD tools. (L4)

Unit I: Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regularpolygons by general methods.
Curves: construction of ellipse, parabola and hyperbola by general method, Cycloids, Involutes, Normal andtangent to Curves.
Scales: Plain scales, diagonal scales and vernier scales.

Unit II: Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.
Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes
Projections of Planes: regular planes Perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes.

Unit III: Projections of Solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simplepositions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of Solids with axis inclined to one reference plane and parallel to another plane.

Unit IV: Sections of Solids: Perpendicular and inclined section planes, Sectional views and True

shape of section, Sections of solids in simple position only.

Development of Surfaces: Methods of Development: Parallel line development and radial line development. Development of a cube, prism, cylinder, pyramid and cone.

Unit V: Conversion of Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Computer graphics: Creating 2D&3D drawings of objects including PCB and Transformations using Auto CAD (*Not for end examination*).

Text Books:

1. N. D. Bhatt, Engineering Drawing, Charotar Publishing House, 2016.

Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kannaiah, Tata McGraw Hill, 2013.

2. Engineering Drawing, M.B.Shah and B.C. Rana, Pearson Education Inc,2009.

3. Engineering Drawing with an Introduction to AutoCAD, Dhananjay Jolhe, Tata McGraw Hill, 2017.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES05101T	ES	**Introduction to Programming** (Common to all branches of Engineering)	2	1	0	3

Pre-Requisites: Nil

Course Objectives:

1. To introduce students to the fundamentals of computer programming.
2. To provide hands-on experience with coding and debugging.
3. To foster logical thinking and problem-solving skills using programming.
4. To familiarize students with programming concepts such as data types, control structures, functions, and arrays.
5. To encourage collaborative learning and teamwork in coding projects.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Demonstrate basics of computers, the concept of algorithm & flow chart and analyse the time & complexities of algorithms. (L4)

CO2: Write the algorithms, draw the flow charts and develop the programs using conditional statements of C-Language. (L3)

CO3: Write the algorithm, draw the flow chart and develop the programs using arrays & strings of C-Language. (L3)

CO4: Apply the Pointers & user defined Data types of C language and Develop solutions to real world problems. (L3)

CO5: Develop the programs using Functions for real world problems in C language. (L3)

Unit I: Introduction to Programming and Problem Solving:

History of Computers, Basic organization of a computer: ALU, input-output units, memory, program counter, Introduction to Programming Languages, Basics of a Computer Program, Algorithms, flowcharts (Using Dia Tool), pseudo code. Introduction to Compilation and Execution, Primitive Data Types, Variables, and Constants, Basic Input and Output, Operations, Type Conversion, and Casting. Problem solving techniques: Algorithmic approach, characteristics of algorithm, Problem solving strategies: Top-down approach, Bottom-up approach, Time and space complexities of algorithms.

Unit II: Control Structures:

Simple sequential programs Conditional Statements (if, if-else, switch), Loops (for, while, do-while) Break and Continue.

Unit III: Arrays and Strings:

Arrays indexing, memory model, programs with array of integers, two dimensional arrays, Introduction to Strings.

Unit IV: Pointers & User Defined Data types:

Pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers, User-defined data types-Structures and Unions.

Unit -5: Functions & File Handling:

Introduction to Functions, Function Declaration and Definition, Function call Return Types and Arguments, modifying parameters inside functions using pointers, arrays as parameters. Scope and Lifetime of Variables, Basics of File Handling

Note: The syllabus is designed with C Language as the fundamental language of implementation.

Text Books:

1. "The C Programming Language", Brian W. Kernighan and Dennis M. Ritchie, Prentice-Hall, 1988.
2. “Schaum’s Outline of Programming with C”, Byron S Gottfried, McGraw-Hill Education, 1996.

Reference Books:

1. “Computing fundamentals and C Programming”, Balagurusamy, E., McGraw-Hill Education, 2008.
2. “Programming in C”, Rema Theraja, Oxford, 2016, 2nd Edition.
3. “C Programming, A Problem-Solving Approach”, Forouzan, Gilberg, Prasad, CENGAGE, 3rd Edition.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB103P	BS	**Engineering Physics Lab** (Common for all branches of Engineering)	0	0	3	1

Pre-Requisites: Fundamentals of Physics

Course Objectives:

1. To study the concepts of optical phenomenon like Interference, Diffraction, etc
2. To recognize the importance of energy gap a study of conductivity.
3. To study the parameters and applications of di-electric and magnetic materials by conducting experiments
4. To verify the laws of stretched strings
5. To Plot the intensity of the magnetic field of circular coil carrying current with distance.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Operate optical instruments like travelling microscope and spectrometer to measure the various physical quantities. (L2)

CO2: Examine the wavelengths of different colors using diffraction grating. (L4)

CO3: Plot the intensity of the magnetic field of circular coil carrying current with distance. (L2)

CO4: Determine dielectric constant for dielectric materials. (L2)

CO5: Calculate the band gap of a given semiconductor and to Identify the type of semiconductor using Hall effect. (L3)

CO6: Examine the loss of stretched string using sonometer (L4)

List of Experiments

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using Diffraction grating in normal incidence configuration.
3. Verification of Brewster's law
4. Determination of dielectric constant using charging and discharging method.
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser light using diffraction grating.
7. Estimation of Planck's constant using photoelectric effect.
8. Determination of the resistivity of semiconductors by four probe methods.
9. Determination of energy gap of a semiconductor using p-n junction diode.
10. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method
11. Determination of Hall voltage , Hall coefficient and type of semiconductor (N-type or P-Type) using Hall effect.
12. Determination of temperature coefficients of a thermistor.
13. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
14. Determination of magnetic susceptibility by Kundt's tube method.
15. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
16. Sonometer: Verification of laws of stretched string.
17. Determination of young's modulus for the given material of wooden scale by non uniform

bending (or double cantilever) method.

18. Determination of Frequency of electrically maintained tuning fork by Melde's experiment

Note: Any TEN of the listed experiments are to be conducted and TWO of these TEN experiments may be conducted in virtual mode.

Reference Book:

A Textbook of Practical Physics - S. Balasubramanian, M.N. Srinivasan, S. Chand Publishers, 2017.

Web Resources :

1.www.vlab.co.in

2.https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES02101P	ES	**Electrical and Electronics Engineering Workshop** (Common to all branches of Engineering)	0	0	3	1.5

Activities:

1. Familiarization of commonly used Electrical & Electronic Workshop Tools: Bread board, Solder, cables, relays, switches, connectors, fuses, Cutter, plier, screwdriver set, wire stripper, flux, knife/blade, soldering iron, de-soldering pump etc.
   - Provide some exercises so that hardware tools and instruments are learned to be used by the students.
2. Familiarization of Measuring Instruments like Voltmeters, Ammeters, multimeter, LCR-Q meter, Power Supplies, CRO, DSO, Function Generator, Frequency counter.
   - Provide some exercises so that measuring instruments are learned to be used by the students.
3. Components:
   - Familiarization/Identification of components (Resistors, Capacitors, Inductors, Diodes, transistors, IC's etc.) – Functionality, type, size, colour coding package, symbol, cost etc.
   - Testing of components like Resistor, Capacitor, Diode, Transistor, ICs etc. - Compare values of components like resistors, inductors, capacitors etc with the measured values by using instruments

Part A: Electrical Engineering Lab

Pre-requisites: Fundamentals of Physics

Course Objectives:

To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Verify KVL, KCL & various network theorems and Apply to AC & DC Electrical circuits to measure Electric Circuit parameters (R, L & C), Power, Power factor etc. (L3)

CO2: Conduct Experiments on AC&DC Machines, plot characteristics and measure the various electrical parameters or quantities. (L3)

CO3: Design suitable circuits and methodologies for the measurement of various electrical parameters; House hold and commercial wiring. (L3)

List of experiments:

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Measurement of Resistance using Wheat stone bridge
4. Magnetization Characteristics of DC shunt Generator
5. Measurement of Power and Power factor using Single-phase wattmeter
6. Measurement of Earth Resistance using Megger
7. Calculation of Electrical Energy for Domestic Premises

Note: Minimum Six Experiments are to be performed.

Reference Books:

1. Basic Electrical Engineering, D. C. Kulshreshtha, Tata McGraw Hill, 2019, First Edition
2. Power System Engineering, P.V. Gupta, M.L. Soni, U.S. Bhatnagar and A. Chakrabarti, Dhanpat Rai & Co, 2013
3. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI publishers, 2014, Third Edition.

Part-B: Electronics Engineering Lab

Pre-requisites: Fundamentals of Physics

Course Objectives:

To impart knowledge on the principles of digital electronics and fundamentals of electron devices & its applications.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the usage of electronic measuring instruments and Analyze the V-I characteristics of various electronic devices. (L4)

CO2: Develop various Analog Electronic Circuits such as Rectifier, Regulators and Amplifiers (L3)

CO3: Develop Digital Electronic Circuits such as Combinational and Sequential Circuits. (L3)

List of Experiments:

1. Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias.
2. Plot V – I characteristics of Zener Diode and its application as voltage Regulator.
3. Implementation of half wave and full wave rectifiers
4. Plot Input & Output characteristics of BJT in CE and CB configurations
5. Frequency response of CE amplifier.
6. Simulation of RC coupled amplifier with the design supplied
7. Verification of Truth Tables of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs.
8. Verification of Truth Tables of S-R, J-K& D flip flops using respective ICs.

Tools / Equipment Required: DC Power supplies, Multi meters, DC Ammeters, DC Voltmeters, AC Voltmeters, CROs, all the required active devices.

Reference Books:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4th Edition, Tata Mc Graw Hill, 2009
3. R. T. Paynter, Introductory Electronic Devices & Circuits – Conventional Flow Version, Pearson Education,2009.

Note: Minimum Six Experiments are to be performed. All the experiments shall be implemented using both Hardware and Software

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES05101P	ES	**Computer Programming Lab** (Common to all branches of Engineering)	0	0	3	1.5

Pre Requisites: Nil

Course Objectives:
The course aims at providing students with hands – on experience and train them on the concepts of the C- programming language.

Course Outcomes (COs):
On successful completion of the course, Student will be able to
CO1: Read, understand, and trace the execution of programs written in C language. (L2)
CO2: Select the right control structure for solving the problem. (L3)
CO3: Develop C programs which utilize memory efficiently using programming constructs like pointers. (L3)
CO4: Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, Basic concepts of pointers in C. (L3)

Unit I: Week 1:
Objective: Getting familiar with the programming environment on the computer and writing the first program.
Suggested Experiments/Activities:
Tutorial 1: Problem-solving using Computers.
Lab1: Familiarization with programming environment
i) Basic Linux environment and its editors like Vi, Vim & Emacs etc.
ii) Exposure to Turbo C, gcc
iii) Writing simple programs using printf(), scanf()

Week 2:
Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.
Suggested Experiments /Activities:
Tutorial 2: Problem-solving using Algorithms and Flow charts.
Lab 1: Converting algorithms/flow charts into C Source code.
Developing the algorithms/flowcharts for the following sample programs
i) Sum and average of 3 numbers
ii) Conversion of Fahrenheit to Celsius and vice versa
iii) Simple interest calculation

Week 3:
Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.
Suggested Experiments/Activities:
Tutorial 3: Variable types and type conversions:
Lab 3: Simple computational problems using arithmetic expressions.
i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT – II : Week 4:

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial4: Operators and the precedence and as associativity:

Lab4: Simple computational problems using the operator' precedence and associativity

i) Evaluate the following expressions.

a. A+B*C+(D*E) + F*G

b. A/B*C-B+A*D/3

c. A+++B---A

d. J= (i++) + (++i)

ii) Find the maximum of three numbers using conditional operator

iii) Take marks of 5 subjects in integers, and find the total, average in float

Week 5:

Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".

Suggested Experiments/Activities:

Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures.

i) Write a C program to find the max and min of four numbers using if-else.

ii) Write a C program to generate electricity bill.

iii) Find the roots of the quadratic equation.

iv) Write a C program to simulate a calculator using switch case.

v) Write a C program to find the given year is a leap year or not.

Week 6:

Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.

Suggested Experiments/Activities:

Tutorial 6: Loops, while and for loops

Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop.

ii) Find if the given number is a prime or not.

iii) Compute sine and cos series

iv) Checking a number palindrome

v) Construct a pyramid of numbers.

Unit III: Week 7:

Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:

Tutorial 7: 1 D Arrays: searching.

Lab 7:1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array.

ii) Perform linear search on1D array.

iii) The reverse of a 1D integer array

iv) Find 2's complement of the given binary number.

v) Eliminate duplicate elements in an array.

Week 8:

Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.

Suggested Experiments/Activities:

Tutorial 8: 2 D arrays, sorting and Strings.

Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices

ii) Multiplication two matrices

iii) Sort array elements using bubble sort

iv) Concatenate two strings without built-in functions

v) Reverse a string using built-in and without built-in string functions

Unit – IV : Week 9:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc (), calloc (), realloc () and free () functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 9: Pointers, structures and dynamic memory allocation

Lab 9: Pointers and structures, memory dereference.

i) Write a C program to find the sum of a 1D array using malloc()

ii) Write a C program to find the total, average of n students using structures

iii) Enter n students data using calloc () and display failed students list

iv) Read student name and marks from the command line and display the student details along with the total.

v) Write a C program to implement realloc ()

Week 10:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 10: Bitfields, Self-Referential Structures, Linked lists

Lab10: Bitfields, linked lists

Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields

i) Create and display a singly linked list using self-referential structure.

ii) Demonstrate the differences between structures and unions using a C program.

iii) Write a C program to shift/rotate using bitfields.

iv) Write a C program to copy one structure variable to another structure of the same type.

Unit – V: Week 11:

Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration

Suggested Experiments/Activities:

Tutorial 11: Functions, call by value, scope and extent,

Lab 11: Simple functions using call by value, solving differential equations using Eulers theorem.

i) Write a C function to calculate NCR value.

ii) Write a C function to find the length of a string.

iii) Write a C function to transpose of a matrix.

iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

Week 12:

Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 12: Recursion, the structure of recursive calls

Lab 12: Recursive functions

i) Write a recursive function to generate Fibonacci series.

ii) Write a recursive function to find the lcm of two numbers.

iii) Write a recursive function to find the factorial of a number.

iv) Write a C Program to implement Ackermann function using recursion.

v) Write a recursive function to find the sum of series.

Week 13:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 13: Call by reference, dangling pointers

Lab 13: Simple functions using Call by reference, Dangling pointers.

i) Write a C program to swap two numbers using call by reference.

ii) Demonstrate Dangling pointer problem using a C program.

iii) Write a C program to copy one string into another using pointer.

iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

Week14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:

Tutorial 14: File handling

Lab 14: File operations

i) Write a C program to write and read text into a file.

ii) Write a C program to write and read text into a binary file using fread() and fwrite()

iii) Copy the contents of one file to another file.

iv) Write a C program to merge two files into the third file using command-line arguments.

v) Find no. of lines, words and characters in a file

vi) Write a C program to print the last n characters of a given file.

Text Books:

1. Ajay Mittal, Programming in C: A practical approach, Pearson 1st Edition 2010.
2. Byron Gottfried, Schaum's Outline of Programming with C, Mc Graw Hill; 2nd edition 1996.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India, 1988.
2. C Programming, A Problem-Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE, 3rd edition, 2011.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES05102P	ES	IT Workshop (Common to all branches of Engineering)	0	0	2	1

Pre Requisites: Nil

Course Objectives:

1. To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
2. To demonstrate configuring the system as Dual boot both Windows and other Operating Systems Viz. Linux, BOSS
3. To teach basic command line interface commands on Linux.
4. To teach the usage of Internet for productivity and self-paced life-long learning
5. To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Perform Hardware troubleshooting. (L3)

CO2: Demonstrate the Hardware components and inter dependencies. (L2)

CO3: Safeguard computer systems from viruses/worms. (L3)

CO4: Prepare Document/ Presentation by utilizing computer tools. (L3)

CO5: Perform calculations using spreadsheets. (L3)

PC Hardware & Software Installation:

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit it to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Task 5: Every student should install BOSS on the computer. The system should be configured as dual boot (VMWare) with both Windows and BOSS. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web:

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate to the instructor how to access websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

LaTeX and Word:

Task 1: Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of LaTeX and MS office or equivalent (FOSS) tool Word as word Processors, Details of the four tasks and features that would be covered in each, Using LaTeX and word –Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

Task 2: Using LaTeX and Word to create a project certificate. Features to be covered: -Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

Task 3: Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 4: Creating a Newsletter: Features to be covered: -Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel:

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel –Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler -Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: -Cell Referencing, Formulae in excel –average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

Lookup/Vlookup

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power Point

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations -Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting –Background, textures, Design Templates, Hidden slides.

AI Tools –ChatGPT

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model completes them.

Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Reference Books:

1. Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dream tech, 2003
2. The Complete Computer upgrade and repair book, Cheryl A Schmidt, WILEY Dream tech, 2013, 3rd edition
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education, 2012, 2nd edition
4. PC Hardware -A Handbook, Kate J. Chase, PHI (Microsoft), 1st Edition, 2004.
5. LaTeX Companion, Leslie Lamport, PHI/Pearson, 1st edition, 1994.
6. IT Essentials PC Hardware and Software Companion Guide, David Anfins on and Ken Quamme. – CISCO Press, Pearson Education, 3rd edition, 2008.
7. IT Essentials PC Hardware and Software Labs and Study Guide, Patrick Regan–CISCO Press, Pearson Education, 3rd edition, 2008.

B.Tech. – I Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS103L	HM	NSS/NCC/Scouts & Guides/Community Service (Common to all branches of Engineering)	0	0	1	0.5

Pre-Requisites: Nil

Course Objectives:

1. To impart discipline, character, and fraternity amongst young citizens
2. To train them to work in teams/groups to enhance their team spirit.
3. To enable the students to acquire leadership qualities.
4. To induce social consciousness among students through various activities.
5. To instill self-confidence and the ideals of selfless service
6. To engage students in responsible and challenging actions for the common good.

Course Outcomes (COs):

On successful completion of the course, the students will be able to

CO1: Explain the importance of discipline, character and service motto. (L2)

CO2: Outline the needs and problems of the community. (L2)

CO3: Solve some societal issues by applying acquired knowledge, facts, and techniques. (L3)

CO4: Explore human relationships by analyzing social problems. (L4)

CO5: Determine to extend their help for the fellow beings and downtrodden people and Develop leadership skills and civic responsibilities. (L3)

Unit I: Orientation:

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i. Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii. Conducting orientations programs for the students –future plans-activities-releasing road map etc.
iii. Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv. Conducting talent show in singing patriotic songs-paintings- any other contribution.

Unit II: Nature & Care:

Activities:

i. Best out of waste competition.
ii. Poster and signs making competition to spread environmental awareness.
iii. Recycling and environmental pollution article writing competition.
iv. Organising Zero-waste day.
v. Digital Environmental awareness activity via various social media platforms.
vi. Virtual demonstration of different eco-friendly approaches for sustainable living.
vii. Write a summary on any book related to environmental issues.

Unit III: Community Service:

Activities:

i. Conducting One Day Special Camp in a village contacting village-area leaders- Survey
ii. in the village, identification of problems- helping them to solve via media- authorities experts etc.
    a. Conducting awareness programs on Health-related issues such as General Health,
iii. Mental health, Spiritual Health, HIV/AIDS,

a. Conducting consumer Awareness. Explaining various legal provisions etc.
b. Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population

iv. Education.
a. Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)
2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi
3. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw Hill, New York 4/e 2008
4. Masters G. M., Joseph K. and Nagendran R. "Introduction to Environmental Engineering and Science", Pearson Education, New Delhi. 2/e 2007
5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB102T	BS	**Differential Equations & Vector Calculus** (Common for all branches of Engineering)	2	1	0	3

Pre Requisites: Basic Knowledge of Mathematics

Course Objectives:

- To enlighten the learners about the concept of differential equations and multivariable calculus.
- To furnish the learners with basic concepts and techniques at plus two level to lead them to advanced level by handling various real-world applications.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Solve the differential equations of first order and first degree and apply in Newton's law of cooling and Electrical Circuits applications. (L3)

CO2: Solve the linear constant coefficient differential equations of higher order and apply in L-C-R Electrical Circuits and Simple Harmonic motion applications. (L3)

CO3: Find the solution to Partial Differential Equations and Homogeneous Linear Partial differential equations with constant coefficients and solve real time related problems. (L3)

CO4: Examine the physical meaning of different operators such as gradient, curl anddivergence. (L4)

CO5: Determine the Line, Surface and Volume integrals using Vector Calculus and solve related engineering problems. (L4)

Unit I: Differential Equations of First Order and First Degree:

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits.

Unit II: Linear Differential Equations of Higher Order (Constant Coefficients):

Definitions, homogenous and non-homogenous, complimentary function, general solution, particular integral, Wronskian, Method of variation of parameters. Simultaneous linear equations, Applications to L-C-R Circuit problems and Simple Harmonic motion.

Unit III: Partial Differential Equations:

Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

Unit IV: Vector Differentiation:

Scalar and vector point functions, vector operator Del, Del applies to scalar point functions- Gradient, Directional derivative, del applied to vector point functions-Divergence and Curl, vector identities.

Unit V: Vector Integration:

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and related problems.

Text Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2018.
2. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna publishers, 2017.

Reference Books:

1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B. V. Ramana, Higher Engineering Mathematics, Mc Graw Hill Education, 2017.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB104T	BS	Chemistry (Common to EEE, ECE, CSE, AI&DS & CSE(AI))	3	0	0	3

Pre-Requisites: Fundamentals of Chemistry

Course Objectives:

1. To understand the concepts of Schrodinger wave equation and molecular orbital theory
2. To understand and apply the concepts of semiconductors, super conductors and nano materials
3. To understand and apply the concepts of electrochemistry effectively.
4. To train the students on the fundamentals and applications of polymers.
5. To introduce basic principles of spectroscopy and chromatography

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the Fundamentals of Quantum mechanics, Apply Schrodinger wave equation to illustrate the molecular orbital energy level diagram for different di- atomic molecules (L3)

CO2: Apply the principle of Band diagrams and classify the Semiconductors, Super conductors, Supercapacitors & Nano materials and demonstrate their applications (L3)

CO3: Analyze electrochemical principles to calculate cell potentials and interpret titration curves, and evaluate the working mechanisms of batteries, fuel cells, and electrochemical sensors. (L4)

CO4: Differentiate between types of polymerization mechanisms and polymer classes, and examine the structure–property relationships and applications of thermoplastics, elastomers, conducting, and biodegradable polymers. (L4)

CO5: Interpret spectroscopic and chromatographic data using principles like Beer-Lambert's law, and analyze the instrumentation and applications of UV-Vis, IR spectroscopy, and HPLC techniques. (L4)

Unit I: Structure and Bonding Models:

Fundamentals of Quantum mechanics- Planck's quantum theory, Dual nature of matter, Schrodinger wave equation, significance of ψ and ψ^2, particle in one-dimensional box, molecular orbital theory- Bonding in homo and heteronuclear di-atomic molecules, Energy level diagrams of N_2, O_2 and CO, NO. π- molecular orbital diagrams for butadiene and benzene, calculation of bond order.

Unit II: Modern Engineering materials:

Semiconductor materials: Introduction, Types of semiconductors, P- type and N- type semiconductors, Band diagrams for conductors, semiconductors and insulators, role of doping on band structures, Applications. **Super conductors -** Introduction, Classification, Properties and Applications. **Supercapacitors:** Introduction, Construction and working, Classification – Applications. **Nano chemistry:** Introduction, classification of nano materials, properties and applications of Fullerenes, carbon nano tubes and Graphene's nanoparticles

Unit III: Electrochemistry and Applications:

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems. **Potentiometry-** potentiometric titrations (redox titration), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations). **Electrochemical sensors** – potentiometric sensors with examples, amperometric sensors with examples. Primary cells – Zinc-air battery, Secondary cells –

lithium-ion batteries- working of the batteries including cell reactions; Fuel cells, hydrogen-oxygen, polymer electrolyte membrane fuel cells – working of the cells.

Unit IV: Polymer Chemistry:

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, with specific examples and mechanisms of polymer formation**. Plastics -** Thermoplastics and Thermosettings, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibers. Elastomers–Buna-S, Buna-N - preparation, properties and applications. Conducting polymers–polyacetylene, polyaniline, mechanism of conduction and applications. Biodegradable polymers- PGA & PLA.

Unit V: Instrumental Methods and Applications:

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law, UV-Visible, Electronic transition, Instrumentation, IR Spectroscopies fundamental modes and selection rules- Instrumentation, Chromatography- Basic principle, classification – HPLC - principle, instrumentation and applications.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. G.V. Subba Reddy, K.N. Jayaveera and C. Ramachandraiah, Engineering Chemistry, Mc Graw Hill, 2020.
2. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

Reference Website:

1. https://youtu.be/Oal2zQ84je4?si=d67NlidzOTfrfEon
2. https://youtu.be/qbxRHHnmvJk?si=soLaMMqXYV8xswri
3. https://youtu.be/CKyo2M1mNqQ?si=xLqBkrqtYm3uyN3G
4. https://youtu.be/rG1qDXuRRoE?si=O0z5iQg7AUlZ_2Ik
5. https://youtu.be/Mig9b5hra-k?si=A6Q5vUJ--M4Nv31_

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS101T	HM	**Communicative English** (Common to all branches of Engineering)	2	0	0	2

Pre-Requisites: Basics of LSRW skills

Course Objectives:

The main objective of introducing this course, *Communicative English,* is to facilitate effective listening, Reading, Speaking and Writing skills among the students. It enhances the same in their comprehending abilities, oral presentations, reporting useful information and providing knowledge of grammatical structures and vocabulary. This course helps the students make them effective in speaking and writing skills and make them industry ready.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the context, topic, and pieces of specific information from social or Transactional dialogues. (L2)

CO2: Apply grammatical structures to formulate sentences and correct word forms. (L3)

CO3: Analyze discourse markers to speak clearly on a specific topic in informal discussions. (L4)

CO4: Evaluate reading / listening texts and to write summaries based on global – Comprehension of these texts. (L5)

CO5: Create a coherent paragraph, essay, and resume. (L6)

Unit I: Human Values: Gift of Magi (Short Story)

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home,family, work, studies and interests; introducing oneself and others.

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Writing: Mechanics of Writing-Capitalization, Spellings, Punctuation-Parts of Sentences.

Grammar: Parts of Speech, Basic Sentence Structures-forming questions

Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words.

Unit II: Nature: The Brook by Alfred Tennyson (Poem)

Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs /small groups on specific topics followed by short structuretalks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Structure of a paragraph - Paragraph writing (specific topics)

Grammar: Cohesive devices -linkers, use of articles and zero article; prepositions.

Vocabulary: Homonyms, Homophones, Homographs.

Unit III: Biography: Elon Musk

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences-recognizing and

interpretingspecific context clues; strategies to use text clues for comprehension.

Writing: Summarizing, Note-making, paraphrasing

Grammar: Verbs - tenses; subject-verb agreement; Compound words, Collocations

Vocabulary: Compound words, Collocations

Unit IV: Inspiration: The Toys of Peace by Saki

Listening: Making predictions while listening to conversations/ transactional dialogueswithout video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formaland informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in text stocon vey information, reveal trends /patterns/ relationships, communicate processes or display complicated data.

Writing: Letter Writing: Official Letters, Resumes

Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice

Vocabulary: Words often confused, Jargons

Unit V: Motivation: The Power of Intrapersonal Communication (An Essay)

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts

Reading: Reading comprehension.

Writing: Writing structured essays on specific topics.

Grammar: Editing short texts –identifying and correcting common errors in grammar andusage (articles, prepositions, tenses, subject verb agreement)

Vocabulary: Technical Jargons

Text Books:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, OrientBlack Swan, 2023 (Units 1,2 & 3)
2. Empowering with Language by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey, Sham Ji & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy, Raymond. English Grammar in Use, Fourth Edition, Cambridge UniversityPress.
4. Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building aSuperior Vocabulary. Anchor, 2014.

Web Resources:

Grammar:

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

Vocabulary:

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES01101T	ES	**Basic Civil and Mechanical Engineering** (Common to All branches of Engineering)	3	0	0	3

Part – A: Basic Civil Engineering

Pre-Requisites: Basic Knowledge in Physics & Chemistry

Course Objectives:

1. Get familiarized with the scope and importance of Civil Engineering sub-divisions.
2. Introduce the preliminary concepts of surveying
3. Acquire preliminary knowledge on Transportation and its importance in nation's economy and also learn water resource and water quality.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Identify the roles and disciplines within civil engineering and apply basic knowledge of construction materials and building techniques, including prefabricated construction, in practical civil engineering contexts. (L3)

CO2: Analyse the methods of horizontal and angular measurements used in surveying and interpret levelling and bearing data to generate contour maps and elevation profiles. (L4)

CO3: Differentiate types of transportation systems and pavement structures, and examine the basic components of water resources and environmental engineering systems including hydrology and water conveyance structures. (L4)

Unit I: Basics of Civil Engineering: Role of Civil Engineers in Society- Various Disciplines of Civil Engineering- Structural Engineering- Geo-Technical Engineering- Transportation Engineering Hydraulics and Water Resources Engineering - Environmental Engineering - Scope of each discipline - Building Construction and Planning- Construction Materials - Cement – Aggregate Bricks- Cement concrete- Steel. Introduction to Prefabricated Construction Techniques.

Unit II: Surveying: Objectives of Surveying- Horizontal Measurements- Angular Measurements- Introduction to Bearings Levelling instruments used for levelling -Simple problems on levelling and bearings-Contour mapping.

Unit III: Transportation Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences. Basics of Harbour, Tunnel, Airport, and Railway Engineering. **Water Resources and Environmental Engineering:** Introduction, Sources of water- Quality of water- Specifications- Introduction to Hydrology–Rainwater Harvesting-Water Storage and Conveyance Structures (Simple introduction to Dams and Reservoirs).

Text Books:

1. Basic Civil Engineering, M.S.Palanisamy, , Tata Mcgraw Hill publications (India) Pvt. Ltd. Fourth Edition.
2. Introduction to Civil Engineering, S.S. Bhavikatti, New Age International Publishers. 2022. First Edition.
3. Basic Civil Engineering, Satheesh Gopi, Pearson Publications, 2009, First Edition.

Reference Books:

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers 2019. Fifth Edition.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi. 2016.
3. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications 2019. 10th Edition.

Part-B : Basic Mechanical Engineering

Pre-Requisites: Basic Knowledge in Physics & Chemistry

Course Objectives:

1. Get familiarized with the scope and importance of Mechanical Engineering in different sectors and industries.
2. Explain different engineering materials and different manufacturing processes.
3. Provide an overview of different thermal and mechanical transmission systems and introduce basics of robotics and its applications.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Identify the role of mechanical engineering across various industrial sectors and apply basic knowledge of engineering materials—including metals, ceramics, composites, and smart materials—in mechanical applications. (L3)

CO2: Differentiate between various manufacturing processes including CNC and smart manufacturing, and analyze the working principles of thermal systems such as engines, refrigeration cycles, and hybrid vehicles. (L4)

CO3: Examine the operating principles of different power plants and mechanical transmission systems, and classify types of robotic configurations based on their structure and applications. (L4)

Unit I: Introduction to Mechanical Engineering: Role of Mechanical Engineering in Industries and Society-Technologies in different sectors such as Energy, Manufacturing, Automotive, Aerospace, and Marine sectors.

Engineering Materials - Metals-Ferrous and Non-ferrous, Ceramics, Composites, Smart materials.

Unit II: Manufacturing Processes: Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.

Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

Unit III: Power Plants – working principle of Steam, Diesel, Hydro, Nuclear power plants.

Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.

Introduction to Robotics - Joints & links, configurations, and applications of robotics. (**Note:** The subject covers only the basic principles of Civil and Mechanical Engineering systems. The evaluation shall be intended to test only the fundamentals of the subject)

Text Books:

1. Internal Combustion Engines by V.Ganesan, By Tata McGraw Hill publications (India) Pvt. Ltd.
2. A Tear book of Theory of Machines by S.S. Rattan, Tata McGraw Hill Publications, (India) Pvt. Ltd.
3. An introduction to Mechanical Engg by Jonathan Wicker and Kemper Lewis, Cengage learning India Pvt. Ltd.

Reference Books:

1. Appuu Kuttan KK, Robotics, I.K. International Publishing House Pvt. Ltd. Volume-I
2. 3D printing & Additive Manufacturing Technology- L. Jyothish Kumar, Pulak M Pandey, Springer publications
3. Thermal Engineering by Mahesh M Rathore Tata McGraw Hill publications (India) Pvt. Ltd.
4. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata McGraw Hill publications (India) Pvt. Ltd.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02101T	PC	**Electrical Circuit Analysis-I** (Electrical and Electronics Engineering)	2	1	0	3

Pre-Requisites: Basic Electrical and Electronic Engineering & Mathematics

Course Objectives:

To develop an understanding of the fundamental laws, elements of electrical circuits and to apply circuit analysis to DC and AC circuits.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Apply the concepts of KVL & KCL for network reductions, Nodal analysis and Mesh Analysis With independent & Dependent sources. (L3)

CO2: Interpret the various fundamental concepts of magnetic circuits and apply these concepts to analyse the composite magnetic circuits. (L4)

CO3: Determine the various electrical parameters of periodic functions and conduct steady state analysis on RLC Circuits with sinusoidal excitation. (L4)

CO4 : Analyse the Series and Parallel Resonance circuits and determine the Q-Factor, BW and Selectivity. (L4)

CO5: Verify the various network theorems by applying KVL & KCL with AC & DC excitations. (L3)

Unit I: Introduction to Electrical Circuits:

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources, node and mesh analysis.

Unit II: Magnetic Circuits:

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

Unit III: Single Phase Circuits:

Characteristics of periodic functions, Average value, R.M.S. value, form factor, representation of a sine function, concept of phasor, phasor diagrams, node and mesh analysis. Steady state analysis of R, L and C circuits to sinusoidal excitations-response of pure resistance, inductance, capacitance, series RL circuit, series RC circuit, series RLC circuit, parallel RL circuit, parallel RC circuit.

Unit IV: Resonance and Locus Diagrams:

Series Resonance: Characteristics of a series resonant circuit, Q-factor, selectivity and bandwidth, expression for half power frequencies; Parallel resonance: Q-factor, selectivity and bandwidth; Locus diagram: RL, RC, RLC with R, L and C variables.

Unit V: Network Theorems (DC & AC Excitations):

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem

Text Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, 6th edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised 3rd Edition

Reference Books:

1. Fundamentals of Electrical Circuits, Charles K. Alexander and Mathew N.O. Sadiku, Mc Graw Hill Education (India), 2013, Fifth Edition
2. Electric Circuits (Schaum's outline Series), Mahmood Nahvi, Joseph Edminister, and K. Rao, Mc Graw Hill Education, 2017, 5th Edition.
3. Electric Circuits, David A. Bell, Oxford University Press, 2009, 7th Edition.
4. Introductory Circuit Analysis, Robert L Boylestad, Pearson Publications, 2023, 14th Edition.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, Dhanpat Rai & Co., 2018, 7th Revised Edition.

Web Resources:

1. https://onlinecourses.nptel.ac.in/noc23_ee81/preview
2. https://nptel.ac.in/courses/108104139
3. https://nptel.ac.in/courses/108106172
4. https://nptel.ac.in/courses/117106108

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB104P	BS	**Chemistry Lab** (Common to EEE, ECE, CSE, AI&DS & CSE(AI))	0	0	2	1

Pre-Requisites: Fundamentals of Chemistry

Course Objectives:

1. To provide solid foundation in chemistry laboratory to solve engineering problems.
2. To Illustrate the applications of conductometry and potentiometry
3. To Illustrates the properties of analytical equipment's like UV-VIS and IR.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Prepare advanced polymer Bakelite materials. (L2)
CO2: Measure the strength of an acid present in secondary batteries. (L3)
CO3: Determine the cell constant and conductance of solutions (L3)
CO4: Analyze some simple organic compounds by IR. (L3)
CO5: Prepare advanced Nano materials. (L2)

List of Chemistry Experiments

1. Estimation of Ferrous Iron by Dichrometry
2. Preparation of a Bakelite
3. Conductometric titration of strong acid vs. strong base
4. Conductometric titration of weak acid vs. strong base
5. Determination of Strength of an acid in Pb-Acid battery
6. Potentiometry - determination of redox potentials and emfs
7. Verify Lambert-Beer's law
8. Determination of cell constant and conductance of solutions
9. Identification of simple organic compounds by IR
10. Preparation of nanomaterials by precipitation
11. Measurement of 10Dq by spectrophotometric method
12. Wavelength measurement of sample through UV-Visible Spectroscopy

Note: Minimum Ten experiments are to be performed.

Reference Books:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.
3. Chemistry Laboratory Manual, Sri Krishna Hitech Publishing Company Pvt.Ltd,2nd Edition, A Ravi Krishanan, B Tirumala Rao, 2020-2021.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS101P	HS	**Communicative English Lab** (Common to all branches of Engineering)	0	0	2	1

Pre-Requisites: Basics of LSRW skills

Course Objectives:

The main objective of introducing this course Communicative English Laboratory is to expose the students to a variety of self-instructional, learner friendly modes of language learning. The students will get trained in basic communication skills and also make them ready to face job interviews.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Understand the different aspects of the English language proficiency with emphasison LSRW skills. (L2)

CO2: Apply communication skills through various language learning activities(L3)

CO3: Analyze the English speech sounds, stress, rhythm, intonation and syllable division forbetter listening and speaking comprehension. (L4)

CO4: Evaluate and exhibit professionalism in participating in debates and group discussions.(L5)

CO5: Create effective Course Objectives. (L6)

List of Topics:

1. Vowels & Consonants
2. Neutralization/Accent Rules
3. Communication Skills & JAM
4. Role Play or Conversational Practice
5. Group Discussions-methods & practice
6. Debates - Methods & Practice
7. PPT Presentations/ Poster Presentation
8. Interview Skills
9. E-mail Writing
10. Resume Writing, Cover letter, SOP

Suggested Software:

- Walden Infotech
- Young India Films

Reference Books:

1. Raman Meenakshi, Sangeeta- Sharma. *Technical Communication*. OxfordPress.2018.
2. TaylorGrant:*EnglishConversationPractice*,TataMcGraw-HillEducationIndia,2016
3. Hewing's, Martin. Cambridge *Academic English*(B2). CUP,2012.
4. J. Sethi & P.V. Dhamija. *A Course in Phonetics and Spoken English*, (2nd Ed),Kindle,2013
5. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, (3rd Ed) Trinity Press.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES03102P	ES	**Engineering Workshop** (Common to all branches of Engineering)	0	0	3	1.5

Pre-Requisites: Nil

Course Objectives:

- To familiarize students with wood working, sheet metal operations, fitting and electrical house wiring skills

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Identify workshop tools and their operational capabilities. (L3)
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding. (L3)
CO3: Apply fitting operations in various applications. (L3)
CO4: Apply basic electrical engineering knowledge for House Wiring Practice (L3)

1. **Demonstration**: Safety practices and precautions to be observed in workshop.
2. **Wood Working:** Familiarity with different types of woods and tools used in wood working and make following joints.
   a) Half – Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint
3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.
   a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing
4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.
   a) V-fit b) Dovetail fit c) Semi-circular fit
   d) Bicycle tire puncture and change of two-wheeler tyre
5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.
   a) Parallel and series b) Two-way switch c) Godown lighting
   d) Tube light e) Three phase motor f) Soldering of wires
6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on Arc Welding and Gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters.

Text Books:

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published,2019.
2. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
3. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai & Co., 2015 & 2017.

Reference Books:

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
3. Wiring Estimating, Costing and Contracting; Soni P.M. & Upadhyay P.A.; Atul Prakashan, 2021-22.

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02101P	PC	**Electrical Circuit Analysis-I Lab** (Electrical and Electronics Engineering)	0	0	3	1.5

Pre Requisites: Basic Electrical and Electronics Engineering

Course Objectives:

To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics. It also gives practical exposure of the usage of different circuits with different conditions.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Conduct experiment and verify the KCL, KVL, Node analysis, Mesh analysis and various Network theorems. (L3)

CO2: Determine the electrical & magnetic parameters of various electrical & magnetic circuits with experimentation. (L3)

CO3: Verify the Locus diagram of RLC circuits and determine the Q-factor, BW & Selectivity (L3)

List of Experiments:

1. Verification of Kirchhoff's circuit laws.
2. Verification of node and mesh analysis.
3. Verification of network reduction techniques.
4. Determination of cold and hot resistance of an electric lamp
5. Determination of Parameters of a choke coil.
6. Determination of self, mutual inductances, and coefficient of coupling
7. Series and parallel resonance
8. Locus diagrams of R-L (L Variable) and R-C (C Variable) series circuits
9. Verification of Superposition theorem
10. Verification of Thevenin’s and Norton’s Theorems
11. Verification of Maximum power transfer theorem
12. Verification of Compensation theorem
13. Verification of Reciprocity and Millman’s Theorems

Reference Books:

1. Engineering Circuits Analysis, Jack Kemmerly, William Hayt and Steven Durbin, Tata Mc Graw Hill Education, 2005, sixth edition.
2. Network Analysis, M. E. Van Valkenburg, Pearson Education, 2019, Revised Third Editio

B.Tech. – I Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS102L	**HM**	**Health and Wellness, Yoga and Sports** (Common to all branches of Engineering)	**0**	**0**	**1**	**0.5**

Pre-Requisites: Nil

Course Objectives:

1. To maintain their mental and physical wellness upright and develop ability in them to cope up with the stress arising in the life.
2. To create space in the curriculum to nurture the potential of the students in sports/games/yoga etc.
3. To introduce a practice oriented introductory course on the subject.

Course Outcomes (COs):

On successful completion of the course, the students will be able to

CO1: Be Physical fit to perform daily routine without undue fatigue. (L2)

CO2: Be Mentally alert and Socially Cohesive(L2)

CO3: Consider success and failure equally.

CO4: Develop Positive Personality. (L3)

CO5: Improve Leadership qualities. (L3)

Unit I: **Health and Fitness:**

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community

ii) Preparation of health profile

iii) Preparation of chart for balance diet for all age groups

Unit II: Yoga:

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities: Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

Unit III: Sports and Fitness:

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.

Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.

2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.

3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24BSHB207T	BS	Complex Variables & Numerical Methods	2	1	0	3

Pre Requisites: Basic Knowledge of Mathematics

Course Objective:

To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real-world problems and their applications

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Use limits and Cauchy-Riemann equations to evaluate complex function differentiability, and apply the Milne-Thomson method to construct analytic functions for solving electromagnetic and signal processing problems. (L4)

CO2: Apply contour integration and residue calculus techniques to evaluate complex integrals and solve engineering problems in signal processing and circuit analysis. (L4)

CO3: Apply and compare numerical methods such as Bisection, Regula-Falsi, Newton-Raphson, Jacobi, and Gauss-Seidel to solve nonlinear equations and systems of algebraic equations arising in engineering problems. (L4)

CO4: Apply finite difference methods and interpolation formulas (Newton's forward/backward, Lagrange) to analyse data, and use least squares curve fitting to model engineering data with linear, quadratic, and exponential trends. (L4)

CO5: Apply and compare numerical methods such as Taylor's series, Picard's method, Euler's methods, and Runge-Kutta methods to solve ordinary differential equations encountered in engineering problems. (L4)

UNIT I: Complex Variable–Differentiation

Introduction to functions of complex variable-concept of Limit & continuity- Differentiation, Cauchy-Riemann equations, analytic functions harmonic functions, finding harmonic conjugate-construction of analytic function by Milne Thomson method.

UNIT II: Complex Variable–Integration

Line integral-Contour integration, Cauchy's integral theorem(Simple Case), Cauchy Integral formula, Power series expansions: Taylor's series, zeros of analytic functions, singularities, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

UNIT III: Solution of Algebraic & Transcendental Equations

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton Raphson method System of Algebraic equations: Jacoby and Gauss Siedal method.

UNIT IV: Interpolation

Finite differences-Newton's forward and backward interpolation formulae – Lagrange's formulae. Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares.

UNIT V: Solution of Initial value problems to Ordinary differential equations

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method

of successive Approximations-Euler's and modified Euler's methods-Runge-Kutta methods (second and fourth order).

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition
2. S.S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2018, 10th Edition.
2. B.V. Ramana, Higher Engineering Mathematics, by Mc Graw Hill publishers
3. R.K.Jainand S.R.K.Iyengar, Advanced Engineering Mathematics, Alpha Science International Ltd.,20215th Edition(9th reprint).

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc20_ma50/preview
3. http://nptel.ac.in/courses/111105090

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS204L	HM	Universal Human Values– Understanding Harmony and Ethical Human Conduct (Common for all branches of Engineering)	2	1	0	3

Pre Requisites: Nil

Course Objectives:

To help the students appreciate the essential complementary between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence. Such holistic perspective forms the basis of Universal Human Values and movement towards value-based living in a natural way.

To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Course Outcomes (COs):

CO1: Analyze the interrelationship between right understanding, human relationships, and physical facilities to identify how these contribute to holistic development and fulfilment of basic human aspirations. (L4)

CO2: Analyze the co-existence of the self and the body to distinguish their respective needs and evaluate the conditions necessary to ensure harmony, self-regulation, and health in the human being. (L4)

CO3: Differentiate core human values such as trust and respect, and examine their role in fostering harmonious relationships within the family and society, leading toward a universal human order. (L4)

CO4: Differentiate the four orders of nature and examine their interconnectedness to understand existence as co-existence, leading to a holistic perception of harmony in nature and the universe. (L4)

CO5: Examine how human values shape professional ethics and conduct, supporting competence and transition toward a value-based universal human order. (L4)

Unit I: Introduction to Value Education (6 lectures and 3 tutorials for practice session)

Lecture 1: Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education)

Lecture 2: Understanding Value Education

Tutorial 1: Practice Session PS1 Sharing about Oneself

Lecture 3: self-exploration as the Process for Value Education

Lecture4: Continuous Happiness and Prosperity – the Basic Human Aspirations

Tutorial 2: Practice Session PS2 Exploring Human Consciousness

Lecture 5: Happiness and Prosperity – Current Scenario

Lecture 6: Method to Fulfill the Basic Human Aspirations

Tutorial 3: Practice Session PS3 Exploring Natural Acceptance

UNIT II: Harmony in the Human Being (6 lectures and 3 tutorials for practice session)

Lecture 7: Understanding Human being as the Co-existence of the self and the body.

Lecture 8: Distinguishing between the Needs of the self and the body

Tutorial 4: Practice Session PS4 Exploring the difference of Needs of self and body.

Lecture 9: The body as an Instrument of the self

Lecture 10: Understanding Harmony in the self

Tutorial 5: Practice Session PS5 Exploring Sources of Imagination in the self

Lecture 11: Harmony of the self with the body

Lecture 12: Programme to ensure self-regulation and Health

Tutorial 6: Practice Session PS6 Exploring Harmony of self with the body

UNIT III: **Harmony in the Family and Society** (6 lectures and 3 tutorials for practice Sessions)
Lecture 13: Harmony in the Family – the Basic Unit of Human Interaction
Lecture 14: 'Trust' – the Foundational Value in Relationship
Tutorial 7: Practice Session PS7 Exploring the Feeling of Trust
Lecture 15: 'Respect' – as the Right Evaluation
Tutorial 8: Practice Session PS8 Exploring the Feeling of Respect
Lecture 16: Other Feelings, Justice in Human-to-Human Relationship
Lecture 17: Understanding Harmony in the Society
Lecture 18: Vision for the Universal Human Order
Tutorial 9: Practice Session PS9 Exploring Systems to fulfil Human Goal

UNIT IV: Harmony in the Nature/Existence (4 lectures and 2 tutorials for practice session)
Lecture 19: Understanding Harmony in the Nature
Lecture 20: Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature
Tutorial 10: Practice Session PS10 Exploring the Four Orders of Nature
Lecture 21: Realizing Existence as Co-existence at All Levels
Lecture 22: The Holistic Perception of Harmony in Existence
Tutorial 11: Practice Session PS11 Exploring Co-existence in Existence

UNIT V: Implications of the Holistic Understanding – a Look at Professional Ethics
(6 lectures and 3 tutorials for practice session)
Lecture 23: Natural Acceptance of Human Values
Lecture 24: Definitiveness of (Ethical) Human Conduct
Tutorial 12: Practice Session PS12 Exploring Ethical Human Conduct
Lecture 25: A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order
Lecture 26: Competence in Professional Ethics
Tutorial 13: Practice Session PS13 Exploring Humanistic Models in Education
Lecture 27: Holistic Technologies, Production Systems and Management Models-Typical Case Studies
Lecture 28: Strategies for Transition towards Value-based Life and Profession
Tutorial 14: Practice Session PS14 Exploring Steps of Transition towards Universal Human Order
Practice Sessions for UNIT I –Introduction to Value Education
PS1 Sharing about Oneself
PS2 Exploring Human Consciousness
PS3 Exploring Natural Acceptance
Practice Sessions for UNIT II –Harmony in the Human Being
PS4 Exploring the difference of Needs of self and body
PS5 Exploring Sources of Imagination in the self
PS6 Exploring Harmony of self with the body
Practice Sessions for UNIT III –Harmony in the Family and Society
PS7 Exploring the Feeling of Trust
PS8 Exploring the Feeling of Respect
PS9 Exploring Systems to fulfill Human Goal
Practice Sessions for UNIT IV –Harmony in the Nature (Existence)
PS10 Exploring the Four Orders of Nature
PS11 Exploring Co-existence in Existence
Practice Sessions for UNIT V –Implications of the Holistic Understanding –a Look at Professional Ethics
PS12 Exploring Ethical Human Conduct
PS13 Exploring Humanistic Models in Education
PS14 Exploring Steps of Transition towards Universal Human Order

READINGS:

Textbook and Teachers Manual

a. The Textbook

R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

b. The Teacher's Manual

R R Gaur, R Asthana, G P Bagaria,Teachers' Manual for A Foundation Course in Human Values and Professional Ethics,2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. JeevanVidya: EkParichaya,A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff(Book).
4. The Story of My Experiments with Truth-by Mohandas Karamchand Gandhi
5. Small is Beautiful-E. F Schumacher.
6. Slow is Beautiful -Cecile Andrews
7. Economy of Permanence-J C Kumarappa
8. Bharat Mein Angreji Raj–PanditSunderlal
9. Rediscovering India -by Dharampal
10. Hind Swaraj or Indian Home Rule-by Mohandas K. Gandhi
11. India Wins Freedom-Maulana Abdul Kalam Azad
12. Vivekananda-Romain Rolland (English)
13. Gandhi -Romain Rolland (English)

Mode of Conduct:

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them.

Tutorial hours are to be used for practice sessions.

While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self-exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up"ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practical are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignment and/or activity are included.

The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

It is recommended that this content be placed before the student as it is, in the form of a basic foundation course, without including anything else or excluding any part of this content.

Additional content may be offered in separate, higher courses. This course is to be taught by faculty from every teaching department, not exclusively by anyone department.

Teacher preparation with a minimum exposure to at least one 8-day Faculty Development Program on Universal Human Values is deemed essential.

Online Resources

1. *https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%201-Introduction%20to%20Value%20Education.pdf*
2. https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%202-Harmony%20in%20the%20Human%20Being.pdf
3. *https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%203-Harmony%20in%20the%20Family.pdf*
4. *https://fdp-si.aicte-india.org/UHV%201%20Teaching%20Material/D3-S2%20Respect%20July%2023.pdf*
5. *https://fdp-si.aicte-india.org/UHV-II%20Class%20Notes%20&%20Handouts/UHV%20Handout%205-Harmony%20in%20the%20Nature%20and%20Existence.pdf*
6. *https://fdp-si.aicte-india.org/download/FDP Teaching Material/3-days%20FDP-SI%20UHV%20Teaching%20Material/Day%203%20Handouts/UHV%203D%20D3-S2A%20Und%20Nature-Existence.pdf*
7. *https://fdp-si.aicte-india.org/UHV%20II%20Teaching%20Material/UHV%20II%20Lecture%2023-25%20Ethics%20v1.pdf*
8. *https://www.studocu.com/in/document/kiet-group-of-institutions/universal-human-values/chapter-5-holistic-understanding-of-harmony-on-professional-ethics/62490385*
https://onlinecourses.swayam2.ac.in/aic22_ge23/preview

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
23PC02203T	PC	Electromagnetic Field Theory	2	1	0	3

Pre Requisites: Fundamentals of Physics and Mathematics

Course Objectives: The objective of the course is to

1. To understand the concepts of vector analysis, basic principles of electrostatics.
2. To understand the concepts of conductors and Dielectrics.
3. To understand the basic principles of magneto statics for time invariant and time varying fields.
4. To understand the concepts of self and mutual inductance.
5. To understand the concepts of time varying fields.

Course Outcomes (COs): On successful completion of the Course, Student will be able to

CO1: Apply vector calculus and coordinate systems to analyse electrostatic fields and compute electric field, potential, and flux using Maxwell's equations, Gauss's law, and Laplace/Poisson equations. (L4)

CO2: Analyse the behaviour of conductors, dielectrics, and capacitors in electrostatic fields, and apply concepts of current density, polarization, boundary conditions, and energy storage to solve field-related problems. (L4)

CO3: Apply Biot-Savart's and Ampere's laws to compute magnetic fields, and analyse magnetic forces, dipoles, and torques in current-carrying conductors and moving charges. (L4)

CO4: Determine self and mutual inductance for standard geometries and evaluate energy stored and energy density in magnetic fields. (L4)

CO5: Explain electromagnetic induction and derive Maxwell's equations for time-varying fields, including displacement current, and compute energy flow using Poynting theorem and Poynting vector. (L4)

Unit-1: Vector Analysis

Vector Algebra: Scalars and Vectors, Unit vector, Vector addition and subtraction, and distance vectors, Vector multiplication, Components of a vector.

Coordinate Systems: Rectangular, Cylindrical and Spherical coordinate systems.

Vector Calculus: Differential length, Area and Volume. Del operator, Gradient of a scalar, Divergence of a vector and Divergence theorem (definition only). Curl of a vector and Stoke's theorem (definition only), Laplacian of a scalar.

Electrostatics: Coulomb's law and Electric field intensity (EFI) – EFI due to Continuous charge distributions (line and surface charge), Electric flux density, Gauss's law (Maxwell's first equation, $\nabla.D=\rho_v$), Applications of Gauss's law, Electric Potential, Work done in moving a point charge in an electrostatic field (second Maxwell's equation for static electric fields, $\nabla XE=0$), Potential gradient, Laplace's and Poison's equations.

Unit-2: Conductors – Dielectrics and Capacitance

Behaviour of conductor in Electric field, Electric dipole and dipole moment – Potential and EFI due to an electric dipole, Torque on an Electric dipole placed in an electric field, Current density-conduction and convection current densities, Ohm's law in point form, Behaviour of conductors in an electric field, Polarization, dielectric constant and strength, Continuity equation and relaxation time, Boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space, Capacitance of parallel plate, coaxial and spherical capacitors, Energy stored and density in a static electric field, Coupled and decoupled capacitors.

Unit-3: Magneto statics, Ampere's Law and Force in magnetic fields:

Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Magnetic flux density and Maxwell's second Equation ($\nabla.B=0$), Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation $\nabla XH=J$).

Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors, Magnetic dipole, Magnetic torque, and moment.

Unit -4: Self and mutual inductance

Self and mutual inductance – determination of self-inductance of a solenoid, toroid, coaxial cable and mutual inductance between a straight long wire and a square loop wire in the same plane – Energy stored and energy density in a magnetic field.

Unit -5: Time Varying Fields:

Faraday's laws of electromagnetic induction, Maxwell's fourth equation, integral and point forms of Maxwell's equations, statically and dynamically induced EMF, Displacement current, Modification of Maxwell's equations for time varying fields, Poynting theorem and Poynting vector

Textbook:

1. "Elements of Electromagnetics" by Matthew N O Sadiku, Oxford Publications, 7th edition, 2018.
2. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill, 7th Editon.2006.

Reference Books:

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt. Ltd, 2nd edition.
2. "Electromagnetic Field Theory" by Yaduvir Singh, Pearson India, 1st edition, 2011.
3. "Fundamentals of Engineering Electromagnetics" by Sunil Bhooshan, Oxford University Press, 2012.
4. Schaum's Outline of Electromagnetics by Joseph A. Edminister, Mahamood Navi, 4th Edition, 2014.

Web Resources:

1. https://archive.nptel.ac.in/courses/108/106/108106073/
2. https://nptel.ac.in/courses/117103065

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02204T	PC	Electrical Circuit Analysis-II	2	1	0	3

Pre Requisites: Fundamentals of Electrical Circuits

Course Objectives:

By the end of this course, the student will be able to:

1. Understand and analyse balanced and unbalanced three-phase electrical circuits.
2. Apply Laplace transform techniques for circuit analysis involving transients in RLC networks.
3. Evaluate network parameters and analyse two-port networks using different parameter representations.
4. Apply Fourier series techniques to analyse electrical circuits under periodic non-sinusoidal excitations.
5. Design and analyse passive filters including low-pass, high-pass, band-pass, and band-stop types.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Analyse voltages, currents, and power relationships in balanced and unbalanced three-phase circuits by examining star and delta connections, phase sequence, and measurement techniques. (L4)

CO2: Analyse transient responses of R-L, R-C, and R-L-C circuits using Laplace transforms with various excitations and solve related problems. (L4)

CO3: Evaluate two-port network parameters, perform conversions between parameter sets, and solve problems on series, parallel, and cascaded network interconnections. (L4)

CO4: Analyse periodic waveforms using Fourier series to interpret harmonic content, and examine their effects on effective value, average value, and power factor in electrical circuits. (L4)

CO5: Design and evaluate constant-k filters and identify appropriate filter types for signal processing applications. (L4)

UNIT I

Analysis of three phase balanced circuits:

Phase sequence, star and delta connection of sources and loads, relation between line and phase quantities, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits:

Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power.

UNIT II

Laplace transforms – Definition and Laplace transforms of standard functions– Shifting theorem – Transforms of derivatives and integrals, Inverse Laplace transforms and applications.

Transient Analysis: Transient response of R-L, R-C and R-L-C circuits (Series and parallel combinations) for D.C. and sinusoidal excitations – Initial conditions - Solution using differential equation approach and Laplace transform approach.

UNIT III

Network Parameters: Impedance parameters, Admittance parameters, Hybrid parameters, Transmission (ABCD) parameters, conversion of Parameters from one form to other, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations-problems.

UNIT IV

Analysis of Electric Circuits with Periodic Excitation: Fourier series and evaluation of Fourier coefficients, Trigonometric and complex Fourier series for periodic waveforms, Application to Electrical Systems – Effective value and average value of non-sinusoidal periodic waveforms, power factor, effect of harmonics.

UNIT V

Filters: Classification of filters-Low pass, High pass, Band pass and Band Elimination filters, Constant-k filters -Low pass and High Pass, Design of Filters.

Textbooks:

1. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, 8th Edition McGraw-Hill, 2013
2. Fundamentals of Electric Circuits, Charles K. Alexander, Mathew N. O. Sadiku, 3rd Edition, Tata McGraw-Hill, 2019.

Reference Books:

1. Network Analysis, M. E. Van Valkenburg, 3rd Edition, PHI, 2019.
2. Network Theory, N. C. Jagan and C. Lakshminarayana, 1st Edition, B. S. Publications, 2012.
3. Circuits and Networks Analysis and Synthesis, A. Sudhakar, Shyam Mohan S. Palli, 5th Edition, Tata McGraw-Hill, 2017.
4. Engineering Network Analysis and Filter Design (Including Synthesis of One Port Networks)- Durgesh C. KulshreshthaGopal G. Bhise, Prem R. Chadha ,Umesh Publications 2012.
5. Circuit Theory: Analysis and Synthesis, A. Chakrabarti, DhanpatRai& Co., 2018, 7th Revised Edition.

Web Resources:

1. https://archive.nptel.ac.in/courses/117/106/117106108/
2. https://archive.nptel.ac.in/courses/108/105/108105159/

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02205T	PC	DC Machines & Transformers	2	1	0	3

Pre Requisites: Fundamentals of Electrical circuits and Magnetic circuits

Course Objectives:

1. Understand the construction, principle of operation, EMF equation, characteristics, and applications of DC generators and DC motors.
2. Learn the starting methods, speed control techniques, efficiency, and testing procedures of DC machines.
3. Explore the construction, working principles, phasor diagrams, equivalent circuit, losses, and efficiency of single-phase transformers.
4. Gain knowledge about testing methods of transformers, separation of losses, and parallel operation with equal and unequal voltage ratios.
5. Study various three-phase transformer connections, vector groups, parallel operation, transients, and special connections like Scott connection

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Describe the construction, operation, EMF equation, excitation methods, and characteristics of DC generators. (L4)

CO2: Analyse DC motor characteristics, efficiency, starting methods, speed control techniques, and testing procedures. (L4)

CO3: Develop phasor diagrams, equivalent circuits, and calculate regulation and efficiency of single-phase transformers. (L4)

CO4: Perform open circuit, short circuit, and Sumpner's tests on transformers and evaluate parallel operation conditions. (L5)

CO5: Analyze various three-phase transformer connections, vector groups, and special transformer arrangements like Scott connection. (L4)

UNIT I

DC Generators:

Construction and principle of operation of DC machines – EMF equation for generator –Excitation techniques– characteristics of DC generators –applications of DC Generators, Back-emf and torque equations of DC motor – Armature reaction and commutation, Applications.

UNIT II

Starting, Speed Control and Testing of DC Machines:

Characteristics of DC motors – losses and efficiency – applications of DC motors. Necessity ofa starter – starting by 3-point and 4-point starters – speed control by armature voltage and field current control – testing of DC machines – brake test, Swinburne's test –Hopkinson's test–Field Test.

UNIT III

Single-phase Transformers:

Introduction to single-phase Transformers (Construction and principle of operation)–emf equation – operation on no-load and on load –lagging, leading and unity power factors loads–phasor diagrams– equivalent circuit –regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency, Applications.

UNIT IV

Testing of Transformers:

Open Circuit and Short Circuit tests – Sumpner's test – separation of losses— Parallel operation with equal and unequal voltage ratios– auto transformer – equivalent circuit –comparison with two winding transformers.

UNIT V

Three-Phase Transformers:

Polyphase connections- Y/Y, Y/Δ, Δ/Y, Δ/Δ, open Δ and Vector groups – third harmonics inphase voltages– Parallel operation–three winding transformers- transients in switching –offload and on load tap changers–Scott connection.

Textbooks:

1. Electrical Machinery by Dr. P S Bimbhra, 7th edition, Khanna Publishers, NewDelhi,1995.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical Machines by D. P.Kothari, I .J .Nagarth, McGraw Hill Publications, 5th edition
2. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education2011.
3. Generalized Theory of Electrical Machines by Dr. P S Bimbhra, 7th Edition, Khanna Publishers,2021.
4. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria&Sons, 2007.
5. Electric Machinery by Fitzgerald, A.E.,Kingsley, Jr.,C.,&Umans, S. D, 7th edition, McGraw-Hill Education, 2014.

Web Resources:

1. nptel.ac.in/courses/108/105/108105112
2. nptel.ac.in/courses/108/105/108105155

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02204P	PC	Electrical Circuit Analysis-II and Simulation Lab	0	0	3	1.5

Pre Requisites: Fundamentals of Electrical Circuits

Course Objectives:

1. To enable students to experimentally verify circuit laws and theorems using simulation tools.
2. To provide practical exposure to the analysis of three-phase power systems (balanced and unbalanced).
3. To develop proficiency in determining network parameters such as Z, Y, ABCD, and hybrid parameters.
4. To facilitate the understanding of resonance and transient behaviour in RLC circuits.
5. To encourage students to analyze and simulate complex electrical networks with software tools.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Measure and compute active and reactive power in balanced and unbalanced three- phase circuits using suitable methods. (L3)

CO2: Determine and interpret Z, Y, ABCD, and hybrid parameters of two-port networks using experimental techniques. (L4)

CO3: Apply simulation tools to demonstrate and solve circuits using basic electrical laws and theorems. (L3)

CO4: Analyse the behaviour of RLC circuits during resonance and transient conditions through simulation. (L4)

CO5: Analyse the effects of self-inductance and mutual inductance using circuit simulation tools. (L4)

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Measurement of Active Power and Reactive Power for balanced loads.
2. Measurement of Active Power and Reactive Power for unbalanced loads.
3. Determination of Z and Y parameters.
4. Determination of ABCD and hybrid parameters
5. Verification of Kirchhoff's current law and voltage law using simulation tools.
6. Verification of mesh and nodal analysis using simulation tools.
7. Verification of super position and maximum power transfer theorems using simulation tools.
8. Verification of Reciprocity and Compensation theorems using simulation tools.
9. Verification of Thevenin's and Norton's theorems using simulation tools.
10. Verification of series and parallel resonance using simulation tools.
11. Simulation and analysis of transient response of RL, RC and RLC circuits.
12. Verification of self-inductance and mutual inductance by using simulation tools.

Reference:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02205P	PC	DC Machines & Transformers Lab	0	0	3	1.5

Pre Requisites: DC Machines & Transformers

Course Objectives:

1. To determine the magnetization characteristics and critical conditions of DC generators.
2. To understand and analyze the methods of speed control and performance evaluation of DC motors.
3. To conduct various tests on DC machines to predict efficiency and evaluate machine performance.
4. To perform different tests on single-phase transformers and determine their equivalent circuit parameters and efficiency.
5. To examine the special operations of transformers such as parallel operation, Scott connection, and separation of core losses.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Determine the critical resistance, critical speed, and magnetization characteristics of a DC generator. (L3)

CO2: Perform speed control and load tests on DC motors and evaluate their performance through testing methods. (L3)

CO3: Conduct testing methods like Swinburne's, Hopkinson's, and field tests on DC machines to predict efficiency. (L4)

CO4: Perform open circuit and short circuit tests on single-phase transformers and evaluate equivalent circuits and efficiency. (L3)

CO5: Analyse the advanced operations of transformers such as Scott connection, parallel operation, and separation of core losses. (L4)

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Speed control of DC shunt motor by Field Current and Armature Voltage Control.
3. Brake test on DC shunt motor- Determination of performance curves.
4. Swinburne's test - Predetermination of efficiencies as DC Generator and Motor.
5. Hopkinson's test on DC shunt Machines.
6. Load test on DC compound generator-Determination of characteristics.
7. Load test on DC shunt generator-Determination of characteristics.
8. Fields test on DC series machines-Determination of efficiency.
9. Brake test on DC compound motor-Determination of performance curves.
10. OC & SC tests on single phase transformer.
11. Sumpner's test on single phase transformer.
12. Scott connection of transformers.
13. Parallel operation of Single-phase Transformers.
14. Separation of core losses of a single-phase transformer.

Reference:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24SE05201S	SE	Data structures	0	1	2	2

Pre-requisite:

- Knowledge in Computer Programming.
- Background in programming c

Course Objectives:

1. provide knowledge on advance data structures frequently used in Computer Science domain
2. Develop skills in algorithm design techniques popularly used
3. Understand the use of various data structures in the algorithm design

Course Outcomes:

CO1: Apply array operations, implement searching & sorting algorithms and analyse their efficiency using practical examples. (L4)

CO2: Develop programs to manipulate linked lists and solve real-world problems such as handling student information and adding polynomials. (L4)

CO3: Implement stack operations using arrays and linked lists, and develop algorithms for expression evaluation, backtracking, and list reversal including infix-to-postfix conversion and postfix evaluation. (L4)

CO4: Implement queue and deque operations using arrays and linked lists, including circular queues, and develop solutions for scheduling and related applications. (L4)

CO5: Implement binary tree and binary search tree operations including insertion, deletion, and traversals using linked lists. (L4)

UNIT- I

Introduction to Data Structures: Definition and importance of Data structures, Abstract data types (ADTs) and its specifications, Arrays: Introduction, 1-D, 2-D Arrays, accessing elements of array, Row Major and Column Major storage of Arrays, Searching Techniques: Linear & Binary Search, Sorting Techniques: Bubble sort, Selection sort, Quick sort.

Sample experiments:

1. Program to find min & max element in an array.
2. Program to implement matrix multiplication.
3. Find an element in given list of sorted elements in an array using Binary search.
4. Implement Selection and Quick sort techniques.

UNIT – II

Linked Lists: Singly linked lists: representation and operations, doubly linked lists and circular linked lists, Comparing arrays and linked lists, Applications of linked lists.

Sample experiments:

1. Write a program to implement the following operations.
   1.Insert b. Deletion c. Traversal
2. Write a program to store name, roll no, and marks of students in a class using circular double linked list.
3. Write a program to perform addition of given two polynomial expressions using linked list.

UNIT - III

Stacks: Introduction to stacks: properties and operations, implementing stacks using arrays and linked lists, Applications of stacks in expression evaluation, backtracking, reversing list etc.

Sample experiments:

1. Implement stack operations using a. Arrays b. Linked list
2. Convert given infix expression into post fix expression using stacks.
3. Evaluate given post fix expression using stack.
4. Write a program to reverse given linked list using stack.

UNIT- IV

Queues: Introduction to queues: properties and operations, Circular queues, implementing queues using arrays and linked lists, Applications of queues scheduling, etc.

Deques: Introduction to deques (double-ended queues), Operations on deques and their applications**.**

Sample experiments:

1. Implement Queue operations using a. Arrays b. Linked list
2. Implement Circular Queue using a. Arrays b. Linked list
3. Implement Dequeue using linked list**.**

UNIT - V

Trees: Introduction to Trees, Binary trees and traversals, Binary Search Tree – Insertion, Deletion & Traversal

Sample experiments:

1. Implement binary tree traversals using linked list.
2. Write program to create binary search tree for given list of integers. Perform in-order traversal of the tree. Implement insertion and deletion operations.

Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss, Pearson, 2nd Edition.
2. Fundamentals of data structures in C, Ellis Horowitz, SartajSahni, Susan Anderson Freed, Silicon Press, 2008

Reference Books:

1. Algorithms and Data Structures: The Basic Toolbox by Kurt Mehlhorn and Peter Sanders
2. C Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, and John E. Hopcroft
3. Problem Solving with Algorithms and Data Structures by Brad Miller and David Ranum
4. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein
5. Algorithms in C, Parts 1-5 (Bundle): Fundamentals, Data Structures, Sorting, Searching, and Graph Algorithms" by Robert Sedgewick

B. Tech. – II Year I Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS205A	HM	Environmental Science (Common for all branches of Engineering)	2	0	0	0

Pre Requisites: Nil

Course Objectives:

- To make the students to get awareness on environment.
- To understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- To save earth from the inventions by the engineers.

Course Outcomes (COs):

On Successful completion of the course, Students will be able to

CO1: Apply the concepts of multidisciplinary environmental studies to real-world issues by identifying the interconnections between natural resources and environmental problems. (L3)

CO2: Analyze the structure, function, and energy dynamics of various ecosystems and apply ecological principles and biodiversity conservation strategies to evaluate environmental issues and promote sustainable ecosystem management. (L4)

CO3: Analyze the causes, effects, and control measures of various types of pollution and disasters and apply appropriate pollution prevention and waste management strategies to mitigate environmental and public health risks. (L4)

CO4: Apply methods like rainwater harvesting, watershed management, and wasteland reclamation to practical scenarios and use of environmental laws (e.g., Air, Water, Wildlife Acts) to explain pollution control strategies to Encourage public awareness and responsible consumer behaviour. (L3)

CO5: Apply concepts of family welfare, value education, and IT in real-world contexts of environmental health and awareness. Use observations from field visits to identify environmental problems and local biodiversity. (L3)

UNIT I Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II Ecosystems: Concept of an ecosystem: – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem. d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its Conservation: Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a

mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III Environmental Pollution: Definition, Cause, effects and control measures of: a. Air Pollution. b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

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

UNIT V Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain Visit to a local polluted site-Urban /Rural/ Industrial/ Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Textbook of Environmental Studies for Undergraduate Courses Erach Bharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education
3. S. Azeem Unnisa, “Environmental Studies” Academic Publishing Company
4. K. Raghavan Nambiar, “Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus”, SciTech Publications (India), Pvt. Ltd.

Reference Books:

1. Deeksha Dave and E. Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2. M. Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3. J.P. Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice Hall of India Private limited
5. G.R. Chatwal, “A Text Book of Environmental Studies” Himalaya Publishing House 6. Gilbert M. Masters and Wendell P. Ela, “Introduction to Environmental Engineering and Science, Prentice Hall of India Private limited.
1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS206T	HM	Managerial Economics and Financial Analysis (Common for all branches of Engineering)	2	0	0	2

Pre Requisites: Nil

Course Objectives:

- To inculcate the basic knowledge of microeconomics and financial accounting
- To make the students learn how demand is estimated for different products, input-output relationship for optimizing production and cost
- To Know the Various types of market structure and pricing methods and strategy
- To give an overview on investment appraisal methods to promote the students to learn how to plan long-term investment decisions.
- To provide fundamental skills on accounting and to explain the process of preparing financial statements.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Understand the significance of managerial economics, analyse demand and its elasticity, and apply appropriate forecasting methods for effective business decision-making. (L4)

CO2: Analyse production functions, cost behaviours, and economies of scale, and apply break-even analysis to determine optimal production and cost efficiency in business decisions. (L4)

CO3: Explain forms of business organizations and analyse various market structures and pricing strategies for effective decision-making. (L4)

CO4: Explain the concept and components of working capital, identify sources of capital, and apply capital budgeting techniques for evaluating investment projects. (L4)

CO5: Apply accounting principles and conventions to prepare final accounts, and analyse financial performance using key financial ratios. (L4)

UNIT –I: Managerial Economics

Introduction –Nature, meaning, significance, functions, and advantages. Demand-Concept, Function, Law of Demand -Demand Elasticity-Types –Measurement. Demand Forecasting-Factors governing Forecasting, Methods. Managerial Economics and Financial Accounting and Management.

UNIT –II: Production and Cost Analysis

Introduction –Nature, meaning, significance, functions and advantages. Production Function– Least-cost combination–Short run and long run Production Function-Isoquants and Isocosts, Economies of Scale - Cost & Break-Even Analysis -Cost concepts and Cost Behavior-Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems).

UNIT –III: Business Organizations and Markets

Introduction –Forms of Business Organizations-Sole Proprietary -Partnership -Joint Stock Companies -Public Sector Enterprises. Types of Markets -Perfect and Imperfect Competition -Features of Perfect Competition Monopoly-Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT –IV: Capital Budgeting

Introduction –Nature, meaning, significance. Types of Working Capital, Components, Sources of Short-term and Long-term Capital, Estimating Working capital requirements. Capital Budgeting–

Features, Proposals, Methods and Evaluation. Projects –Pay Back Method, Accounting Rate of Return (ARR) Net Present Value (NPV) Internal Rate Return (IRR) Method (sample problems)

UNIT –V: Financial Accounting and Analysis

Introduction –Concepts and Conventions-Double-Entry Bookkeeping, Journal, Ledger, Trial Balance-Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Introduction to Financial Analysis -Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

Textbooks:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH.

Reference Books:

1. Ahuja Hl Managerial economics Schand.
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, New Delhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage.

Online Learning Resources:

https://www.slideshare.net/123ps/managerial-economics-ppt
https://www.slideshare.net/rossanz/production-and-cost-45827016
https://www.slideshare.net/darkyla/business-organizations-19917607
https://www.slideshare.net/balarajbl/market-and-classification-of-market

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS207T	HM	Organizational Behaviour (Common for all branches of Engineering)	2	0	0	2

Pre Requisites: Nil

Course Objectives:

- To enable student's comprehension of organizational behavior
- To offer knowledge to students on self-motivation, leadership and management
- To facilitate them to become powerful leaders
- To Impart knowledge about group dynamics
- To make them understand the importance of change and development

Course Outcomes (COs):

CO1: Explain the nature, scope, and functions of organization and examine individual behavior aspects to improve organizational effectiveness. (L4)

CO2: Apply theories of motivation to analyze the performance problems (L4)

CO3: Analyze the different theories of leadership and their application in the organizations. (L4)

CO4: Evaluate group dynamics and demonstrate skills required for working in groups (L4)

CO5: Develop as powerful leader by applying relevant theories to solve problems of change within the organizations. (L4)

UNIT –I: Introduction to Organizational Behavior

Meaning, definition, nature, scope and functions -Organizing Process –Making organizing effective -Understanding Individual Behavior –Attitude -Perception -Learning –Personality.

UNIT –II: Motivation and Leading

Theories of Motivation-Maslow's Hierarchy of Needs -Hertzberg's Two Factor Theory -Vroom's theory of expectancy –Mc Cleland's theory of needs–Mc Gregor's theory X and theory Y–Adam's equity theory.

UNIT –III: Organizational Culture

Introduction –Meaning, scope, definition, Nature -Organizational Climate -Leadership -Traits Theory–Managerial Grid -Transactional Vs Transformational Leadership -Qualities of good Leader -Conflict Management -Evaluating Leader.

UNIT –IV: Group Dynamics

Introduction –Meaning, scope, definition, Nature-Types of groups -Determinants of group behavior - Group process –Group Development -Group norms -Group cohesiveness -Small Groups -Group decision making -Team building -Conflict in the organization–Conflict resolution

UNIT –V: Organizational Change and Development

Introduction –Nature, Meaning, scope, definition and functions-Organizational Culture -Changing the Culture –Change Management –Work Stress Management -Organizational management –Managerial implications of organization's change and development

Textbooks:

1. Luthans, Fred, Organisational Behaviour, McGraw-Hill, 12th edition.
2. P Subba Ran, Organisational Behaviour, Himalya Publishing House.

Reference Books:

1. McShane, Organizational Behaviour, TMH

2. Nelson, Organisational Behaviour, Thomson.
3. Robbins, P. Stephen, Timothy A. Judge, Organisational Behaviour, Pearson.
4. Aswathappa, Organisational Behaviour, Himalaya.

Online Learning Resources:

https://www.slideshare.net/Knight1040/organizational- culture9608857
https://www.slideshare.net/AbhayRajpoot3/motivation - 165556714
https://www.slideshare.net/harshrastogi1/group-dynamics-159412405
https://www.slideshare.net/vanyasingla1/organizational

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24HMHS208T	HM	Business Environment (Common for all branches of Engineering)	2	0	0	2

Pre Requisites: Nil

Course Objectives:

- To make the student to understand about the business environment
- To enable them in knowing the importance of fiscal and monitory policy
- To facilitate them in understanding the export policy of the country
- To Impart knowledge about the functioning and role of WTO
- To Encourage the student in knowing the structure of stock markets

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Apply business environment concepts, classify types and industry structures, and assess environmental analysis pros and cons. (L3)

CO2: Apply concepts of public finance and evaluate recent trends and roles of institutions like RBI and Finance Commission. (L4)

CO3: Analyze India's Trade Policy (L4)

CO4: Analyze trade policies, agreements, EXIM policy, BoP issues, and WTO roles to assess global and Indian trade dynamics. (L4)

CO5: Analyze the Indian financial system, money and capital markets, SEBI regulations, and recent reforms including aspects of international finance. (L4)

UNIT –I: Overview of Business Environment

Introduction – meaning Nature, Scope, significance, functions and advantages. Types-Internal &External, Micro and Macro. Competitive structure of industries -Environmental analysis-advantages & limitations of environmental analysis.

UNIT –II: Fiscal & Monetary Policy

Introduction – Nature, meaning, significance, functions and advantages. Public Revenues - Public Expenditure - Evaluation of recent fiscal policy of GOI. Highlights of Budget- Monetary Policy - Demand and Supply of Money –RBI -Objectives of monetary and credit policy - Recent trends- Role of Finance Commission.

UNIT –III: India's Trade Policy

Introduction – Nature, meaning, significance, functions and advantages. Magnitude and direction of Indian International Trade - Bilateral and Multilateral Trade Agreements - EXIM policy and role of EXIM bank -Balance of Payments– Structure & Major components - Causes for Disequilibrium in Balance of Payments - Correction measures.

UNIT –IV: World Trade Organization

Introduction – Nature, significance, functions and advantages. Organization and Structure - Role and functions of WTO in promoting world trade - GATT -Agreements in the Uruguay Round –TRIPS, TRIMS - Disputes Settlement Mechanism - Dumping and Anti-dumping Measures.

UNIT –V: Money Markets and Capital Markets

Introduction – Nature, meaning, significance, functions and advantages. Features and components of Indian financial systems - Objectives, features and structure of money markets and capital markets - Reforms and recent development – SEBI – Stock Exchanges - Investor protection and role of SEBI, Introduction to international finance.

Textbooks:

1. Francis Cherunilam, International Business: Text and Cases, Prentice Hall of India.
2. K. Aswathappa, Essentials of Business Environment: Texts and Cases & Exercises 13th Revised Edition.HPH

Reference Books:

1. K. V. Sivayya, V. B. M Das, Indian Industrial Economy, Sultan Chand Publishers, New Delhi, India.
2. Sundaram, Black, International Business Environment Text and Cases, Prentice Hall of India, New Delhi, India.
3. Chari. S. N, International Business, Wiley India.
4. E. Bhattacharya, International Business, Excel Publications, New Delhi.

Online Learning Resources:

https://www.slideshare.net/ShompaDhali/business-environment-53111245
https://www.slideshare.net/rbalsells/fiscal-policy-ppt
https://www.slideshare.net/aguness/monetary-policy-presentationppt
https://www.slideshare.net/DaudRizwan/monetary-policy-of-india-69561982
https://www.slideshare.net/ShikhaGupta31/indias-trade-policyppt
https://www.slideshare.net/viking2690/wto-ppt-60260883
https://www.slideshare.net/prateeknepal3/ppt-mo

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC04208T	PC	Analog Circuits	2	1	0	3

Pre Requisites: Basic Knowledge on Mathematics, electrical concepts and semiconductor devices

Course Objectives:

- Understanding and applying fundamental principles to design and analyze analog circuits.
- Understanding the concepts like biasing, amplifier design, feedback, and the behaviour of various electronic components, such as diodes, transistors, and op-amps.
- Design and implementation of applications of IC's and analyse various ADC's and DAC's
- Design electronic circuits for a given specification.

Course Outcomes (COs):

On successful completion of the course, Student will be able to

CO1: Design and implement diode clipping and clamping circuits, analyze their transfer characteristics, and apply DC biasing techniques for BJTs to establish stable operating points with thermal stability. *(L4)*

CO2: Apply small-signal modeling techniques using h-parameters to analyze BJT amplifier configurations and their frequency responses, and evaluate the characteristics and effects of different types of negative feedback in amplifiers. (L4)

CO3: Design various oscillator circuits using the Barkhausen criterion, and demonstrate the characteristics and applications of the 741 Op-Amp. (L3)

CO4: Design and implement basic Op-Amp applications including instrumentation amplifiers, converters, and waveform generators, and analyze comparators and multivibrator circuits. (L4)

CO5: Explain and apply the operation & applications of 555 timers and phase-locked loops, and design and analyse various ADCs & DACs along with their specifications. (L4)

Unit I:

Diode clipping and clamping circuits: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, clamping circuit operation.

DC biasing of BJTs: Load lines, Operating Point, Bias Stability, Collector-to-Base Bias, Self-Bias, Stabilization against Variations in V_{BE} and β for the Self-Bias Circuit, Bias Compensation, Thermal Runaway, Thermal Stability.

Unit II:

Small Signals Modeling of BJT: Analysis of a Transistor Amplifier Circuit using h- parameters, Simplified CE Hybrid Model, Analysis of CE, CC, CB Configuration using Approximate Model, Frequency Response of CE and CC amplifiers.

Feedback Amplifiers: Classification of Amplifiers, the Feedback Concept, General Characteristics of Negative-Feedback Amplifiers, Effect of Negative Feedback upon Output and Input Resistances, Voltage-Series Feedback, Current-Series Feedback, Current-Shunt Feedback, Voltage-Shunt Feedback.

Unit III:

Oscillator Circuits: Barkhausen Criterion of oscillation, Oscillator operation, R-C phase shift oscillator, Wien bridge Oscillator, Crystal Oscillator.

Operational Amplifiers: Introduction, Basic information of Op-Amp, Ideal Operational Amplifier, Block Diagram Representation of Typical Op-Amp, OP-Amps Characteristics: Introduction, DC and AC characteristics, 741 op-amp & its features.

Unit IV:

OP-AMPS Applications: Introduction, Basic Op-Amp Applications, Instrumentation Amplifier, AC Amplifier, V to I and I to V Converter, Sample and Hold Circuit, Log and Antilog Amplifier, Multiplier and Divider, Differentiator, integrator.

Comparators and Waveform Generators: Introduction, Comparator, Square Wave Generator, Monostable Multivibrator, Triangular Wave Generator, Sine Wave Generators.

Unit V:

Timers and Phase Locked Loop: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger, PLL block schematic, principles and description of individual blocks, 565 PLL, Applications of VCO (566).

Digital To Analog And Analog To Digital Converters: Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A-D Converters – parallel Comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C.Halkias, Tata Mc-Graw Hill, 2nd Edition, 2010.
2. Linear Integrated Circuits – D. Roy Choudhury, New Age International (p) Ltd, 2nd Edition, 2003.

Reference Books:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad and Lowis Nashelsky, Pearson Edition, 2021.
2. Electronic Devices and Circuits–G.K. Mithal, Khanna Publisher, 23rd Edition, 2017.
3. Electronic Devices and Circuits – David Bell, Oxford, 5thEdition, 2008.
4. Electronic Principles–Malvino, Albert Paul, and David J. Bates, McGraw-Hill/Higher Education, 2007.
5. Operational Amplifiers and Linear Integrated Circuits– Gayakwad R.A, Prentice Hall India, 2002.
6. Operational Amplifiers and Linear Integrated Circuits –Sanjay Sharma, Kataria & Sons, 2nd Edition, 2010.
7. Design of Analog CMOS Integrated Circuits - Behzad Razavi

Web Resources:

1. https://nptel.ac.in/courses/122106025.
2. https://nptel.ac.in/courses/108102112.

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02206T	PC	Power Systems-I	2	1	0	3

Pre Requisites: Electrical Circuits

Course Objectives:

1. To introduce the principles and layout of hydroelectric and thermal power stations including major components and operation.
2. To provide knowledge on nuclear power generation, reactor types, radiation safety, and waste disposal methods.
3. To impart an understanding of air and gas insulated substations, their configurations, and equipment layouts.
4. To explain the design and operation of distribution systems and underground cables with associated technical parameters.
5. To analyze economic aspects of power generation and compare various tariff structures used in power systems.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Interpret the layout and operation of hydroelectric and thermal power plants, and examine the function and interrelation of major components. (L4)

CO2: Explain the working principles of nuclear power stations, reactor types, and evaluate radiation effects and waste management. (L4)

CO3: Illustrate the layout of air-insulated and gas-insulated substations and compare various bus bar arrangements. (L3)

CO4: Analyse the components and design considerations of distribution systems and underground cables. (L4)

CO5: Examine economic aspects of power generation and compare different tariff methods to understand their impact on energy billing efficiency. (L4)

UNIT I

Hydroelectric Power Stations:

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Thermal Power Stations: Selection of site, general layout of a thermal power plant. Brief description of components: boilers, super heaters, economizers and electrostatic precipitators, steam turbines: impulse and reaction turbines, condensers, feed water circuit, cooling towers and chimney.

UNIT II

Nuclear Power Stations:

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants, types of nuclear reactors and brief description of PWR, BWR and FBR. Radiation: radiation hazards and shielding, nuclear waste disposal.

UNIT III

Substations:

Air Insulated Substations – indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment. Bus bar arrangements in the substations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams.

Gas Insulated Substations (GIS) – advantages of gas insulated substations, constructional aspects of GIS, comparison of air insulated substations and gas insulated substations.

UNIT IV

Distribution Systems:

Classification of Distribution systems, A.C Distribution, overhead versus Underground system, Connection schemes of Distribution system, Requirements of Distribution system, Design considerations in Distribution system.

Underground Cables:

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables.

UNIT V

Economic Aspects & Tariff:

Economic Aspects – load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak load plants.

Tariff Methods– Costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block rate, two-part, three–part, and power factor tariff methods, Time of Day (ToD) tariff and Time of Use (ToU) tariff.

Textbooks:

1. S. N. Singh, Electric Power Generation, Transmission and Distribution, PHI Learning Pvt Ltd, New Delhi, 2nd Edition, 2010

2. J. B. Gupta, Transmission and Distribution of Electrical Power, S. K. Kataria and sons, 10th Edition, 2012

Reference Books:

1. I.J.Nagarath& D.P. Kothari, Power System Engineering, McGraw-Hill Education, 3rd Edition, 2019.

2. C.L.Wadhwa, Generation, Distribution and Utilization of Electrical Energy, New Age International Publishers, 6th Edition, 2018.

3. V. K. Mehta and Rohit Mehta, Principles of Power System, S. Chand, 4th Edition, 2005.

4. Turan Gonen, Electric Power Distribution System Engineering, McGraw-Hill, 1985.

5. Handbook of switchgear, BHEL, McGraw-Hill Education, 2007.

Web Resources:

1. https://nptel.ac.in/courses/108102047

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02207T	PC	Induction and Synchronous Machines	2	1	0	3

Pre Requisites: Electrical circuits, Magnetic circuits, DC Machines & Transformers

Course Objectives:

1. To understand the construction, principle of operation, and performance characteristics of three-phase induction motors.
2. To analyze the testing methods, torque-slip behaviour, starting, and speed control techniques of three-phase induction motors.
3. To comprehend the working principles, equivalent circuits, and starting methods of single-phase induction motors and special motors.
4. To explain the construction, EMF equation, armature reaction, voltage regulation, and synchronization of synchronous generators.
5. To analyze the operation, excitation effects, power development, and applications of synchronous motors.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Explain the construction and operation of squirrel cage and slip-ring induction motors, and examine their equivalent circuit, phasor diagram, and performance characteristics under various operating conditions. (L4)

CO2: Analyze the performance of three-phase induction motors through testing and evaluate methods of starting and speed control. (L4)

CO3: Explain the construction and working principles of single-phase induction motors and assess starting methods, equivalent circuits, and applications. (L4)

CO4: Describe the construction and working of synchronous generators and examine EMF generation, armature reaction, voltage regulation methods, and parallel operation techniques. (L4)

CO5: Explain the operating principles of synchronous motors, describe the effect of excitation on current and power factor, and interpret power development, hunting, starting methods, and applications. (L4)

UNIT I

3-phase induction motors:

Construction of Squirrel cage and Slip-ring induction motors– production of rotating magnetic field – principle of operation – rotor emf and rotor frequency – rotor current and power factor at standstill and during running conditions– rotor power input, rotor copper loss and mechanical power developed and their inter-relationship –equivalent circuit – phasor diagram, Applications.

UNIT II

Performance of 3-Phase induction motors:

Torque equation – expressions for maximum torque and starting torque – torque-slip characteristics – double cage and deep bar rotors –No load, Brake test and Blocked rotor tests– circle diagram for predetermination of performance- methods of starting –starting current and torque calculations -speed control of induction motor with V/f control method, rotor resistance control and rotor emf injection technique –crawling and cogging – induction generator operation.

UNIT III

Single Phase Motors:

Single phase induction motors – constructional features – double revolving field theory, Cross field theory – equivalent circuit- starting methods: capacitor start capacitor run, capacitor start induction run, split phase & shaded pole, AC series motor, Applications.

UNIT IV

Synchronous Generator:

Constructional features of non-salient and salient pole type alternators- armature windings –distributed and concentrated windings – distribution& pitch factors – E.M.F equation –armature reaction – voltage regulation by synchronous impedance method – MMF method and Potier triangle method –two reaction analysis of salient pole machines -methods of synchronization- Slip test – Parallel operation of alternators.

UNIT V

Synchronous Motor:

Synchronous motor principle and theory of operation – Effect of excitation on current and power factor– synchronous condenser –expression for power developed –hunting and its suppression – methods of starting, Applications.

Textbooks:

1. Electrical Machinery, Dr. P.S. Bhimbra, Khanna Publishing, 2021,First Edition.
2. Performance and analysis of AC machines by M.G. Say, CBS, 2002.

Reference Books:

1. Electrical machines, D.P. Kothari and I.J. Nagrath, McGraw Hill Education, 2017, Fifth Edition.
2. Theory & Performance of Electrical Machines by J.B.Gupta, S.K.Kataria& Sons,2007.
3. Electric Machinery, A.E.Fitzgerald, Charles kingsley, Stephen D.Umans, McGraw- Hill, 2020, Seventh edition.

Web Resources:

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

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02208T	PC	Control Systems	2	1	0	3

Pre Requisites: Laplace Transforms & inverse Laplace Transforms, Matrix basics and circuit analysis concepts

Course Objectives:

1. To introduce control system fundamentals, types, modeling techniques and servo mechanisms.
2. To analyze the time-domain response of first and second order systems and design basic controllers.
3. To examine the stability of control systems using Routh-Hurwitz and root locus techniques.
4. To perform frequency domain analysis using Bode, Polar and Nyquist plots and apply compensation techniques.
5. To understand state-space modeling, analyze system behavior using state-space methods, and assess controllability and observability.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Differentiate between open-loop and closed-loop control systems, develop mathematical models using differential equations and transfer functions, and apply block diagram and signal flow graph techniques for system analysis. (L4)

CO2: Analyse time domain responses of first and second order systems and design controllers to meet time domain specifications. (L4)

CO3: Describe system stability, use Routh's criterion and root locus methods to determine the impact of poles and zeros on system behaviour. (L4)

CO4: Determine frequency domain characteristics of control systems using Bode, Nyquist and Polar plots and design compensators. (L4)

CO5: Explain state variables and state models, derive transfer functions from state equations, and analyse system response, controllability, and observability using state-space methods. (L4)

UNIT I
CONTROL SYSTEMS CONCEPTS

Open loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback characteristics, Effects of positive and negative feedback, Mathematical models – Differential equations of translational and rotational mechanical systems and electrical systems, Analogous Systems, Block diagram reduction methods – Signal flow graphs - Reduction using Mason's gain formula. Principle of operation of DC and AC Servo motor, Transfer function of DC servo motor - AC servo motor, Synchros.

UNIT II
TIME RESPONSE ANALYSIS

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems – Time domain specifications – Steady state response - Steady state errors and error constants, P, PI, PID Controllers.

UNIT III
STABILITY ANALYSIS IN TIME DOMAIN

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

UNIT IV

FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis. Compensation techniques – Lag, Lead, and Lag-Lead Compensator design in frequency Domain.

UNIT V

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalizations, Transfer function from state model, solving the Time invariant state Equations- State Transition Matrix and its Properties. System response through State Space models. The concepts of controllability and observability, Duality between controllability and observability.

Textbooks:

1. Modern Control Engineering by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering by I. J. Nagrath and M. Gopal, New Age International (P) Limited Publishers, 5th edition, 2007.

Reference Books:

1. Control Systems Principles & Design by M.Gopal, 4th Edition, Mc Graw Hill Education, 2012.
2. Automatic Control Systems by B. C. Kuo and Farid Golnaraghi, John wiley and sons, 8th edition, 2003.
3. Feedback and Control Systems, Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Control System Design by Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, Pearson, 2000.
5. Feedback Control of Dynamic Systems by Gene F. Franklin, J.D. Powell and Abbas Emami-Naeini, 6th Edition, Pearson, 2010.

Web Resources:

1. https://nptel.ac.in/courses/108102043
2. https://nptel.ac.in/courses/108106098.

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02207P	PC	Induction and Synchronous Machines Lab	0	0	3	1.5

Pre Requisites: Induction and Synchronous Machines

Course Objectives:

1. To evaluate the performance characteristics of three-phase and single-phase induction motors through various tests.
2. To understand speed control methods and starting techniques of induction motors.
3. To conduct performance and regulation tests on synchronous generators and motors.
4. To perform parallel operation of alternators and efficiency determination of synchronous and AC series motors.
5. To analyze experimental results to understand the behaviour and performance improvements of AC machines.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Perform load tests, construct circle diagrams, and control the speed of induction motors to Assess their performance. (L3)

CO2: Evaluate starting techniques and methods for improving the efficiency of induction motors. (L3)

CO3: Conduct tests using various methods to determine regulation and reactance parameters of synchronous generators. (L4)

CO4: Analyse synchronous motor characteristics and performance through V-curves and efficiency tests. (L4)

CO5: Perform parallel operation of alternators and determine the efficiency of AC series motors under practical conditions. (L4)

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Brake test on three phase Induction Motor.
2. Circle diagram of three phase induction motor.
3. Speed control of three phase induction motor by V/f method.
4. Rotor resistance starter for slip ring Induction Motor.
5. Equivalent circuit of single-phase induction motor.
6. Power factor improvement of single-phase induction motor by using capacitors.
7. Load test on single phase induction motor.
8. Regulation of a three -phase alternator by synchronous impedance &MMF methods.
9. Regulation of three-phase alternator by Potier triangle method.
10. V and Inverted V curves of a three-phase synchronous motor.
11. Determination of Xd, Xq& Regulation of a salient pole synchronous generator.
12. Determination of efficiency of three phase alternator by loading with three phase induction motor.
13. Parallel operation of three-phase alternator under no-load and load conditions.
14. Determination of efficiency of a single-phase AC series Motor by conducting Brake test.

Reference:

1. https://ems-iitr.vlabs.ac.in/List%20of%20experiments.html

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24PC02208P	PC	Control Systems Lab	0	0	3	1.5

Pre Requisites: Control Systems

Course Objectives:

1. To enable students to analyze the behavior of second-order systems and understand system dynamics.
2. To familiarize students with the working principles and characteristics of servo motors, synchros, and magnetic amplifiers.
3. To apply and verify control strategies including PID controllers and compensation techniques in hardware and software platforms.
4. To provide hands-on experience in simulation tools like MATLAB for control system design and analysis.
5. To demonstrate practical implementation of state-space modeling techniques.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Apply time-domain analysis techniques to second-order systems and assess the effects of P, PI, PD,and PID controllers on system response. (L4)

CO2: Apply knowledge of control system components such as synchros, magnetic amplifiers, and servomotors to explain their characteristics and operation. (L3)

CO3: Implement and validate PID control and compensation techniques through simulation and real-time experimentation. (L3)

CO4: Simulate linear time-invariant systems and perform time and frequency domain analyses using MATLAB tools. (L3)

CO5: Develop and analyse state-space models of control systems using MATLAB. (L4)

List of Experiments:

Any 10 of the following experiments are to be conducted:

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order system
7. Lag and lead compensation – Magnitude and phase plot
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
12. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
13. State space model for classical transfer function using MATLAB – Verification.

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24SE05202S	SE	Python Programming (Common for all branches of Engineering)	0	1	2	2

Pre Requisites: Fundamentals of C Programming Language

Course Objective:

The main objectives of the course are to

1. Introduce core programming concepts of Python programming language.
2. Demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
3. Implement Functions, Modules and Regular Expressions in Python Programming and to create practical and contemporary applications using these.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Describe the evolution and thrust areas of Python, and develop basic Python programs using variables, data types, operators, expressions, and input/output constructs in Jupyter Notebook. (L3)

CO2: Develop Python programs using user-defined functions with parameters and return values, apply string and list operations, and utilize built-in functions and command-line arguments. (L4)

CO3: Apply tuple, set, and dictionary operations in Python, including indexing, slicing, built-in methods, and key-value manipulation for data processing tasks. (L4)

CO4: Apply file handling techniques and object-oriented programming concepts such as encapsulation, inheritance, and polymorphism to develop structured and reusable Python programs. (L4)

CO5: Analyse and apply data science libraries such as JSON, NumPy, Pandas, and Matplotlib to perform data processing, manipulation, and visualization using Python. (L4)

LIST OF EXPERIMENTS

Unit – 1:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement, while Loop, for Loop, continue and break Statements, Catching Exceptions Using try and except Statement.

Sample Experiments:

1. Write a program to find the largest element among three Numbers.
2. Write a Program to display all prime numbers within an interval
3. Write a program to swap two numbers without using a temporary variable.
4. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
5. Write a program to add and multiply complex numbers
6. Write a program to print multiplication table of a given number.

Unit – II:

Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Experiments:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to perform the given operations on a list: i) Addition ii) Insertion iii) slicing
12. Write a program to perform any 5 built-in functions by taking any list.

Unit – III:

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple () Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, using zip () Function, Sets, Set Methods, Frozenset.

Sample Experiments:

13. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
14. Write a program to count the number of vowels in a string (No control flow allowed).
15. Write a program to check if a given key exists in a dictionary or not.
16. Write a program to add a new key-value pair to an existing dictionary.
17. Write a program to sum all the items in a given dictionary.

Unit – IV:

Files: Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism.

Sample Experiments:

18. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
19. Python program to print each line of a file in reverse order.
20. Python program to compute the number of characters, words and lines in a file.
21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

Unit – V:

Introduction to Data Science: Functional Programming, JSON and XPython, NumPy with Python, Pandas.

Sample Experiments:

24. Python program to check whether a JSON string contains complex object or not25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list this list contains at least ten values and convert this dictionary as a pandas data and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame.
    b) Perform various data selection operations on Data Frame.
30. Select any two columns from the above data frame, and observe the change attribute with respect to other attribute with scatter and plot operations in matplotlib.

Reference Books:

1. Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24ES03102T	ES	Design Thinking & Innovation (Common for all branches of Engineering)	1	0	2	2

Pre Requisites: Nil

Course Objectives: The main objectives of the course is to

- familiarize students with design thinking process as a tool for breakthrough innovation.
- equip students with design thinking skills and ignite the minds to create innovative ideas.
- develop solutions for real-time problems.

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

CO1: Explain fundamental elements and principles of design, and analyze the role of design thinking and material innovations in shaping modern industrial practices. (L4)
CO2: Apply the design thinking process—empathize, analyze, ideate, prototype—and use tools like journey maps and brainstorming to develop innovative solutions for product and social innovation. (L4)
CO3: Distinguish between creativity and innovation, and apply creative thinking in teams to develop and evaluate innovative ideas in organizational contexts. (L4)
CO4: Formulate problems and define product specifications by applying product design strategies and planning for value-driven innovation. (L4)
CO5: Apply design thinking principles to address business challenges and develop innovative business models, prototypes, and startup strategies. (L4)

UNIT – I: Introduction to Design Thinking

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry.

UNIT – II: Design Thinking Process

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brainstorming, product development.

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development.

UNIT – III: Innovation

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations- Creativity to Innovation- Teams for innovation- Measuring the impact and value of creativity.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation.

UNIT – IV: Product Design

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design.

UNIT – V: Design Thinking in Business

Processes Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes.

Activity: How to market our own product, About maintenance, Reliability and plan for startup.

Textbooks:

1. Tim Brown,Change by design, Harper Bollins (2009)

2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press

2. Shrutin N Shetty, Design the Future, Norton Press

3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.

4. Chesbrough.H, The Era of Open Innovation – 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/ https://nptel.ac.in/courses/109/104/109104109/ https://swayam.gov.in/nd1_noc19_mg60/preview

B. Tech. – II Year II Semester

Course Code	Category	Name of the Course	L	T	P	C
24IPCP301L	IP	**Community Service Project** (Common for all branches of Engineering)	0	0	0	2

Pre Requisites: Problem-Solving & Critical Thinking, Communication & Presentation Skills, Teamwork & Collaboration Skills, Foundations in Ethics and Social Responsibility.

Course Objectives:

- To develop social awareness and responsibility among engineering students by engaging with real-world community needs.
- To apply basic engineering knowledge and problem-solving skills in designing practical solutions for local societal challenges.
- To foster teamwork, leadership, and communication skills through collaborative, interdisciplinary project work.
- To cultivate ethical reasoning, empathy, and intercultural understanding by working with diverse communities and stakeholders.
- To enhance students' ability to plan, execute, and document projects through structured project management and reporting.
- To bridge academic learning with practical experience, strengthening the relevance of engineering education to societal development.

Course Outcomes (COs):

On successful completion of the Course, Student will be able to

CO1: Apply engineering knowledge to identify and address community needs through structured service-based projects. (L3)

CO2: Work collaboratively in diverse teams to plan, execute, and evaluate community service initiatives. (L3)

CO3: Communicate project goals, processes, and outcomes effectively through written reports and oral presentations. (L3)

CO4: Assess the social, ethical, and environmental implications of engineering solutions implemented in community settings. (L4)

CO5: Evaluate personal and professional development achieved through community engagement, with emphasis on leadership, empathy, and social responsibility. (L4)

COMMUNITY SERVICE PROJECT ……Experiential learning through community engagement

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will benefit with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and emerge as a socially responsible institution.

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships.

The specific objectives are

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box solutions to social problems.
- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in 6 weeks for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, housewives, etc
- A logbook must be maintained by each of the students, where the activities undertaken/ involved to be recorded.
- The logbook has to be countersigned by the concerned mentor/faculty in charge.
- An evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programs of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project reports should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training.

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, to enable them to commute from their residence and return back by evening or so.
    - The Community Service Project is a twofold one –
        - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be

viewed as a duplication of work by the Village or Ward volunteers, rather, it could be another primary source of data.

- Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like –
  - Agriculture
  - Health
  - Marketing and Cooperation
  - Animal Husbandry
  - Horticulture
  - Fisheries
  - Sericulture
  - Revenue and Survey
  - Natural Disaster Management
  - Irrigation
  - Law & Order
  - Excise and Prohibition
  - Mines and Geology
  - Energy
  - Internet
  - Free Electricity
  - Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development.
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills.

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity. Relationship with the Institution
- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research.

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment.
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation
- Valuable human resources needed to achieve community goals.
- New energy, enthusiasm and perspectives applied to community work.
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following the recommended list of projects for Engineering students. The lists are not exhaustive and open for additions, deletions, and modifications. Colleges are expected to focus on specific local issues for this kind of project. The students are expected to carry out these projects with involvement, commitment, responsibility, and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of project. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting should be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aqua culture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases

22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Crop rotation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species 3
3. Food adulteration
34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling level- observation.

Complimenting the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programs

Programs for School Children

1. Reading Skill Program (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Program on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Program on Socially relevant themes.

Programs for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Women's Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programs on Environment
10. Health and Hygiene
11. Hand wash programmes

12. Commemoration and Celebration of important days

Programs for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programs

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programs in consonance with the Govt. Departments like –

i. Agriculture
ii. Health
iii. Marketing and Cooperation
iv. Animal Husbandry
v. Horticulture
vi. Fisheries
vii. Sericulture
viii. Revenue and Survey
ix. Natural Disaster Management
x. Irrigation
xi. Law & Order
xii. Excise and Prohibition
xiii. Mines and Geology
xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also, with the Governmental Departments. If the program is rolled out, the district Administration could be roped in for the successful deployment of the program.
- An in-house training and induction program could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. **Preliminary Survey (One Week)**

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secreteriats could be aligned for the survey.

2. **Community Awareness Campaigns (One Week)**

• Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. **Community Immersion Programme (Three Weeks)**

Along with the Community Awareness Programmes, the student batch can also work with any one of the below-listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to experiential learning about the community and its dynamics. Programs could be in consonance with the Govt. Departments.

4. **Community Exit Report (One Week)**

• During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks' works to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily logbook needs to be maintained by the student's batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.