

OBJECTIVE:

The objective of this course is to make students learn the laboratory skills needed to design safe conduction of reactions and experiments in Chemistry. The student will acquire a foundation of Chemistry to enable them to understand and critically interpret the primary research in Chemistry.

Course outcome

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

CO1	Interpret UV-Visible and IR-Spectra	K2, K4
CO2	Describe reaction rates for reactions of various orders	K2, K3, K4
CO3	Understand different aspects of corrosion and thermodynamic view of electrochemical processes, reversible, irreversible cells and nanochemistry	K2, K3
CO4	Understand the stereochemistry of molecules and identify organic reactions on the basis of their mechanism	K1, K3, K4
CO5	Distinguish between different polymeric structures, classify polymers, and analyze the polymerization mechanism and use of polymers in different walks of life. Knowledge of conductivity of polymer, biodegradable polymers and fibre reinforced plastics. Acquire knowledge about water and treatment of municipal water and solid waste management	K2, K3, K5, K6
CO6	To develop experimental skills to perform, monitor and manipulate the reactions.	K2, K4, K5

K1-Remember, K2-Understand, K3-Apply, K4-Analyse, K5- Evaluate, K6-Create

Course Articulation Matrix (CO-PO Matrix)

PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
3	3	1	3	2	-	2	-	-	-	-	3
3	3	1	3	2	-	2	-	-	-	-	3
3	3	1	3	2	-	2	-	-	-	-	3
3	3	1	3	2	-	2	-	-	-	-	3
3	3	1	3	2	-	2	-	-	-	-	3
3	3	3	3	2	2	2	2	1	2	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content

UNIT- 1

Bonding VSEPR Theory, Valence Bond Theory, Crystal-field theory, Electronic Spectra and Ligands (strong and weak field), Phosphorescence and Fluorescence, Jablonski diagram, hydrogen bonding and their effect on physical properties, Metallic bonds, Classification and Applications of Liquid crystals, Band Theory of Solids and superconductors.

Spectroscopy Basic Principles, Instrumentation and Applications of UV-Vis and IR Spectroscopy.

UNIT- 2

Chemical Kinetics Second order reactions. Determination of order, Fast and slow reaction, steady state approximation, Temperature effect, Concept of Activated Complex / Transition State: Energy of activation, Potential energy surface, Theories of reaction rate: Collision and Transition State theories in terms of enzyme catalysis.

Surface Chemistry Introduction, Types of adsorption, Adsorption isotherms, BET, Applications of adsorption.

UNIT- 3

Electrochemistry Dry and fuel cells, electrochemical cell, Solar cells, Disensitized cell, Photovoltaic cell.

Nanochemistry Introduction, general methods of synthesis, classification and applications of nano materials.

Environmental Chemistry Air and Water Pollution, analysis of gaseous effluents oxides of Nitrogen, oxides of Sulphur and H_2S , chemical analysis of effluents liquid streams, BOD, COD, control of pollution, Depletion of ozone layer.

UNIT- 4

Stereochemistry Stereoisomerism of organic compounds containing one & two chiral centers. Enantiomers & Diastereomers, E-Z nomenclature, R-S configuration, Atropisomerism, and Optical isomerism in Allenes, biphenyl and Spiranes, Circular Dichroism.

Reaction Mechanism Inductive, Electromeric and Mesomeric effects. Study of reaction intermediates (Carbanion, carbocation, carbene, nitrene and benzyne). Mechanism of nucleophilic and electrophilic substitution reactions. Mechanism and application of following reactions:

- a) Suzuki-Miyaura Cross coupling reaction
- b) Fries and Photo-Fries Rearrangement
- c) Wagner-Meerwein Rearrangement
- d) Umpolung Reactions
- e) Favorskii Rearrangement

UNIT- 5

Polymers: Introduction, types of polymers, Molecular mass-number and mass average molecular weight, determination of molecular mass by Osmometry, viscosity, light scattering and size exclusion chromatography, Rheological properties and uses of some common polymers. Synthetic Polymers (carbon framework, silicon framework, fluorinated polymer), Conducting and Biodegradable polymers.

Water Analysis: Introduction; Hardness of Water- cause, types, units, Disadvantages of using hard water for domestic and industrial purposes, Softening of hard water, Chemical analysis of Water- estimation of free chlorine, total alkalinity, hardness, Numerical based on determination of hardness.

Solid Waste Management: Classification, waste treatment & Disposal methods (Composting, sanitary landfilling, thermal processes, recycling and reuse).

List of Experiments:

1. Determination of alkalinity in given water sample.
 - i. Sodium Carbonate & Sodium Bicarbonate
 - ii. Sodium Carbonate & Sodium Hydroxide

- Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
- Determination of Chloride content of water by Mohr's Method.
- Determination of Chlorine content in Bleaching powder.
- Determination of strength of supplied Ferrous Ammonium Sulphate (FAS) solution in using external, internal indicators.
- Determination of viscosity of a given liquid by Ostwald's viscometer.
- Determination of surface tension of a given liquid by Stalagmometer.
- pH metric titration.
- Determination of Dissociation constant of weak acids by conductometric Titration.
- To prepare aspirin (acetyl salicylic acid) from salicylic acid.
- Synthesis of polyurethanes
- Find the concentration of the given samples using UV-visible spectroscopy.

Textbooks

- A Text Book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co., Fifth Edition, 2017.

Reference Books:

- Organic Chemistry by I. L. Finer, Vol-1, Ninth Edition, 2015, Pearson Publisher.
- Physical Chemistry by Puri, Sharma & Pathania, Vishal Publishing Co., 48th Edition, 2021, ISBN: 978-93-87015-81-4
- Polymer Science by V. R. Gowarikar, N. V. Vishwanathan and J. Shridhar, Wiley Eastern Ltd., New Delhi, 1987, ISBN: 978-0470203224.
- Elementary Organic Spectroscopy by Y.R. Sharma, S. Chand, Fifth Edition, 2013, ISBN: 9788121928847.

Web links

- <https://nptel.ac.in/courses/104101121> [Prof. Debabrata Maiti, IIT Bombay]
- <https://nptel.ac.in/courses/104106119> [Prof. Harinath Chakrapani & Prof. Neeraja Dashaputre, IIT Madras]
- <https://nptel.ac.in/courses/104105084> [Prof. Debashis Ray, IIT Kharagpur]
- <https://nptel.ac.in/courses/104106129> [Prof. M. V. Sangaranarayanan, IIT Madras]

Evaluation Scheme:

S. No.	Course Type	Subject Code	Course title	Credits (L-T-P)	Sessional Marks				ESM	Total Marks
					MSE	TA	Lab	Total		
1	BSC	NCY 101/102	Engineering Chemistry	4(3-0-2)	15	20	15	50	50	100

NWS 101 / 102 : WORKSHOP PRACTICE

C (L-T-P) : 2[0-0-4]

Course Objective: The objective of this course is to educate and impart basic knowledge of various hand tools and equipments and their use in different shops, day to day industrial work and domestic life. Students able to understand safety precautions in the workshop. Student acquires skills of application oriented task.

Course Outcome

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

CO 1	Study and practice on machine tools and their operations	K2
CO 2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry, black - smithy and welding work	K3
CO 3	Identify and apply suitable tools for machining processes including plain turning, step turning, taper turning, facing, thread cutting operations	K4
CO 4	Understand and practice welding and forging operations	K3
CO 5	Select the appropriate tools required for specific operation and the proper safety measure required to be taken while using different tools.	K2 , K3

K1 - Remember, K2 - Understand, K3 - Apply, K4 - Analyze, K5 - Evaluate, K6 – Create

Course Articulation Matrix (CO-PO Matrix)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	1	1	1	-	-	-	-	-	1
CO2	2	-	-	1	1	1	-	-	-	-	-	1
CO3	2	-	-	1	1	1	-	-	-	-	-	1
CO4	2	-	-	1	1	1	-	-	-	-	-	1
CO5	2	-	-	1	1	1	-	-	-	-	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

CO1

1. Working principle of lathe machine
2. Parts and operations on lathe machine
3. Tool geometry of single point cutting tool

CO2

1. Study and practice of different tools used in Fitting shop, Carpentry shop and Foundry shop.
2. Study and practice of different tools used in Black-smithy shop, Sheet metal shop and Welding shop.

CO3

1. Explanation and demonstration of various processes like plain turning and step turning.
2. Explanation and demonstration of various processes like taper turning and facing.
3. Explanation and demonstration of various processes like thread cutting, knurling and chamfering.

CO4

1. Classification of different welding processes with the help of flow chart.
2. Explanation and demonstration forging operations.
3. Safety precautions during actual forging and welding.

CO5

1. Selection of proper drilling tool for drilling operation.
2. Selection of proper tap for internal thread cutting operation.
3. Selection of power hacksaw blade, wood cutting cutter , snips, chisels etc.

CO6

1. Proper demonstration of safety precautions to be taken for example leather apron, leather hand gloves, welding shield etc.
2. Description of different safety tools and precautions in workshop.

Course Content

1. Carpentry Shop

Practice (I) : To prepare half lap corner joint from given pieces of mango wood.

Practice (II) : To prepare mortise and tenon joint from given pieces of mango wood.

Instructions : Description and demonstration of different tools, joints along with advanced carpentry joints, classification and definition of timber, wood seasoning, demonstration of wood working lathe and advanced power tools used in carpentry work, safety precaution during actual working.

2. Fitting and Bench working Shop

Practice (I) : To prepare male-female joint from given pieces of mild steel.

Practice (II) : To prepare practice work piece involving marking , measuring , sawing, drilling and tapping operations.

Instructions : Classification and description of different tools used in fitting shop e.g. marking and measuring tools , holding and supporting tools, striking tools and cutting tools etc , safety precaution during actual working.

3. Black Smithy Shop

- Practice (I) : To prepare ' L ' shape job from given piece of mild steel rod by hand forging.
- Practice (II) : To prepare a ' Ring ' from given piece of mild steel rod by hand forging.
- Instructions : Description of various forging processes done in black-smithy work e.g. upsetting, drawing down, punching, bending, fullering etc, classification and description of different tools, equipments used in black smithy shop, safety precaution during actual working.

4. Welding Shop

- Practice (I) : To prepare simple butt joint and lap joint by electric arc welding from given pieces of mild steel.
- Practice (II) : To prepare simple lap joint by oxy-acetylene gas welding and gas flame cutting practice.
- Instructions : Concept of welding, classification and explanation of various types of welding with the help of flow chart, description of different tools. Equipments required for arc welding and gas welding, demonstration of various types of flames in Oxy-acetylene gas welding, setting of current and selection of electrodes along with different welding joints, safety precaution during actual working.

5. Sheet Metal Shop

- Practice (I) : To prepare a funnel complete with soldering from given G.I. sheet.
- Practice (II) : To fabricate tray / tool box or electric panel box from given G.I. sheet.
- Instructions : Classification and description of different types of tools, equipments used in sheet metal work, different types of metals used in sheet metal shop e.g. Galvanized iron, lack iron, copper, aluminum etc, concept of development of surfaces along with different types of joints in sheet metal work, safety precaution during actual working.

6. Machine Shop

- Practice (I) : To prepare a job by plain turning, facing, step turning and chamfering operation from given mild steel rod.
- Practice (II) : To prepare a job by taper turning, threading, knurling operations from given mild steel rod.
- Instructions : Classification of lathe machines, different parts of lathe machine, tools and equipments used, explanation and demonstration of various operations on lathe machine, tool geometry of single point cutting tool, cutting speed, feed and depth of cut in turning, safety precaution during actual working.

7. Foundry Shop

- Practice (I) : To prepare a mould of given pattern in Green Sand
- Practice (II) : To prepare a mould with two step pulley with runner and riser
- Instructions : Description and use of various foundry tools, showel, flat rammer, hand rammer, strike off bars, vent wire, trowels, hand riddle etc. Types of various moulding sands, types of patterns, pattern materials, pattern allowances, safety precautions during actual working.

Text Books

1. Elements Of Workshop Technology Vol-1, by Choudhury H S K, MPP Pvt. Ltd., 2008
2. A Course in Workshop Technology Vol I by Raghuwanshi, Dhanpat Rai & sons, 2011.
3. Workshop Practice Manual by V Kapoor, Dhanpat Rai & sons, 1998
4. Workshop Technology: Manufacturing Processes by Khurmi & Gupta, S. Chand Publications, 2008

Reference books

- 1-Mechanical Workshop Practice, 2/E 2nd edition, Kindle Edition, K.C.John, PHI, 2010.
- 2-Workshop Practice , Singh Swarn, Katson Books, 2003.
- 3- Workshop Practice, R.K.Rajput, 2016.
- 4- Workshop Practice, B.L.Juneja, Cengage Learning Publishers, 2015.

Link:

- 1- <https://sjce.ac.in/wp-content/uploads/2018/04/Workshop-Laboratory-Manual.pdf>
- 2- <https://nptel.ac.in/courses/112107219>

Evaluation Scheme

Course Title	Credit (L:T:P)	Sessional Marks				ESM	Total Marks
		MSE	T A	Lab	Total		
Workshop Practice	2(0-0-4)	--	20	30	50	50	100

NPH-101/102 : ENGINEERING PHYSICS

C[L-T-P]: 4[3-0-2]

Course Objective:

The objective of the course is to understand the basic concepts of nature around us and to synthesize the knowledge from different areas of physics for analysing and solving various critical problems.

Course Outcome (CO):

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

CO1	Understand and apply the principle of conservation of momentum, the theory of relativity.	K2, K1
CO2	Understand the basics of quantum mechanics and apply its principles to learn the phenomenon that occurs at subatomic dimensions.	K3, K1
CO3	Understand Maxwell's equations of electromagnetic theory with the aim to apply them in a communication system.	K5, K1
CO4	Apply the fundamentals of material science, especially to dielectric materials, semiconducting materials, nanomaterials, and Superconducting Materials.	K2, K1
CO5	Understand the statistical behavior of the constituent particles and apply the principles of statistical mechanics in the formation of materials and basics of LASERs	K4, K1

K1-Remember, K2- Understand, K3-Apply, K4-Analyse, K5-Evaluate, K6-Create

Course Articulation Matrix (CO-PO Matrix)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	2	-	-	-	-	-	3
CO2	3	3	1	2	1	2	-	-	-	-	-	3
CO3	3	3	1	2	1	2	-	-	-	-	-	3
CO4	3	3	3	2	1	3	3	-	-	-	-	3
CO5	3	3	2	3	3	3	-	-	-	-	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put "-".

Course Content

UNIT- 1

Relativistic Mechanics:

Inertial and Non- Inertial Frames of references, Galilean transformation equations, Michelson Morley Experiment, Lorentz Transformation equations, Length contraction, Time dilation and its experimental evidence, Relativistic velocity addition formula, Relativistic variation of mass with velocity, Evidence of variation of mass with velocity, Einstein's Mass-Energy equivalence, examples from nuclear physics, Relativistic energy momentum relation.

UNIT- 2

Quantum Mechanics:

Dual nature of matter & radiation, Heisenberg's uncertainty Principle and their applications, wave packet concept, Davisson-Germer experiment, Postulates of quantum mechanics, Significance of wave function, Derivation of Schrodinger equation for time independent and time dependent cases.

Applications of Schrodinger wave equation for a free particle, Particle in a box (one dimensional and three dimensional cases), Simple harmonic oscillator (one dimensional case).

UNIT- 3

Electromagnetic Theory:

Ampere's law and Faraday's law of electromagnetic induction, Derivation of Maxwell's equations and their physical significance, Correction of Ampere's law by Maxwell, Concept of displacement current, Poynting theorem, Maxwell's equations in free space & velocity of electromagnetic waves, Transverse character of the wave and orthogonality of \mathbf{E} , \mathbf{H} and \mathbf{k} vectors, Maxwell's equation in dielectric medium and velocity of e.m. wave, Comparison with free space, Maxwell's equations in conducting media & solution of differential equation in this case, penetration depth & its significance.

UNIT- 4

Statistical Mechanics & Lasers:

Macrostates and Microstates, Phase space, probability of distribution, most probable distribution, Maxwell-Boltzmann Statistics, Applications of Maxwell-Boltzmann Statistics, derivation of average velocity, RMS velocity and most probable velocity in the above cases, Bose-Einstein Statistics & its application in case of black body radiation, distribution law of energy, Planck's radiation formula, derivation of Wien's law, Rayleigh-Jeans law and Stefan's law from Planck's radiation formula. Fermi – Dirac statistics, application in case of free electrons in metals, energy distribution, Fermi energy.

Lasers: Spontaneous and stimulated emission of radiations, Einstein's theory of matter-radiation interaction, Einstein's coefficients and relation between them, Population inversion, components of a laser, different kinds of lasers, Ruby laser, He-Ne laser, solid state lasers, properties of laser beams, monochromaticity, coherence, directionality and brightness, applications of lasers in various technological applications.

UNIT- 5

Materials of Technological Importance:

Dielectric Materials: Electric field in presence of dielectric medium, concept of electric polarization, different types of polarizations, behaviour of dielectric in a.c. field, concept of dielectric loss and loss energy and their importance.

Semiconducting Materials: Concept of energy bands in solids, carrier concentration and conductivity in intrinsic semiconductors and their temperature dependence, carrier concentration and conductivity in extrinsic semiconductors and their temperature dependence, Hall effect in semiconductors, compound semiconductors, amorphous semiconductors.

Nano Materials: Basic principles of nanoscience and technology, preparation, structure and properties of fullerene and carbon nanotubes, applications of nanotechnology.

Superconducting Materials: Resistivity and susceptibility of Superconductors, Type – I and Type – II superconductors, Meissner effect, Low temperature Superconductors, Organic Superconductors, Oxide Superconductors, High temperature Superconductors, BCS theory (Qualitative).

Text Books:

1. Engineering Physics, R. K. Shukla, Pearson Education, Vol.-II, 2014
2. Electrical Engineering Materials, R.K. Shukla, McGraw Hill, 1st Edition, 2012
3. Principles of Engineering Physics, R.K. Shukla, Ira Books, 1st Edition, 2011
4. Engineering Physics –I & II, S.K. Gupta, Krishna Prakashan Media (P) Ltd., 2014

References Books:

1. Fundamental university physics, Vol. - I: Mechanics, Marcelo Alonso, J. Finn Edwards, Addison-Wesley, 1st Edition, 1967
2. Concepts of Modern Physics, Arthur Beiser, McGraw Hill, 6th Edition, 2003
3. Introduction to Electrodynamics, David Griffiths, Cambridge University Press, 4th Edition, 2017
4. Introduction to Solid State Physics, Charles Kittel, Willey, 8th Edition, 2005
5. Introduction to Nanotechnology, Charles P. Poole Jr., Frank J. Owens, Wiley-Interscience, 1st Edition, 2003

Web Links:

1. <https://nptel.ac.in/courses/122101002> [IIT Bombay, Prof. D.K. Ghosh]
2. <https://nptel.ac.in/courses/122103011> [IIT Guwahati, Prof. Alike Khare , Prof. Pratima Agarwal, Prof. S. Ravi]
3. <https://nptel.ac.in/courses/115105099> [IIT Kharagpur, Prof. Amal Kumar Das]
4. <https://nptel.ac.in/courses/115101005> [IIT Bombay, Prof. D.K. Ghosh]
5. <https://nptel.ac.in/courses/115106066> [IIT Madras, Prof. S. Lakshmi Bala]

NHS 103 / 104 : PROFESSIONAL COMMUNICATION

C [L-T-P]: 4[3 0 2]

Course Objectives

- Critically think about communication processes and messages.
- Write effectively for a variety of contexts and audiences.
- Interact skillfully and ethically.
- Develop and deliver professional presentations

Course Outcomes (CO)

At the end of this course students should be able to:

CO1	Effectively communicate their ideas in the contemporary global competitive environment.	K2, K1
CO2	Convey their messages through constructive writing.	K3, K1
CO3	Draft potent E-Mails, letters, proposals and reports.	K4, K1
CO4	Present their presentations along with using all nuances of delivery with clarity and thoroughness.	K5, K1
CO5	Solve problems based on real time situations and articulate them eventually.	K3, K1

K1- Remember, K2- Understand, K3-Apply, K4-Analyse, K5- Evaluate, K6- Create

Course Articulation Matrix (CO-PO Matrix of selected Course): NHS 103/104

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	0	0	0	0	0	0	0	0	2	3	0	1
CO2	0	0	0	0	0	0	0	0	2	3	0	1
CO3	0	0	0	0	0	0	0	0	2	3	0	1
CO4	0	0	0	0	0	0	0	0	2	3	0	1
CO5	0	0	0	0	0	0	0	0	2	3	0	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

UNIT I

Fundamentals of Technical Communication

Process of communication, language as a tool of communication, levels of communication, flow of communication, barriers to communication, communication across cultures; Technical Communication: meaning, significance, characteristics, difference between technical and general communication.

UNIT II

Elements of Written Communication

Words and phrases, word formation, synonyms and antonyms, homophones, one word substitution, sentence construction, paragraph construction,

UNIT III

Forms of Technical Communication

(A) business letters, job application letter and resume, 7C's of letter writing, business letters: sales & credit letters, letters of enquiry, letters of quotation, order, claim and adjustment letters, official letters: D.O. letters, government letters, letters to authorities, etc. ,

(B) Technical Reports: general format of a report, formal and informal reports, memo report, progress report, status report, survey report, trip report, complaint report, , Joining Report ,laboratory report, research papers, dissertations and theses. E-mail writing
Technical Proposals: purpose, characteristics, types, structure

UNIT IV

Presentation Strategies

Defining the subject, scope and purpose, analysing audience & locale, collecting materials, preparing outlines, organising the contents, Pre-presentation strategies, during presentation strategies, nuances of delivery, verbal and non-verbal communication, Body language, paralinguistic features of voice, visual aids.

UNIT V

Value-based Text Reading

(A) Study of the following essays from the text book with emphasis on writing skills:

- | | |
|---|---------------------|
| 1. Man and Nature | by J. Bronowski |
| 2. The Language of Literature and Science | by Aldous Huxley |
| 3. The Aims of Science &The Humanities | by Moody E Prior |
| 4. Gods in this Godless Universe | by Bertrand Russell |
| 5. Science and Survival | by Barry Commoner |

(B) Readings of selected short stories:

- | | |
|-----------------------------|------------------------|
| 1. The Renunciation | by Rabindranath Tagore |
| 2. The Lament | by Anton P. Chekhov |
| 3. The Barber's Trade Union | by Mulk Raj Anand |
| 4. The Eyes Are Not Here | by Ruskin Bond |

Professional Communication Laboratory

Interactive practical sessions with emphasis on oral presentations / spoken communication:

Practical Sessions on:

1. Group Discussions: selected topical issues to be discussed in groups.
2. Mock interviews
3. Communication skills for seminars/conferences/workshops with emphasis on non-verbal skills.
4. Presentation skills for technical papers/project reports/professional reports.
5. Theme presentation/ key note presentation based on correct argumentation methodologies.
6. Argumentative skills
7. Role play
8. Comprehension skills based on reading and listening practice, asking questions.
9. Introduction to International Phonetics Alphabets
10. Audio Visual demonstration of effective communicative strategies & TED Talks

Text Books

1. Improve Your Writing Edited By V N Arora and Laxmi Chandra, Oxford University Press, First Edition, New Delhi, 2013.
2. An Anthology of English Short Stories, Edited by R P Singh, First Edition, 2015, Oxford University Press.
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Third Edition, 2015, Oxford University Press, New Delhi.
4. Sethi and Dhamija, 'A Course in Phonetics and Spoken English', Second Edition, 2004, Prentice Hall of India, New Delhi.
5. Joans Daniel, 'English Pronouncing Dictionary', 18th Edition, 2011, Cambridge University Press.

Reference Books

1. Effective Technical Communication, by Barun K Mitra, First Edition, 2008, Oxford University Press.
2. Business Correspondence & Report Writing by R.C. Sharma & Krishna Mohan, Fifth Edition, 2017, Tata McGraw Hill, N.D.
3. Developing Communication Skills by Krishna Mohan & Meera Banerjee, Second Edition, 2000, Macmillan India
4. Technical Communication- Principles and Practices by M R S Sharma, Third Edition, 2015, Oxford University Press, New Delhi
5. R. K. Bansal & J.B. Harrison, Spoken English for India, Orient Longman, Fourth Edition, 2013, Orient Blackswan, Hyderabad.
6. Excellence in Business Communication, 13th Edition, 2020 Publisher-Pearson Education.

Web Links:

1. <https://nptel.ac.in/courses/109104030> [Dr. T Ravichandran, IIT Kanpur]

NME-101/102 : INTRODUCTION TO MECHANICAL ENGINEERING

C[L-T-P]: 4[3-1-0]

Course Objectives:

To explain the basic fundamentals of forces, moments, stresses, strains, fundamental of fluid and fluid flow application, fundamentals of thermodynamics and mode of heat transfers.

Course Outcomes (CO):

At the end of this course students should be able to:

CO1	Understand the basic laws concepts of mechanical systems.	K2, K1
CO2	Determine resultants and apply conditions of static equilibrium to plane force systems.	K3, K1
CO3	Analyze beam for shear force and bending moment along the span and analyze trusses for axial forces.	K4, K1
CO4	Evaluate the structural properties centroid and moment of inertia	K5, K1
CO5	Stress analysis for one- and two-dimensional stress systems.	K3, K1

K1- Remember, K2- Understand, K3-Apply, K4-Analyse, K5- Evaluate, K6- Create

Course Articulation Matrix (CO-PO Matrix)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3			1	1	1	1	1		1
CO2	3	3	3									1
CO3	3	3	3									1
CO4		3	2	2								1
CO5		3	2	2								1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content:

UNIT-1: Fundamental Concepts and Definitions:

Mechanical Engineering: Scope and expanse

Concept of machines and mechanisms, classification of machines.

Thermodynamic systems, Laws of thermodynamics. Introduction to modes of heat transfer, applications.

Materials, classification, selection of materials in design of components.

Manufacturing processes, mechanical working of metals.

UNIT-2:

Two-Dimensional Force Systems: Basic concepts, laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, distributed force system, free body diagrams, equilibrium and equations of equilibrium, applications.

Friction: Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry-friction, belt friction, applications.

UNIT-3:

Beam: Introduction, Shear force and bending moment, differential equations for equilibrium, shear force and bending moment diagrams for statically determinate beams.

Trusses: Introduction, simple truss and solution of simple truss, Method of joints and method of sections.

UNIT-4: Centroid and Moment of Inertia: Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area, Parallel Axes theorem, Perpendicular axes theorems, Principal moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere and cone about their axis of symmetry.

UNIT-5: Introduction to Strength of Materials: Introduction, normal and shear stresses, stress- strain diagrams for ductile and brittle material, elastic constants, One Dimensional loading of members of varying cross- sections, strain energy, 2D state of plane stress, Principal stresses and strains.

Text books:

1. Engineering Mechanics by Abhijit Chanda and Debabrata Nag, Wiley India Pvt. Ltd, 2018, Kindle -Edition, ISBN: 9788126570935.
2. Engineering Mechanics: Statics by J L Meriam. L G Kraige. Virginia Polytechnic Institute and State University, John Wiley & Sons, 2017. ISBN-978-8126564033.
3. Engineering Mechanics of Solids, Egor P. Popov, PHI Publications, 1990.
4. Theory of Machines and Mechanisms by J.E. Shigley, Oxford University Press, 5th Edition, 2017.
5. Engineering Thermodynamics by P K Nag, TMH Publication, 4th Edition, 2008.

Reference Books:

1. Theory of Machines and Mechanisms by Amitabha Ghosh and Asok Kumar Mallick, Affiliated East-West Press, 3rd Edition, ISBN: 9788185938936.
2. Engineering Mechanics by Timoshenko S., McGraw-Hill Education – Europe, 5th Edition, 2013.
3. Engineering Mechanics by Nelson A, McGraw Hill Education India, 1st Edition, ISBN-978-0070146143, 2017
4. Materials and Manufacturing: An Introduction to How they Work and Why it Matters by Mark A Atwater McGraw-Hill Education, 1st Edition, ISBN: 9781260122312, 2018
5. Engineering Thermodynamics: Work and Heat Transfer by Rogers, Pearson Education India, 4th Edition, 2002.

Web Links:

- 1- <https://nptel.ac.in/courses/112106286> [IIT Madras, Prof. K. Ramesh]
- 2- <https://nptel.ac.in/courses/112103108> [IIT Guwahati, Prof. US Dixit]
- 3- <https://nptel.ac.in/courses/112103109> [IIT Guwahati, Prof. US Dixit]
- 4- <https://eng.utq.edu.iq/wp-content/uploads/sites/4/2019/09/engineering-mechanics-lectures.pdf> [Thi-Qar University, Prof. Haider]
- 5- https://www.youtube.com/watch?v=tisNUzd_f1M&t=96s [Dr. V. P. Singh, HBTU, Kanpur]
- 6- <https://www.youtube.com/watch?v=a6RNss9kBuI&t=11s> [Dr. V. P. Singh, HBTU, Kanpur]
- 7- https://www.youtube.com/watch?v=LE1Lc6_640U [Dr. V. P. Singh, HBTU, Kanpur]

NCE-101/102 : INTRODUCTION TO CIVIL ENGINEERING

C[L-T-P]: 4[3-1-0]

Course Outcomes

At the end of this course students should be able to:

CO1	To understand the overview and scope of Civil Engineering and apply the fundamentals of Surveying
CO2	To understand the various types of Civil Engineering materials
CO3	To understand the basic concepts of water and wastewater quality, infrastructure, and also the basics of different pollution
CO4	To understand the basics of Highways, Railways and Airport Engineering
CO5	To understand the basics of various Civil Engineering structures

Course Articulation Matrix (CO-PO Matrix)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	2	-	-	-	-	-	1
CO1	2	-	-	-	-	2	-	-	-	-	-	1
CO2	2	-	-	-	-	2	3	-	-	-	-	1
CO3	2	-	-	-	-	2	3	-	-	-	-	1
CO4	2	-	-	-	-	2	3	-	-	-	-	1
CO5	2	1	1	-	-	2	1	-	-	-	-	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content

Unit-1: Introduction

Civil Engineering: Overview and scope of Civil Engineering, Civil Engineering landmarks, Job opportunities in Civil Engineering

Fundamentals of Surveying: Introduction, Types of Surveying - Chain, Compass, levelling and contouring, Total Station, Introduction to Remote Sensing/ GIS/ GPS

Unit-2: Civil Engineering materials

Building materials : Bricks, Stones, Cement, Aggregate, Concrete, RCC, Steel, Timber, Tiles, lime, paint.

Highway materials: bitumen, concrete, Surkhi, sand, stone dust

Soil: Types of soil, classification of soil.

Unit-3: Environmental Engineering

Water and Wastewater Quality, Drinking Water Standards, Water infrastructure- Intake, Treatment plants, distribution system, and household plumbing.

Waste water infrastructure- household drainage system, sewerage system, Treatment Plant, and, disposal, effluent standards.

Introduction to Air Pollution, Air Quality Index, Air quality standards, Solid Waste Management- collection and segregation, Noise Pollution- standards

Unit-4: Transportation Engineering

Highway Engineering: Introduction, Model, elemental and functional classification of Transportation System, IRC classification of roads, Typical cross-section of pavements, Control system.

Railway Engineering: Types of rails, Components of permanent way, stations

Airport- Components of the airport

Introduction to Docks, Harbour, and Inland waterways

Unit-5: Civil Engineering Structures

Introduction to buildings: Elements- slab, beam, column, footing

Introduction to various Civil Engineering Structures- Bridges, Retaining Wall, Tanks and Reservoirs, Hydraulic Structures- Dams, Canals, Weirs, Barrage, Industrial Structures

Textbooks

1. S.S. Bhavikatti (2010). 'Basic Civil Engineering.', 1st edition, New Age International Publishers, New Delhi
2. Sateesh Gopi (2009). 'Basic Civil Engineering.', Pearson Publishers, Delhi, India
3. Punmia, B.C., Jain, A.K. and Jain, A.K. (2003). 'Basic Civil Engineering.', Laxmi Publications, New Delhi.

Reference Books

1. An Introduction to Civil Engineering by V. Okumu, CreateSpace Independent Publishing Platform.
2. Penn M. R. and Parker P. J. "Introduction to Infrastructure: An Introduction to Civil and Environmental Engineering" John Wiley & Sons 2011.

Web Resources

<https://nptel.ac.in/courses/105106201>

NCE-103/104 : ENGINEERING GRAPHICS

C[L-T-P]: 2[0-0-4]

Course Outcomes

At the end of this course, students should be able:

CO1	To understand and apply the concepts of lettering, dimensioning, scales and geometric construction
CO2	To visualize the position and location of any point, line, plane, or surface and draw their orthographic projections
CO3	To visualize and draw/develop the true shape, size, and sections of solid objects the true shape, size, and specifications of physical objects
CO4	To apply the visualization skill, to draw a simple isometric and perspective projections
CO5	To understand and draw basic civil Engineering building components using AutoCAD

Course Articulation Matrix (CO-PO Matrix)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	1	2	-	-
CO2	2	-	-	-	-	-	-	-	1	2	-	-
CO3	2	-	-	-	-	-	-	-	1	2	-	-
CO4	2	-	-	-	-	-	-	-	1	2	-	-
CO5	2	-	-	-	3	-	-	-	1	2	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content

Unit –I

Lettering and Dimensioning: Introduction, lettering practices, Rules of dimensioning – systems of dimensioning.

Geometric Constructions: Freehand sketching, Conic Sections, Special Curves.

Engineering Scales

Unit –II

Orthographic Projection

Projection of Points: First and Third Angle Projections; Projection of Points

Projection of Lines: Projection of straight lines (First angle projection only); Projection of lines inclined to one plane and both planes, true length and true inclinations.

Projection of solids: Classification of solids, Projection of solids in simple position, Projection of solids inclined to one plane.

Unit –III

Sections of Solids: Right regular solids and auxiliary views for the true shape of the sections.
Development of Surfaces: Development of surfaces for various regular solids.

Unit –IV

Isometric Projection: Isometric scales, Isometric projections of simple and combination of solids;

Perspective Projection: Orthographic representation of perspective views – Plane figures and simple solids – Visual Ray Method.

Conversion of pictorial view into orthographic Projection.

Unit –V

Introduction to Auto CAD, Drawings of Buildings and their components – front view, top view, and sectional views of a typical residential building using Auto CAD.

Detailed Drawing of RCC Design- Slab, beam, column, footings.

Textbooks

1. D.A. Jolhe (2008). 'Engineering Drawing- With an Introduction to AutoCAD.', Tata Mcgraw, Delhi.
2. N D Bhatt and V M Panchal (2001). 'Engineering Drawing.', 43rd Ed., Charotar Publishing House, Anand, 2001.
3. M B Shah and B C Rana (2009). 'Engineering Drawing.', 2nd Ed., Pearson Education, Delhi.

Reference Books

1. A Textbook of Engineering Graphics by K.V. Natarajan.
2. T E French, C J Vierck and R J Foster, Graphic Science and Design, 4th Ed., McGraw Hill, 1984.
3. W J Luzadder and J M Duff, Fundamentals of Engineering Drawing, 11th Ed., PHI, 1995.
4. K Venugopal, Engineering Drawing and Graphics, 3rd Ed., New Age International, 1998

Web Resources

<https://nptel.ac.in/courses/112103019>

<https://nptel.ac.in/courses/112102304>

<https://nptel.ac.in/courses/112105294>

<https://archive.nptel.ac.in/courses/112/102/112102304/>

NCS-101/102: INTRODUCTION TO COMPUTER SCIENCE AND ENGINEERING

C[L-T-P]: 4[3-1-0]

Course Outcomes (COs):

To explain the fundamentals of the computer system in terms of hardware components and basics of an operating system, understanding of programming, database management systems, and working with Internet and web applications.

At the end of this course students should be able to:

CO1	Understand hardware components of computer systems such as memory system organization, and input/output devices, and be aware of software components of computer system	Understand	K1
CO2	Understand Operating systems and be able to develop basic shell scripts.	Understand, Apply	K1, K2
CO3	Develop a basic understanding of programming and get a concept of algorithmic thinking.	Apply, Analyze	K2, K3
CO4	Understand Databases, Use SQL to write queries.	Understand, Evaluate	K1, K4
CO5	Explain how the Internet works and be able to make basic static Web applications.	Understand, Create	K1, K5

K1-Understand, K2-Apply, K3-Analyse, K4-Evaluate, K5-Create

Course Articulation Matrix (CO-PO Matrix)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	1	-	-	-	-	-	-	-	-	-
CO3	3	3	2	3	1	-	-	1	1	1	1	1
CO4	3	2	2	3	1	-	-	-	1	-	2	1
CO5	3	2	3	1	2	1	1	2	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content

Unit - 1

Fundamentals of Computers: Introduction to Computers - Computer Definition, Characteristics of Computers, Evolution, and History of Computers, Types of Computers, Basic Organization of a Digital Computer; Classification of Digital Computer Systems: Microcomputers, Minicomputers, Mainframes, Supercomputers. Number Systems, Computer Codes – BCD, Gray Code, ASCII, and Unicode; Boolean Algebra – Boolean Operators with Truth Tables; Types of Software – System Software and Utility Software; Computer Languages - Machine Level, Assembly Level & High-Level Languages, Translator Programs – Assembler, Interpreter and Compiler; Planning a Computer Program – Data Structures, Algorithm, Flowchart and Pseudo code with Examples.

Unit-2

Operating System Fundamentals: Operating Systems: Introduction, Functions of an Operating System, Classification of Operating Systems, System programs, Application programs, Utilities, The Unix Operating System, Basic Unix commands, Microkernel Based Operating System, Booting.

Unit-3

Fundamentals of C Programming Language: Introduction to C Programming Languages, Structure of C programs, compilation and execution of C programs, Debugging Techniques, Data Types and Sizes, Declaration of variables, Modifiers, Identifiers and keywords, Symbolic constants, Storage classes (automatic, external, register and static), Enumerations, command line parameters, Macros, The C Preprocessor.

Operators: Unary operators, Arithmetic & logical operators, Bitwise operators, Assignment operators and expressions, Conditional expressions, Precedence, and order of evaluation.

Control statements: if-else, switch, break, and continue the comma operator, goto statement. Loops: for, while, do-while. Functions: built-in and user-defined, function declaration, definition and function call, and parameter passing: call by value, call by reference, recursive functions. Arrays: linear arrays, multidimensional arrays, passing arrays to functions, Arrays, and strings.

Unit-4

Introduction to Database Management Systems: Database, DBMS, Why Database -File system vs DBMS, Database applications, Database users, Introduction to SQL, Data types, Classification of SQL-DDL with constraints, DML, DCL, TCL

Unit-5

Internet Basics: Introduction, Features of the Internet, Internet application, Services of the Internet, Logical and physical addresses, Internet Service Providers, Domain Name System.

Web Basics: Introduction to web, web browsers, http/https, URL, HTML5, CSS

Text Books:

1. Kernighan B.W., Ritchie D.M., "The C Programming Language", 2nd Edition, Prentice Hall Software, 2015
2. V. Rajaraman, "Fundamentals of Computers", 6th Edition, PHI Learning Pvt. Ltd., 2015
3. Peter Norton's, "Introduction to Computers", 7th Edition, Tata McGraw Hill, 2017
4. David Riley and Kenny Hunt, "Computational Thinking for Modern Solver", Chapman & Hall/CRC, 1st Edition, 2014

Reference:

1. J. Glenn Brook shear," Computer Science: An Overview", Addison-Wesley, Twelfth Edition, 2017
2. R.G. Dromey, "How to Solve it by Computer", PHI, 1982
3. Balagurusamy E., "Fundamentals of Computers", Second ed. 2009, McGraw Hill
4. Thareja R., "Fundamentals of Computers", 2014, Oxford University Press.

Web link:

1. https://onlinecourses.swayam2.ac.in/cec19_cs06/preview

NEE-101/102 : INTRODUCTION TO ELECTRICAL ENGINEERING

C[L-T-P] : 4 [3-0-2]

Course Objectives

The goal of the course is to make the students understand the basic principles of electrical engineering.

Course Outcomes

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

- CO1. apply Mesh and Nodal Methods of Analysis and Network Theorem in DC Network.
- CO2. understand and analyze the ac circuit and calculate the various parameters.
- CO3. understand and analyze the 3-phase connections of source and load, and, measurement of 3-phase power.
- CO4. understand the magnetic circuit with working & applications and to calculate the various parameters of magnetic circuits and transformer efficiency.
- CO5. understand the basic principles of AC & DC Machines

Course Articulation Matrix (CO-PO Matrix)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2		1					2		2
CO2	3	1			1					2		2
CO3	3			3	1					2		2
CO4	3				1					2		2
CO5	3		2		1					2		2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content

UNIT 1 - DC Circuit Analysis and Network Theorems

Circuit Concepts: Concepts of Network, Active and Passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements. R L and C as linear elements. Source Transformation. Kirchhoff's Law, loop and nodal methods of analysis; star – delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem. (Simple Numerical Problems)

UNIT 2 - Steady State Analysis of Single Phase AC Circuits

Sinusoidal, Square and Triangular waveforms – average and effective values, form and peak factors, concept of phasors, phasor representation of sinusoidally varying voltage and current. Analysis of series, parallel, and series – parallel RLC Circuits: Apparent, Active & Reactive Powers, Power factor, causes and problems of low power factor, power factor improvement. Resonance in Series and Parallel Circuits. (Simple Numerical Problems)

UNIT 3 - Three Phase AC Circuits

Three Phase System – its necessity and advantages, meaning of phase sequence and star and delta connections, balanced supply and balanced load, line and phase voltage / current relations, three phase power and its measurement. (Simple Numerical Problems)

UNIT 4 - Magnetic Circuits and Transformer

Magnetic Circuit: Magnetic circuit concepts, analogy between Electric & Magnetic circuits, Magnetic circuits with DC and AC excitations, Magnetic leakage. B-H curve, Hysteresis and Eddy Current losses, Magnetic circuit calculations.

Single Phase Transformer: Principle of Operation, Construction, e.m.f. equation, Power losses, efficiency. (Simple Numerical Problems)

UNIT 5 - Electro Mechanical Energy Conversion

Basic Principles of electro mechanical energy conversion.

DC Machines: Types of DC machines, e.m.f. equation of generator and torque equation of motor, Speed-Torque characteristics of DC Series and Shunt Motors, Applications of dc motors. (Simple Numerical Problems).

Three Phase Induction Motor: Types, Principle of Operation, Slip – torque Characteristics, applications. (Simple Numerical Problems).

Single Phase Induction Motor: Basic Principles of 1-phase Induction Motor and its applications

Three Phase Synchronous Machines: Principle of Operation of alternator and synchronous motor and their applications.

List of Experiments

1. Verification of Kirchhoff's laws.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Measurement of power and power factor in a 1 – \emptyset ac series inductive circuit and study improvement of power factor using capacitor.
6. Study of phenomenon of resonance in RLC series circuit and obtain the resonant frequency.
7. Measurement of power in 3 – \emptyset circuit by Two Wattmeter method and determination of its power factor.
8. Determination of parameter of ac 1 – \emptyset series RLC Circuit.
9. Determination of Efficiency by load test of a 1 – \emptyset Transformer.
10. To study running and speed reversal of a 3 – \emptyset induction motor and record its speed in both direction.

Note:

- a. Department may add any three experiments in the above list.
- b. Minimum eight experiments are to be performed out of the above list.

Text books:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall International
2. I. J. Nagrath, "Basic Electrical Engineering" Tata Mc - Graw Hill
3. D. E. Fitzgerald & A. Grabel Higginbotham, "Basic Electrical Engineering" Mc - Graw Hill
4. B. L. Theraja and A. K. Theraja, "Basic Electrical Engineering: July 1999.

Reference books:

1. Edward Hughes, "Electrical Technology" Longman
2. T. K. Nagsarkar & M. S. Sukhija, "Basic Electrical Engineering" Oxford University Press
3. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing
4. W. H. Hayt & J. E. Kennely, "Engineering Circuit Analysis" Mc - Graw Hill

NET-101/102 : INTRODUCTION TO ELECTRONICS ENGINEERING

C[L-T-P]: 4[3-1-0]

Course Objective

To understand the fundamentals of analog & digital electronic devices like diode, transistor, logic gates, flip-flop and to understand the working principles of common Instruments used in electronic measurement.

Course Outcomes (CO):

At the end of this course students should be able to:

CO1	To understand the basic concept of diodes, and use the diode as a circuit element for different applications.	K2,K3
CO2	To understand the working of BJT, FET and OP-amp and their application.	K2, K3, K6
CO3	To design the simple digital circuits using different logic gates.	K4, K6
CO4	To identify the errors while making electronic measurements and to understand the working of different types of transducers.	K1, K4, K5
CO5	To understand the working principle of electronic instruments and displaying it on electronic devices.	K1, K2, K4

K1- Remember, K2- Understand, K3-Apply, K4-Analyse, K5- Evaluate, K6- Create

Course Articulation Matrix (CO-PO Matrix)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	1	-	-	-	-	-	-	-
CO2	2	3	3	3	2	2	-	-	-	-	-	-
CO3	3	2	1	3	2	1	-	-	-	-	-	-
CO4	3	2	1	1	1	-	-	-	-	-	-	-
CO5	3	1	3	2	1	-	-	-	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation put “-”.

Course Content

Unit-I:

P-N Junction Diode, Depletion layer, Barrier potential, forward and reverse bias, Knee voltage, V-I Characteristics and its Equivalent Models, Avalanche and Zener Break Down, Diode Applications as Half Wave, Full Wave & Bridge Rectifier and their comparative analysis, Clippers, Clampers, Voltage Multiplier Circuit, Zener Diode and its Applications as a voltage regulator, Varactor diode.

Unit-II:

Basic theory and operation of PNP and NPN transistors, Characteristics of Common Base, Common Emitter and Common Collector configuration, DC Biasing : Fixed Bias, Emitter Bias, voltage divider bias, Field effect transistor: JFET, Drain and Transfer characteristic, MOSFET, Introduction to Operational Amplifier and its Applications as Adder, Subtractor, Integrator, Differentiator, log antilog.

Unit-III:

Number System, Base Conversion, BCD code, Excess-3 code, Gray Code, Review of Logic Gates, Concept of Universal Gates &, Boolean laws and theorems, SOP and POS representation of Boolean functions,

Minimization of Boolean functions using K map, Basic Combinational Circuits: Half Adder, Full Adder, Subtractor, Sequential Circuits: Latch, Flip-Flops, Characteristic and Excitation Table of SR, JK, D and T Flip-flop. Concept of Master Slave Flip- Flop, Shift Registers.

Unit-IV:

Functional Elements of Instruments, Classification & Characteristics, Types of Errors, Sources of Error, Dynamic Characteristics, Active and Passive Transducers: Resistive Transducers, Thermistor, Strain Gauge, Thermocouple, Differential Output Transducers, LVDT and their Characteristics.

Unit-V:

Display Devices: LCD, LED, Seven Segment Display, Alphanumeric Display, Electronic Ammeter and Voltmeter, Digital Multi-meter, Cathode Ray Oscilloscope (CRO), Digital Storage Oscilloscope (DSO)

Text Books:

1. Electronics Principles by Albert Malvino, & David Bates, 2016, Tata McGraw-Hill, Eighth Edition, ISBN- 978-0-07-337388-1
2. Electronic Devices & Circuit Theory by Boylestad, Robert & Nashelsky, 2015, Louis, Prentice Hall of India. Eleventh Edition, ISBN- 10-9332542600
3. Electronic Instrumentation and Measurements by H.S. Kalsi, 2019, Tata McGraw-Hill, Fourth Edition, ISBN-10- 9353162513
4. Digital Principles and Applications by Leach, Malvino, & Saha, 2014, Tata McGraw-Hill, 8th Edition, ISBN-10- 9789339203405

Reference Books:

1. Microelectronic Circuits by Adel Sedra, Kenneth C.(KC) Smith, Tony Chan Carusone, Vincent Gaudet, 2020, Oxford University Press, 8th Edition, ISBN-10-0190853468
2. A Course in Electrical and Electronic Measurements and Instrumentation by A K Sawhney 2021, Dhanpat Rai & sons, ISBN-10- 8177001000
3. Fundamentals of Microelectronics by Behzad Razavi, Wiley, Second Edition, ISBN-13:9781118156322

Web Links:

1. <https://nptel.ac.in/courses/108101091>
2. <https://nptel.ac.in/courses/122106025>