

**N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY  
(AUTONOMOUS)**

**R-23 B.TECH. - COURSE STRUCTURE**

**B.Tech. Regular Full Time  
effective for the students admitted into I B.Tech  
from the AY 2023-24 onwards  
&  
B.Tech (Lateral Entry Scheme)  
effective for the students admitted into II B.Tech  
through LE scheme from the AY 2024-25 onwards**

**INDUCTION PROGRAM  
1<sup>st</sup> Year B.Tech 1<sup>st</sup> Semester**

<b>S.No.</b>	<b>Course Name</b>	<b>Category</b>	<b>L-T-P-C</b>
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

**1<sup>st</sup> Year B.Tech 1<sup>st</sup> Semester**  
**Group A: CSE, CSE (AI&ML), CSE (DS), IT**

S.No.	Category	Title	L/D	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS&H	Engineering Chemistry/ Chemistry/Fundamental Chemistry	3	0	0	3
3	BS&H	Linear Algebra & Calculus	3	0	0	3
4	Engineering Science	Basic Civil & Mechanical Engineering	3	0	0	3
5	Engineering Science	Introduction to Programming	3	0	0	3
6	BS&H	Communicative English Lab	0	0	2	1
7	BS&H	Engineering Chemistry/ Chemistry/Fundamental Chemistry Lab	0	0	2	1
8	Engineering Science	Engineering Workshop	0	0	3	1.5
9	Engineering Science	Computer Programming Lab	0	0	3	1.5
10	BS&H	Health and wellness, Yoga and Sports	-	-	1	0.5
<b>Total</b>			<b>14</b>	<b>00</b>	<b>11</b>	<b>19.5</b>

**B.Tech 1<sup>st</sup> Year 1<sup>st</sup> Semester**  
**Group B: Civil, Mechanical, EEE, ECE, AI&DS**

No	Category	Title	L/D	T	P	Credits
1	BS&H	Engineering Physics	3	0	0	3
2	BS&H	Linear Algebra & Calculus	3	0	0	3
3	Engineering Science	Basic Electrical & Electronics Engineering	3	0	0	3
4	Engineering Science	Engineering Graphics	1	0	4	3
5	Engineering Science	Introduction to Programming	3	0	0	3
6	Engineering Science	IT Workshop	0	0	2	1
7	BS&H	Engineering Physics Lab	0	0	2	1
8	Engineering Science	Electrical & Electronics Engineering Workshop	0	0	3	1.5
9	Engineering Science	Computer Programming Lab	0	0	3	1.5
10	BS&H	NSS/NCC/Scouts & Guides/Community Service	-	-	1	0.5
<b>Total</b>			<b>13</b>	<b>00</b>	<b>15</b>	<b>20.5</b>

**B.Tech 1<sup>st</sup> Year 2<sup>nd</sup> Semester**  
**Group A: CSE, CSE (AI&ML), CSE (DS), IT**

No	Category	Title	L/D	T	P	Credits
1	BS&H	Engineering Physics	3	0	0	3
2	BS & H	Differential Equations & Vector Calculus	3	0	0	3
3	Engineering Science	Basic Electrical and Electronics Engineering	3	0	0	3
4	Engineering Science	Engineering Graphics	1	0	4	3
5	Engineering Science	IT Workshop	0	0	2	1
6	Professional Core	Data Structures / Electrical Circuit Analysis-I	3	0	0	3
7	BS&H	Engineering Physics Lab	0	0	2	1
8	Engineering Science	Electrical and Electronics Engineering Workshop	0	0	3	1.5
9	Professional Core	Data Structures Lab / Electrical Circuit Analysis -I Lab	0	0	3	1.5
10	BS&H	NSS/NCC/Scouts & Guides/ Community Service	-	-	1	0.5
<b>Total</b>			<b>13</b>	<b>0</b>	<b>15</b>	<b>20.5</b>

**B.Tech 1<sup>st</sup> Year 2<sup>nd</sup> Semester**  
**Group B: Civil, Mechanical, EEE, ECE, AI&DS**

No	Category	Title	L	T	P	Credits
1	BS&H	Communicative English	2	0	0	2
2	BS & H	Engineering Chemistry / Chemistry /Fundamental Chemistry	3	0	0	3
3	Engineering Science	Differential Equations & Vector Calculus	3	0	0	3
4	Engineering Science	Basic Civil & Mechanical Engineering	3	0	0	3
5	Professional Core	Engineering Mechanics/Network Analysis/ Data structures (Branch specific)	3	0	0	3
6	BS&H	Communicative English Lab	0	0	2	1
7	BS&H	Engineering Chemistry / Chemistry /Fundamental Chemistry Lab	0	0	2	1
8	Engineering Science	Engineering Workshop	0	0	3	1.5
9	Professional Core	Engineering Mechanics & Building Practices Lab Engineering Mechanics Lab/ Network Analysis Lab/ Data structures Lab	0	0	3	1.5
10	BS&H	Health and wellness, Yoga and Sports	-	-	1	0.5
<b>Total</b>			<b>14</b>	<b>0</b>	<b>11</b>	<b>19.5</b>

**N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY**  
**(AUTONOMOUS)**  
**Affiliated to JNTUA, Ananthapuramu**  
**R-23 I B.Tech. COURSE SYLLABI**

**COMMUNICATIVE ENGLISH**  
 (Common to All Branches of Engineering)

L	T	P	C
2	0	0	2

**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 to make them effective in speaking and writing skills and to make them industry-ready

**Course Outcomes**

- Understand the context, topic, and pieces of specific information from social or transactional dialogues.
- Apply grammatical structures to formulate sentences and correct word forms.
- Analyze discourse markers to speak clearly on a specific topic in informal discussions.
- Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
- Create a coherent paragraph, essay, and resume.

<b>UNIT I</b>	
<b>Lesson</b>	: HUMAN VALUES: Gift of Magi (Short Story)
<b>Listening</b>	: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.
<b>Speaking</b>	: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.
<b>Reading</b>	: Skimming to get the main idea of a text; scanning to look for specific pieces of information.
<b>Writing</b>	: Mechanics of Writing - Capitalization, Spellings, Punctuation – Parts of Sentences.
<b>Grammar</b>	: Parts of Speech, Basic Sentence Structures-forming questions
<b>Vocabulary</b>	: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words

<b>UNIT II</b>	
<b>Lesson</b>	: NATURE: The Brook by Alfred Tennyson (Poem)
<b>Listening</b>	: Answering a series of questions about main ideas and supporting ideas after listening to audio texts.
<b>Speaking</b>	: Discussion in pairs/small groups on specific topics followed by short structure talks.
<b>Reading</b>	: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
<b>Writing</b>	: Structure of a paragraph - Paragraph writing (specific topics)
<b>Grammar</b>	: Cohesive devices - linkers, use of articles and zero article; <b>prepositions.</b>
<b>Vocabulary</b>	: Homonyms, Homophones, Homographs.

<b>UNIT III</b>	
<b>Lesson</b>	: <b>BIOGRAPHY: Elon Musk</b>
<b>Listening</b>	: <b>Listening for global comprehension and summarizing what is listened to.</b>
<b>Speaking</b>	: <b>Discussing specific topics in pairs or small groups and reporting what is discussed</b>
<b>Reading</b>	: <b>Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.</b>
<b>Writing</b>	: <b>Summarizing, Note-making, paraphrasing</b>
<b>Grammar</b>	: <b>Verbs - tenses; subject-verb agreement; Compound words, Collocations</b>
<b>Vocabulary</b>	: <b>Compound words, Collocations</b>

<b>UNIT IV</b>	
<b>Lesson</b>	: <b>INSPIRATION: The Toys of Peace by Saki</b>
<b>Listening</b>	: <b>Making predictions while listening to conversations/ transactional dialogues without video; listening with video.</b>
<b>Speaking</b>	: <b>Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.</b>
<b>Reading</b>	: <b>Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.</b>
<b>Writing</b>	: <b>Letter Writing: Official Letters, Resumes</b>
<b>Grammar</b>	: <b>Reporting verbs, Direct &amp; Indirect speech, Active &amp; Passive Voice</b>
<b>Vocabulary</b>	: <b>Words often confused, Jargons</b>

<b>UNIT V</b>	
<b>Lesson</b>	: <b>MOTIVATION: The Power of Intrapersonal Communication (An Essay)</b>
<b>Listening</b>	: <b>Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.</b>
<b>Speaking</b>	: <b>Formal oral presentations on topics from academic contexts</b>
<b>Reading</b>	: <b>Reading comprehension.</b>
<b>Writing</b>	: <b>Writing structured essays on specific topics.</b>
<b>Grammar</b>	: <b>Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)</b>
<b>Vocabulary</b>	: <b>Technical Jargons</b>

**Textbooks:**

1. **Pathfinder: Communicative English for Undergraduate Students, 1<sup>st</sup> Edition, Orient Black 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 University Press, 2019.**
4. **Lewis, Norman. Word Power Made Easy- The Complete Handbook for Building a Superior Vocabulary. Anchor, 2014.**

## Web Resources:

### GRAMMAR:

1. [www.bbc.co.uk/learningenglish](http://www.bbc.co.uk/learningenglish)
2. <https://dictionary.cambridge.org/grammar/british-grammar/>
3. [www.eslpod.com/index.html](http://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](https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA)

## COMMUNICATIVE ENGLISH LAB (Common to All Branches of Engineering)

L	T	P	C
0	0	2	1

### 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 students will get trained in the basic communication skills and also make them ready to face job interviews.

### Course Outcomes:

- Understand the different aspects of the English language proficiency with emphasis on LSRW skills.
- Apply communication skills through various language learning activities.
- Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- Evaluate and exhibit professionalism in participating in debates and group discussions.
- Create effective resonate and prepare themselves to face interviews in future.

### List of Topics:

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

### Suggested Software:

- Walden Infotech
- Young India Films

### Reference Books:

1. Meenakshi Raman, Sangeeta-Sharma. *Technical Communication*. Oxford Press.2018.
2. Grant Taylor: *English Conversation Practice*, Tata McGraw-Hill Education India, 2016
3. Hewing's, Martin. *Cambridge Academic English (B2)*. CUP, 2012.
4. T. Balasubramanyam, *A Textbook of English Phonetics for Indian Students*,(3rd Ed) Trinity Press.

## Web Resources:

### Spoken English:

1. [www.esl-lab.com](http://www.esl-lab.com)
2. [www.englishmedialab.com](http://www.englishmedialab.com)
3. [www.englishinteractive.net](http://www.englishinteractive.net)
4. <https://www.britishcouncil.in/english/online>
5. <http://www.letstalkpodcast.com/>
6. [https://www.youtube.com/c/mmmEnglish\\_Emma/featured](https://www.youtube.com/c/mmmEnglish_Emma/featured)
7. <https://www.youtube.com/c/ArnelsEverydayEnglish/featured>
8. <https://www.youtube.com/c/engvidAdam/featured>
9. <https://www.youtube.com/c/EnglishClass101/featured>
10. <https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists>
11. [https://www.youtube.com/channel/UCV1h\\_cBE0Drdx19qkTM0WNw](https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw)

### Voice & Accent:

1. <https://www.youtube.com/user/letstalkaccent/videos>
2. <https://www.youtube.com/c/EngLanguageClub/featured>
3. [https://www.youtube.com/channel/UC\\_OskgZBoS4dAnVUgJVexc](https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc)
4. [https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp\\_IA](https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA)

## **LINEAR ALGEBRA & CALCULUS**

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

### Course Objectives:

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications.

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

- Develop matrix algebra techniques that is needed by engineers for practical applications.
- Familiarize with functions of several variables which is useful in optimization.
- Learn important tools of calculus in higher dimensions.
- Familiarize with double and triple integrals of functions of several variables in two and three dimensions.

### 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, Gauss Seidel Iteration Method.

### UNIT II      **Linear Transformation and Orthogonal Transformation:**

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

### **UNIT III     Calculus**

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)**

Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, 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).

#### **Textbooks:**

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

#### **Reference Books:**

1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
3. Glyn James, Advanced Modern Engineering Mathematics, 5/e, Pearson publishers, 2018.
4. Michael Greenberg, Advanced Engineering Mathematics, 9<sup>th</sup> edition, Pearson edn
5. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand, 2021



# DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches of Engineering)

L	T	P	C
3	0	0	3

## Course Objectives:

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

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

- Solve the differential equations related to various engineering fields.
- Identify solution methods for partial differential equations that model physical processes.
- Interpret the physical meaning of different operators such as gradient, curl and divergence.
- Estimate the work done against a field, circulation and flux using vector calculus.

## 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, 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 applications of these theorems.

## Textbooks:

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. Micheal 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, McGraw Hill Education, 2017

**ENGINEERING PHYSICS**  
(Common for all branches of Engineering)

L	T	P	C
3	0	0	3

**Course Objectives:**

To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the 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:**

- Analyze the intensity variation of light due to polarization, interference and diffraction.
- Familiarize with the basics of crystals and their structures.
- Explain fundamentals of quantum mechanics and apply to one dimensional motion of particles.
- Summarize various types of polarization of dielectrics and classify the magnetic materials.
- Explain the basic concepts of Quantum Mechanics and the band theory of solids.
- Identify the type of semiconductor using Hall effect.

**UNIT I Wave Optics**

**Interference:** Introduction - Principle of superposition -Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors 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**

**Crystallography:** 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 - Hall effect and its applications.

### **Textbooks:**

1. A Text book of Engineering Physics - M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy, S. Chand Publications, 11th Edition 2019.
2. Engineering Physics - D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

### **Reference Books:**

1. Engineering Physics - B.K. Pandey and S. Chaturvedi, Cengage Learning
2. Engineering Physics - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
3. Engineering Physics" - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
4. Engineering Physics - M.R. Srinivasan, New Age international publishers (2009).

**ENGINEERING PHYSICS LAB**  
(Common to All Branches of Engineering)

L	T	P	C
0	0	2	1

**Course Objectives:**

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

**Course Outcomes: The students will be able to**

- Operate optical instruments like travelling microscope and spectrometer.
- Estimate the wavelengths of different colors using diffraction grating.
- Plot the intensity of the magnetic field of circular coil carrying current with distance.
- Evaluate dielectric constant and magnetic susceptibility for dielectric and magnetic materials respectively.
- Calculate the band gap of a given semiconductor.
- Identify the type of semiconductor using Hall effect.

**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 and Hall coefficient of a given semiconductor 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. Out of which any TWO experiments may be conducted in virtual mode.

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

**URL:**[www.vlab.co.in](http://www.vlab.co.in)

# ENGINEERING CHEMISTRY

(Common to Civil, Mechanical Engineering and allied branches)

L	T	P	C
3	0	0	3

## Course Objectives:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

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

- Demonstrate the corrosion prevention methods and factors affecting corrosion.
- Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.
- Explain calorific values, octane number, refining of petroleum and cracking of oils.
- Explain the setting and hardening of cement.
- Summarize the concepts of colloids, micelle and nanomaterials.

## UNIT I Water Technology

Soft and hardwater, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles - Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment - Specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

## UNIT II Electrochemistry and Applications

Electrodes - electrochemical cell, Nernst equation, cell potential calculations. Primary cells - Zinc-air battery, Secondary cells - Nickel-Cadmium (NiCad), and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell. Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

## UNIT III Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization.

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC Nylon 6,6 and Bakelite.

Elastomers - Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers. Fuels - Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octane and Cetane number- alternative fuels- propane, methanol, ethanol and bio fuel-bio diesel.

## UNIT IV Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils - Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

## UNIT V Surface Chemistry and Nanomaterials

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nanomaterials - catalysis, medicine, sensors, etc.

### Textbooks:

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

### Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heinemann, 1992.

## ENGINEERING CHEMISTRY LAB

(Common to Civil, Chemical, Mechanical Engineering & allied branches)

L	T	P	C
0	0	2	1

### Course Objectives:

To Verify the fundamental concepts with experiments

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

- Determine the cell constant and conductance of solutions.
- Prepare advanced polymer materials.
- Determine the physical properties like surface tension, adsorption and viscosity.
- Estimate the Iron and Calcium in cement.
- Calculate the hardness of water.

### List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron in Cement sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter

### Reference:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

## **CHEMISTRY**

(Common to EEE, ECE, CSE, IT) & allied branches)

L	T	P	C
3	0	0	3

### **Course Objectives:**

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches

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

- Compare the materials of construction for battery and electrochemical sensors.
- Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.
- Explain the principles of spectrometry, slc in separation of solid and liquid mixtures.
- Apply the principle of Band diagrams in the application of conductors and semiconductors.

### **UNIT I Structure and Bonding Models:**

Fundamentals of Quantum mechanics, Schrodinger Wave equation, significance of  $\Psi$  and  $\Psi^2$ , particle in one dimensional box, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of  $O_2$  and  $CO$ , etc.  $\pi$ -molecular orbitals of butadiene and benzene, calculation of bond order.

### **UNIT II Modern Engineering materials**

Semiconductors, band diagram in solids, Semiconductor devices (p-n junction diode as rectifier and transistors)

Super conductors-Introduction basic concept, applications.

Supercapacitors: Introduction, Basic Concept-Classification – Applications.

Nano materials: Introduction, classification, properties and applications of Fullerenes, carbon nano tubes and Graphines nanoparticles.

### **UNIT III Electrochemistry and Applications:**

Electrochemical cell, Nernst equation, cell potential calculations and numerical problems, potentiometry- potentiometric titrations (redox titrations), 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 fuel cell– working of the cells. Polymer Electrolyte Membrane Fuel cells (PEMFC).

### **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 –Thermo and Thermosetting plastics, Preparation, properties and applications of – PVC, Teflon, Bakelite, Nylon-6,6, carbon fibres.

Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, – mechanism of conduction and applications. Bio-Degradable polymers - Poly Glycolic Acid (PGA), Polyl Lactic Acid (PLA).

## UNIT V Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography-Basic Principle, Classification-HPLC: Principle, Instrumentation and Applications.

### Textbooks:

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. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. J.M.Lehn, Supra Molecular Chemistry, VCH Publications

## CHEMISTRY LAB

(Common to EEE, ECE, CSE, IT & allied branches)

### Course Objectives:

- Verify the fundamental concepts with experiments.

L	T	P	C
0	0	2	1

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

- Determine the cell constant and conductance of solutions.
- Prepare advanced polymer Bakelite materials.
- Measure the strength of an acid present in secondary batteries.
- Analyze the IR spectra of some organic compounds.

### List of Experiments:

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

### Reference:

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar



**FUNDAMENTAL CHEMISTRY**  
(Food Technology & allied branches)

L	T	P	C
3	0	0	3

**Course Objectives:**

- To familiarize engineering chemistry and its applications
- To train the students on the principles and applications of electrochemistry and polymers
- To introduce instrumental methods, molecular machines and switches

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

- Compare the materials of construction for battery and electrochemical sensors.
- Explain the preparation, properties, and applications of thermoplastics & thermosetting, elastomers & conducting polymers.
- Distinguish the principles of spectrometry, solid liquid chromatography in separation of solids and liquid mixtures.

**UNIT I Structure and Bonding Models**

Planck's quantum theory, dual nature of matter, Schrodinger wave equation, significance of  $\Psi$  and  $\Psi^2$ , applications to hydrogen, Molecular Orbital Theory – bonding in homo- and heteronuclear diatomic molecules – Energy level diagrams of O<sub>2</sub> and CO, etc.  $\pi$ -molecular orbitals of butadiene and benzene, calculation of bond order.

**UNIT II Electrochemistry and Applications**

Electrodes –reference electrodes (Calomel electrode, and glass electrode) electrochemical cell, Nernst equation, numerical problems based on cell potential calculations, pH meter and applications of pH metry (acid-base titrations), conductivity, conductivity cell, conductometric titrations (acid-base titrations).

Electrochemical sensors – potentiometric sensors with example.

Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium and lithium ion batteries- working principle of the batteries including cell reactions; Fuel cells- hydrogen-oxygen fuel cells – basic principle, working, and applications.

**UNIT III Polymer Chemistry**

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermo settings, Preparation, properties and applications of – PVC, Bakelite, Nylon-6,6, carbon fibres. Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Bio degradable polymers: Poly  $\beta$ -hydroxybutyrate-co- $\beta$ -hydroxyvalerate(PHBV), poly hydroxyl butyrate(PHB) and applications.

**UNIT IV Instrumental Methods and Applications**

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, electronic transition, Instrumentation, IR spectroscopies, fundamental modes and selection rules, Instrumentation. Chromatography: Basic principle-Classification of Chromatography-HPLC-principle, Instrumentation, Thin Layer Chromatography (TLC) and applications

**UNIT V Surface Chemistry and Nano Materials**

Introduction to surface chemistry, colloids, nanometals and nanometal oxides, micelle formation, synthesis of colloids (Braggs Method), chemical and biological methods of preparation of nanometals and metal oxides, stabilization of colloids

and nanomaterials by stabilizing agents, adsorption isotherm (Freundlich and Langmuir), BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors, etc.

**Textbooks:**

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. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heinemann, 1992.

**FUNDAMENTAL CHEMISTRY LAB**  
(Food Technology & allied branches)

L	T	P	C
0	0	2	1

**Course Objectives:**

- Verify the fundamental concepts with the following experiments.

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

- Determine the cell constant and conductance of solutions.
- Prepare advanced polymer materials.
- Measure the strength of an acid present in secondary batteries.
- Analyze the IR spectra of some organic compounds.

**List of Experiments:**

1. Measurement of  $10Dq$  by spectrophotometric method
2. pH metric titration of strong acid vs strong base,
3. pH metric titration of weak acid vs strong base
4. Conductometric titration of weak acid vs strong base
5. Determination of cell constant and conductance of solutions
6. Determination of Strength of an acid in Pb-Acid battery
7. Preparation of Bakelite.
8. Determination of viscosity of polymer solution using viscometer
9. Verify Lambert-Beer's law
10. Separation of Organic Mixtures by Thin Layer Chromatography.
11. Identification of simple organic compounds by IR
12. Preparation of nanomaterials by precipitation method.
13. Adsorption of acetic acid by charcoal

**Reference:**

- "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C.Denney, J.D.Barnes and B. Sivasankar

**BASIC CIVIL AND MECHANICAL ENGINEERING**  
(Common to All branches of Engineering)

L	T	P	C
3	0	0	3

**Course Objectives:**

- Get familiarized with the scope and importance of Civil and Mechanical Engineering in different sectors and industries.
- Introduce the preliminary concepts of Building Planning, Building Construction, Materials and the related tests.
- Acquire preliminary knowledge of surveying and understand the importance of the quality of the drinking water.
- Explain different engineering materials and manufacturing processes.
- Provide an overview of different thermal and mechanical systems, introduce basics of robotics and its applications.

**Course Outcomes:** On completion of the course, the student should be able to:

- Understand various sub-divisions of Civil Engineering and to appreciate their role in ensuring better society.
- Know the concepts of surveying and to understand the measurement of distances, angles and levels through surveying.
- Realize the importance of Transportation in nation's economy and the engineering measures related to highways in terms of geometrics.
- Understand the importance of water resources and storage structures so that the social responsibilities of water conservation will be appreciated.
- Understand the different manufacturing processes and explain the basics of thermal engineering and its applications.
- Describe the working of different mechanical power transmission systems and power plants; learn basics of robotics.

**PART A: BASIC CIVIL ENGINEERING**

**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-Tests on these materials.

Factors to be considered in Building Planning- Nature of Buildings- Typical Layouts of a Residential Building- Industrial Building- Commercial Building like a Supermarket / Hotel / Theatre.

**UNIT II**

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

### **UNIT III**

Transportation Engineering, Water Resources and Environmental Engineering: Importance of Transportation in Nation's economic development- Types of Highway Pavements- Flexible Pavements and Rigid Pavements - Simple Differences - Basic geometric design elements of a highway- Camber- Stopping Sight Distance- Super elevation- Introduction.

Water Resources and Environmental Engineering: Sources of water- Quality of water- Specifications and Tests- Introduction to Hydrology- Hydrograph -Rain water Harvesting- Rain water runoff- Water Storage Structures (Simple introduction to Dams and Reservoirs).

#### **Textbooks:**

1. G. Shanmugam and M.S.Palanisamy, Basic Civil and the Mechanical Engineering, Tata Mcgraw Hill publications (India) Pvt. Ltd.
2. Basic Civil Engineering, S.S. Bhavikatti, New Age International Publishers.
3. Engineering Materials, Dr. S.C. Rangwala, Charotor Publishing House.
4. Highway Engineering, S.K.Khanna, C.E.G. Justo and Veeraraghavan, Nemchand and Brothers Publications.
5. Irrigation Engineering and Hydraulic Structures - Santosh Kumar Garg, Khanna Publishers, Delhi.
6. Building Construction, Dr. B. C. Punmia, Lakshmi Publications, Delhi.

#### **Reference Books:**

1. Surveying, Vol- I and Vol-II, S.K. Duggal, Tata McGraw Hill Publishers.
2. Hydrology and Water Resources Engineering, Santosh Kumar Garg, Khanna Publishers, Delhi.

## **PART B: BASIC MECHANICAL ENGINEERING**

### **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)

**Textbooks:**

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.

**ENGINEERING WORKSHOP**  
(Common to All branches of Engineering)

L	T	P	C
0	0	3	1.5

**Course Objectives:**

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

**Course Outcomes:**

- Identify workshop tools and their operational capabilities.
- Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding.
- Apply fitting operations in various applications.
- Apply basic electrical engineering knowledge for House Wiring Practice

**SYLLABUS**

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.

**Textbooks:**

1. Basic Workshop Technology: Manufacturing Process, Felix W.; Independently Published, 2019. Workshop Processes, Practices and Materials; Bruce J. Black, Routledge publishers, 5th Edn. 2015.
2. 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.

**BASIC ELECTRICAL & ELECTRONICS ENGINEERING**

(Common to All branches of Engineering)

L	T	P	C
0	0	2	1

**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:** After the completion of the course students will be able to

- Understand the basic electrical circuits, AC and DC machines.
- Analyze different electrical circuits, performance of AC and DC machines.
- Explain the theory, construction, and operation of electronic devices.
- Apply the concept of science and mathematics to explain the working of diodes, transistors, and their applications.
- Analyze small signal amplifier circuits to find the amplifier parameters.

**PART A: BASIC ELECTRICAL ENGINEERING**

**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.

### **Textbooks:**

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. Basic Electrical Engineering by S. N. Singh, PHI Publishers, 2011
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI publishers, Third Edition, 2014.

### **Reference Books:**

1. Principles of Power Systems by V.K. Mehtha, S.Chand Technical Publishers, 2020.
2. A textbook of Electrical Technology by B.L. Theraja, S. Chand and Company, reprint edition, 2014.
3. S. K. Bhattacharya, Basic Electrical and Electronics Engineering, Second Edition, Person Publications, 2018.

## **PART B: BASIC ELECTRONICS ENGINEERING**

### **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 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, Concept of voltage divider biasing. **Electronic Instrumentation:** Block diagram of an electronic instrumentation system.

### UNIT III DIGITAL ELECTRONICS

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 Integrated Circuits (ICs). Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters.

#### Textbooks:

1. R. L. Boylestad & Louis Nashlesky, Electronic Devices & Circuit Theory, Pearson Education, 2021.
2. R. P. Jain, Modern Digital Electronics, 4<sup>th</sup> 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.

### ELECTRICAL & ELECTRONICS ENGINEERING WORKSHOP

(Common to All branches of Engineering)

L	T	P	C
0	0	3	1.5

#### Course Objectives:

- To impart knowledge on the fundamental laws & theorems of electrical circuits, functions of electrical machines and energy calculations.
- To impart knowledge on the principles of digital electronics and fundamentals of electron devices.

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

- Get an exposure to common electrical & electronic components and their ratings.
- Understand the usage of common electrical & electronic measuring instruments.
- Understand the basic characteristics of electrical machines and perform energy calculations.
- Plot and discuss the characteristics of various electron devices.
- Explain the operation of a digital circuit.

#### 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: BASIC ELECTRICAL ENGINEERING LAB**

### **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

### **References:**

1. Basic Electrical Engineering by D C Kulshreshtha, Tata McGraw Hill, First Edition 2019.
2. Basic Electrical Engineering by S. N. Singh, PHI Publishers, 2011
3. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI publishers, Third Edition, 2014.

**Note: Minimum Six Experiments to be performed.**

## **PART B: BASIC ELECTRONICS ENGINEERING LAB**

### **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 Table 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.

### **References:**

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

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

# IT WORKSHOP

(Common to all branches of Engineering)

L	T	P	C
0	0	2	1

## Course Objectives:

- To introduce the internal parts of a computer, peripherals, I/O ports, connecting cables
- To teach basic command line interface commands on Linux.
- To teach the usage of Internet for productivity and self-paced life-long learning
- To introduce Compression, Multimedia and Antivirus tools and Office Tools such as Word processors, Spread sheets and Presentation tools.

## Course Outcomes:

- Perform Hardware troubleshooting.
- Understand Hardware components and inter dependencies.
- Safeguard computer systems from viruses/worms.
- Document/ Presentation preparation.
- Perform calculations using spreadsheets.

## PC Hardware

**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 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 with both Windows and Linux. 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 the 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 La TeX and Microsoft (MS) office or equivalent (FOSS) tool word: Importance of La TeX 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 La TeX and word - Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.

**Task 2:** Using La TeX 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 La TeX 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: Code Generation:** Test the model's ability to generate code by giving it partial code snippets and asking it to complete them. You can also ask the model to explain programming concepts or help you debug code.

- Ex: Prompt: "Complete the following Python code to swap the values of two variables:  
`\npython\nna = 5\nnb = 10\ntemp = a\nna = b\nnb = temp\n"`

**Task 4: 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?'"

**Task 5: Summarization:** Provide a long piece of text, such as an article or a blog post, and ask the model to summarize it. Compare the model's summary with the original text to assess its ability to condense information effectively.

- Ex: Prompt: "Summarize the article titled 'Ramayanam' in 3-4 sentences."

**Task 6: Futuristic Predictions:** Have fun by asking the model to predict future technological advancements, societal changes, or even hypothetical scenarios. Compare its responses with your own ideas.

- Ex: Prompt: "Predict how artificial intelligence will transform everyday life in the next 20 years."

**Task 7: Technical Explanations:** Challenge the model with technical questions from different domains. Ask it to explain scientific concepts, mathematical theorems, or complex algorithms in simple terms.

- Ex: Prompt: "Explain the concept of neural networks in machine learning, including their layers and the process of backpropagation."

#### **Reference Books:**

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

# ENGINEERING GRAPHICS

(Common to All branches of Engineering)

L	T	P	C
2	0	2	3

## Course Objectives:

The students completing the course are expected to:

- Understand the basic principles and conventions of engineering drawing, use engineering instruments and draw engineering curves.
- Use orthographic projections and make the students draw the projections of lines and planes inclined to both the planes.
- Draw the projections of the solids in different positions with respect to the reference planes.
- Understand the importance of sectioning and concept of development of surfaces.
- Represent and convert isometric views to orthographic views and vice versa.

**Course Outcomes:** On completion of the course, the student should be able to:

- Understand the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.
- Draw and interpret orthographic projections of points, lines, planes and solids in front, top and side views.
- Understand and apply concepts of sectional views to represent details of solids in simple positions.
- Gain a clear understanding of the principles behind development of surfaces and to understand how to unfold basic geometric shapes into flat patterns.
- Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.

## UNIT I

**Introduction:** Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

**Curves:** construction of ellipse, parabola and hyperbola by general, Cycloids, Involute, Normal and tangent 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 simple positions: 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 other and axes inclined to both the reference planes.

## 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*).

### Textbook:

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

### Reference Books:

1. Engineering Drawing, K.L. Narayana and P. Kanniah, 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.

## INTRODUCTION TO PROGRAMMING (Common to All branches of Engineering)

### Course Objectives:

L	T	P	C
3	0	0	3

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

**Course Outcomes:** A student after completion of the course will be able to

- Understand basics of computers, the concept of algorithm and algorithmic thinking.
- Develop the ability to analyze a problem, develop an algorithm to solve it.
- Proficiently use the C programming language to implement various algorithms.
- Understand more advanced features of C language.
- Develop problem-solving skills and the ability to debug and optimize the code.

## 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. 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 Functions**

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

## **UNIT V User Defined Data types, File Handling, Pointers**

User-defined data types-Structures and Unions, pointers, dereferencing and address operators, pointer and address arithmetic, array manipulation using pointers. Basics of File Handling.

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

### **Textbooks:**

1. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie
2. Schaum's Outline of Programming with C by Byron S Gottfried (1996), McGraw-Hill Education (ISBN:978-0070240353)

### **Reference Books:**

1. Balagurusamy, E. (2008). Computing fundamentals and C Programming. McGraw-Hill Education.
2. Programming in C Rema Theraja-2<sup>nd</sup> edition 2016
3. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

## **COMPUTER PROGRAMMING LAB** (Common to All branches of Engineering)

L	T	P	C
0	0	3	1.5

### **Course Objectives:**

- To use basic data types, operators, expressions and expression evaluation mechanisms using C Programming Language.
- To implement control flows, construct in C Programming Language and understand the syntax, semantics and usability contexts of these different constructs.
- To develop composite data types in C and constructs available to develop their datatypes, utilize them to model things and dealing with data from and to external files.
- To design programs with different variations of the constructs available for practicing modular programming and understand the pros and cons of using different variants and apply optimization.

### **Course Outcomes:** Student should be able to

- Read, understand and trace the execution of programs written in C language.
- Select the right control structure for solving the problem.
- Develop C programs which utilize the memory efficiently using

programming constructs like pointers.

- Develop, Debug and Execute programs to demonstrate the applications of arrays, functions, basic concepts of pointers in C.

## **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 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 on 1D 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 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 9:** Functions, call by value, scope and extent,

**Lab 9:** 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 10:**

**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 10:** Recursion, the structure of recursive calls

### **Lab 10: 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 11:**

**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 11:** Call by reference, dangling pointers

**Lab 11:** 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.

## **UNIT V**

### **WEEK12:**

**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 12:** Pointers, structures and dynamic memory allocation

**Lab12:** 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 13:**

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

#### **Suggested Experiments/Activities:**

**Tutorial 13:** Bitfields, Self-Referential Structures, Linked lists

**Lab13 :** 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.

## 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 last n characters of a given file.

### Textbooks:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw Hill

### Reference Books:

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

## ENGINEERING MECHANICS

(Common to Civil , Mechanical Engineering & Allied branches)

### Course Objectives:

- To get familiarized with different types of force systems.
- To draw accurate free body diagrams representing forces and moments acting on a body to analyze the equilibrium of system of forces.
- To teach the basic principles of center of gravity, centroid and moment of inertia and determine them for different simple and composite bodies.
- To apply the Work-Energy method to particle motion.
- To understand the kinematics and kinetics of translational and rotational motion of rigid bodies.

L	T	P	C
3	0	0	3

### Course Outcomes: On Completion of the course, the student should be able to

- Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.
- Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.
- Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.
- Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.
- Solve the problems involving the translational and rotational motion of rigid bodies.

## **UNIT I**

**Introduction to Engineering Mechanics – Basic Concepts. Scope and Applications  
Systems of Forces: Coplanar Concurrent Forces – Components in Space – Resultant  
– Moment of Force and its Application – Couples and Resultant of Force Systems.  
Friction: Introduction, limiting friction and impending motion, Coulomb’s laws of  
dry friction, coefficient of friction, Cone of Static friction.**

## **UNIT II**

**Equilibrium of Systems of Forces: Free Body Diagrams, Lami’s Theorem, Equations of  
Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle  
law of forces, converse of the law of polygon of forces condition of equilibrium,  
Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial  
system of forces using vector approach, Analysis of plane trusses.  
Principle of virtual work with simple examples**

## **UNIT III**

**Centroid: Centroids of simple figures (from basic principles) – Centroids of  
Composite Figures Centre of Gravity: Centre of gravity of simple body (from basic  
principles), Centre of gravity of composite bodies, Pappus theorems.  
Area Moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem,  
Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for  
Product of Inertia.  
Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass  
Moments of Inertia, Mass Moment of Inertia of composite bodies.**

## **UNIT IV**

**Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D’Alembert’s  
Principle  
- Work Energy method and applications to particle motion- Impulse Momentum method.**

## **UNIT V**

**Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis  
and plane motion, Work Energy method and Impulse Momentum method.**

### **Textbooks:**

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5<sup>th</sup> Edition, McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14<sup>th</sup> Edition, Pearson Education, Inc., New Delhi, 2022

### **Reference Books:**

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., 4<sup>th</sup> Edition, PHI, 2002.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L. G. Kraige., 6<sup>th</sup> Edition, John Wiley, 2008.
4. Engineering Mechanics: Principles of Statics and Dynamics, R.C. Hibbeler., Pearson Press, 2006.
5. Introduction to Statics and Dynamics, Andy Ruina and Rudra Pratap., Oxford University Press, 2011.

## ENGINEERING MECHANICS & BUILDING PRACTICES LAB

(Civil Engineering & allied branches)

L	T	P	C
0	0	3	1.5

**Course Objectives:** The students completing the course are expected to:

- Verify the Law of Parallelogram of Forces and Lami's theorem.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Understand the layout of a building, concepts of Non-Destructive Testing and different Alternative Materials.

**Course Outcomes:** On completion of the course, the student should be able to:

- Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
- Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever.
- Determine the Centre of gravity different configurations and study of safety practices in construction industry.
- Understand the Quality Testing and Assessment Procedures and principles of Non- Destructive Testing.

**Students have to perform any 12 of the following Experiments:**

1. To study various types of tools used in construction.
2. Forces in Pin Jointed Trusses
3. Experimental Proof of Lami's Theorem
4. Verification of Law of Parallelogram of Forces.
5. Determination of Center of Gravity of different shaped Plane Lamina.
6. Determination of coefficient of Static and Rolling Friction.
7. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever
8. Layout plan of a building
9. Study of Alternative Materials like M-sand, Fly ash, Sea Sand etc.
10. Conducting Green audit of a building or Industry or Organization
11. Field-Visit to understand the Quality Testing and Assessment Procedures- report.
12. Safety Practices in Construction industry
13. Demonstration and principles of Non-Destructive Testing - using Rebound Hammer & USPV
14. Study of Plumbing, Wiring, Carpentry, Welding etc. in buildings.

## ENGINEERING MECHANICS LAB

(Mechanical Engineering & allied branches)

L	T	P	C
0	0	3	1.5

**Course Objectives:** The students completing the course are expected to:

- Verify the Law of Parallelogram and Triangle of Forces.
- Determine the coefficients of friction of Static and Rolling friction and Centre of gravity of different plane Lamina.
- Analyse the system of Pulleys and Moment of Inertia of Compound Pendulum and Flywheel.

**Course Outcomes:** On completion of the course, the student should be able to:

- Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller.
- Verify Law of Polygon of forces and Law of Moment using force polygon and bell crank lever.
- Determine the Centre of gravity and Moment of Inertia of different configurations.
- Verify the equilibrium conditions of a rigid body under the action of different force systems.

**Students have to perform any 10 of the following Experiments:**

**List of Experiments:**

1. Verification of Law of Parallelogram of Forces.
2. Verification of Law of Triangle of Forces.
3. Verification of the Law of polygon for coplanar-concurrent forces acting on a particle in equilibrium and to find the value of unknown forces considering particle to be in equilibrium using universal force table.
4. Determination of coefficient of Static and Rolling Frictions
5. Determination of Centre of Gravity of different shaped Plane Lamina.
6. Verification of the conditions of equilibrium of a rigid body under the action of coplanar non-concurrent, parallel force system with the help of a simply supported beam.
7. Study of the systems of pulleys and draw the free body diagram of the system.
8. Determine the acceleration due to gravity using a compound pendulum.
9. Determine the Moment of Inertia of the compound pendulum about an axis perpendicular to the plane of oscillation and passing through its centre of mass.
10. Determine the Moment of Inertia of a Flywheel.
11. Verification of Law of Moment using Rotation Disc Apparatus and Bell Crank Lever.

**References:**

1. S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., Engineering Mechanics, 5<sup>th</sup> Edition, McGraw Hill Education.
2. Hibbeler R.C., Engineering Mechanics: Statics and Dynamics, 14<sup>th</sup> Edition, Pearson Education, Inc., New Delhi, 2022

**ELECTRICAL CIRCUIT ANALYSIS -I**

(EEE & allied branches)

L	T	P	C
3	0	0	3

**Course Objectives:**

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

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

- Examine various electrical networks in presence of active and passive elements.
- Analyze magnetic circuit with various dot conventions.
- Calculate the parameters of R, L, C network with sinusoidal excitation.
- Calculate the parameters of R, L, network with variation of any one of the parameters i.e R, L, C and f.
- Solve Electrical networks by using principles of network theorems.

**UNIT I Introduction to Electrical Circuits**

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchoff'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.

### **Textbooks:**

1. **Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, Mc Graw Hill Company, 6<sup>th</sup> edition.**
2. **Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd**

### **Reference Books:**

1. **Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O. Sadiku, Mc Graw Hill Education (India)**
2. **Linear Circuit Analysis by De Carlo, Lin, Oxford publications**
3. **Electric Circuits – (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by Kuma Rao, 5<sup>th</sup> Edition – Mc Graw Hill.**
4. **Electric Circuits by David A. Bell, Oxford publications**
5. **Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications.**
6. **Circuit Theory (Analysis and Synthesis) by A. Chakrabarthy, Dhanpat Rai & Co.**



**ELECTRICAL CIRCUITS LAB**  
(EEE & allied branches)

L	T	P	C
0	0	3	1.5

**Course Objectives:**

The objective of laboratory is 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 to the usage of different circuits with different condition.

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

- Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.
- Draw locus diagrams of RL, RC series circuits and examine series and parallel resonance.
- Apply Thevenin's, Norton's, Thevenin's, superposition theorem, maximum power transfer, compensation, reciprocity and Millman's Theorems to compare practical results obtained with theoretical calculations.

**List of Experiments:**

(Any 10 of the following experiments are to be conducted)

1. Verification of Kirchoff'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

**References:**

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, Mc Graw Hill Company, 6<sup>th</sup> edition.
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd

## NETWORK ANALYSIS

(ECE & allied branches)

L	T	P	C
3	0	0	3

### Course Objectives:

- To introduce basic laws, mesh & nodal analysis techniques for solving electrical circuits
- To impart knowledge on applying appropriate theorem for electrical circuit analysis
- To explain transient behavior of circuits in time and frequency domains
- To teach concepts of resonance
- To introduce open circuit, short circuit, transmission, hybrid parameters and their interrelationship.

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

- Understand basic electrical circuits with nodal and mesh analysis.
- Analyze the circuit using Network simplification theorems.
- Infer and evaluate Transient response and Steady state response of a network.
- Analyze electrical networks in the Laplace domain.
- Compute the parameters of a two-port network.

### UNIT I

Types of circuit components, Types of Sources and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples.

**Network Theorems:** Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens - problem solving using dependent sources also.

### UNIT II

**Transients:** First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots.

**Laplace transform:** introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.

### UNIT III

**Steady State Analysis of A.C Circuits:** Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving using Laplace transforms also.

### UNIT IV

**Resonance:** Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, general case-resistance present in both branches, anti-resonance at all frequencies.

**Coupled Circuits:** Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

## UNIT V

**Two-port Networks:** Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h- parameters, Relationships Between parameter Sets, Parallel & series connection of two port networks, cascading of two port networks, problem solving using dependent sources also.

Image and iterative impedances. Image and iterative transfer constants. Insertion loss. Attenuators and pads. Lattice network and its parameters. Impedance matching networks.

### Textbooks:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9<sup>th</sup> Edition 2020.
3. Network lines and Fields by John. D. Ryder 2<sup>nd</sup> Edition, PHI

### Reference Books:

1. D. Roy Choudhury, Networks and Systems, New Age International Publications, 2013.
2. Joseph Edminister and Mahmood Nahvi, Electric Circuits, Schaum's Outline Series, 7<sup>th</sup> Edition, Tata McGraw Hill Publishing Company, New Delhi, 2017
3. Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku, McGraw-Hill Education.

## NETWORK ANALYSIS AND SIMULATION LABORATORY

(ECE & allied branches)

L	T	P	C
0	0	3	1.5

### Course Objectives:

- To gain hands on experience in verifying Kirchoff's laws and network theorems
- To analyze transient behavior of circuits
- To study resonance characteristics
- To determine 2-port network parameters

### Course Outcomes:

- Verify Kirchoff's laws and network theorems.
- Measure time constants of RL & RC circuits.
- Analyze behavior of RLC circuit for different cases.
- Design resonant circuit for given specifications.
- Characterize and model the network in terms of all network parameters.

The following experiments need to be performed using both Hardware and simulation Software.

The experiments need to be simulated using software and the same need to be verified using the hardware.

1. Study of components of a circuit and Verification of KCL and KVL.
2. Verification of mesh and nodal analysis for AC circuits
3. Verification of Superposition, Thevenin's & Norton theorems for AC circuits
4. Verification of maximum power transfer theorem for AC circuits
5. Verification of Tellegen's theorem for two networks of the same topology.
6. Study of DC transients in RL, RC and RLC circuits
7. To study frequency response of various 1<sup>st</sup> order RL & RC networks
8. To study the transient and steady state response of a 2<sup>nd</sup> order circuit by

- varying its various parameters and studying their effects on responses
9. Find the Q Factor and Bandwidth of a Series and Parallel Resonance circuit.
  10. Determination of open circuit (Z) and short circuit (Y) parameters
  11. Determination of hybrid (H) and transmission (ABCD) parameters
  12. To measure two port parameters of a twin-T network and study its frequency response.

**Hardware Requirements:**

Regulated Power supplies, Analog/Digital Function Generators, Digital Multimeters, Decade Resistance Boxes/Rheostats, Decade Capacitance Boxes, Ammeters (Analog or Digital), Voltmeters (Analog or Digital), Active & Passive Electronic Components

**Software requirements:**

Multisim/ Pspice/Equivalent simulation software tool, Computer Systems with required specifications

**References:**

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.
2. Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9<sup>th</sup> Edition 2020.

**DATA STRUCTURES**

(Common to CSE, IT & allied branches)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Course Objectives:**

- Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
- Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
- Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
- Utilize queues to model real-world scenarios, such as process scheduling and breadth- first search algorithms and understand the versatility of dequeues and prioritize data management using priority queues.
- Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

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

- Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
- Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
- Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.
- Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

## **UNIT I**

**Introduction to Linear Data Structures: Definition and importance of linear data structures, Abstract data types (ADTs) and their implementation, Overview of time and space complexity analysis for linear data structures.**

## **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.**

## **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.**

## **UNIT IV**

**Queues: Introduction to queues: properties and operations, Implementing queues using arrays and linked lists, Applications of queues in breadth-first search, scheduling, etc.**

**Deque: Introduction to deque (double-ended queue), Operations on deque and their applications.**

## **UNIT V**

**Hashing: Brief introduction to hashing and hash functions, Collision resolution techniques: chaining and open addressing, Hash tables: basic implementation and operations, Applications of hashing in unique identifier generation, caching, etc.**

### **Textbooks:**

1. **Data Structures and algorithm analysis in C, Mark Allen Weiss.**
2. **Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta.**

### **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**

**DATA STRUCTURES LAB**  
(Common to CSE, IT & allied branches)

L	T	P	C
0	0	3	1.5

**Course Objectives:**

- Understand the significance of linear data structures in problem-solving and basic time/space complexity analysis.
- Create and manage linked lists to efficiently organize and manipulate data, emphasizing memory efficiency.
- Implement and apply stacks to manage program flow and solve problems involving expression evaluation and backtracking.
- Utilize queues to model real-world scenarios, such as process scheduling and breadth- first search algorithms and understand the versatility of dequeues and prioritize data management using priority queues.
- Explore basic concepts of hashing and apply it to solve problems requiring fast data retrieval and management.

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

- Explain the role of linear data structures in organizing and accessing data efficiently in algorithms.
- Design, implement, and apply linked lists for dynamic data storage, demonstrating understanding of memory allocation.
- Develop programs using stacks to handle recursive algorithms, manage program states, and solve related problems.
- Apply queue-based algorithms for efficient task scheduling and breadth-first traversal in graphs and distinguish between dequeues and priority queues, and apply them appropriately to solve data management challenges.
- Recognize scenarios where hashing is advantageous, and design hash-based solutions for specific problems.

**List of Experiments:**

**Exercise 1: Array Manipulation**

- i) Implement basic operations on arrays: insertion, deletion, searching.
- ii) Create a program to find the maximum and minimum elements in an array.
- iii) Write a program to reverse an array.

**Exercise 2: Linked List Implementation**

- i) Implement a singly linked list and perform insertion and deletion operations.
- ii) Develop a program to reverse a linked list iteratively and recursively.
- iii) Solve problems involving linked list traversal and manipulation.

**Exercise 3: Linked List Applications**

- i) Create a program to detect and remove duplicates from a linked list.
- ii) Implement a linked list to represent polynomials and perform addition.
- iii) Implement a double-ended queue (deque) with essential operations.

**Exercise 4: Double Linked List Implementation**

- i) Implement a doubly linked list and perform various operations to understand its properties and applications.
- ii) Implement a circular linked list and perform insertion, deletion, and traversal.

**Exercise 5: Stack Operations**

- i) Implement a stack using arrays and linked lists.
- ii) Write a program to evaluate a postfix expression using a stack.
- iii) Implement a program to check for balanced parentheses using a stack.

### Exercise 6: Queue Operations

- i) Implement a queue using arrays and linked lists.
- ii) Develop a program to simulate a simple printer queue system.
- iii) Solve problems involving circular queues.

### Exercise 7: Stack and Queue Applications

- i) Use a stack to evaluate an infix expression and convert it to postfix.
- ii) Create a program to determine whether a given string is a palindrome or not.
- iii) Implement a stack or queue to perform comparison and check for symmetry.

### Exercise 8: Hashing

- i) Implement a hash table with collision resolution techniques.
- ii) Write a program to implement a simple cache using hashing.

### Textbooks:

1. Data Structures and algorithm analysis in C, Mark Allen Weiss.
2. Fundamentals of data structures in C, Ellis Horowitz, Sartaj Sahni, Dinesh Mehta.

### 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.

### Health And Wellness, Yoga and Sports (Common to All branches of Engineering)

L	T	P	C
0	0	1	0.5

### Course Objectives:

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

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

- Be Physical fit to perform daily routine without undue fatigue.
- Be Mentally alert and Socially Cohesive
- Consider success and failure equally.
- Develop Positive Personality
- Improve Leadership qualities.

### UNIT I

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**

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**

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.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.



## **NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE**

(Common to All branches of Engineering)

L	T	P	C
0	0	1	0.5

### **Course Objectives:**

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

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

- Understand the importance of discipline, character and service motto.
- Outline the needs and problems of the community.
- Solve some societal issues by applying acquired knowledge, facts, and techniques.
- Explore human relationships by analyzing social problems.
- Determine to extend their help for the fellow beings and downtrodden people.
- Develop leadership skills and civic responsibilities.

### **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 in the village, identification of problems- helping them to solve via media- authorities- experts-etc.
- ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
- iii) Conducting consumer Awareness. Explaining various legal provisions etc.
- iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
- v) 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.

**Evaluation Guidelines:**

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.