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|--|--|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: BS-103 / BS-104 | Paper: Applied Chemistry | L | T/P | C | | | | | | | | |
| | | 3 | - | 3 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term-end examinations question paper. | | | | | | | | | | | | |
| 2. The first unit will be compulsory and cover the entire syllabus. This question will have Five sub-parts, and the students will be required to answer any THREE parts of 5 marks each. This unit will have a total weightage of 15 marks. | | | | | | | | | | | | |
| 3. Apart from unit 1 which is compulsory, the rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain up to 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course/paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To understand the fuels and their uses. | | | | | | | | | | | |
| 2: | To understand phase rule and its applications. Also, to understand the properties and industrial applications of polymers. | | | | | | | | | | | |
| 3: | To understand the methods used to make pure water. | | | | | | | | | | | |
| 4: | To understand the chemical aspects of corrosion and gain a basic understanding about the principles of Green Chemistry and Nano-chemistry. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Ability to use fuels and perform energy conversion calculations. | | | | | | | | | | | |
| CO2 | Understand the phase rule and its applications. Also, to understand the properties and industrial applications of polymers. | | | | | | | | | | | |
| CO3 | Ability to analyse water and use technologies to purify it. | | | | | | | | | | | |
| CO4 | Understand the chemical aspects of corrosion and its prevention. Also, to understand the basics of Green Chemistry and Nano-chemistry. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 1 |
| CO2 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 1 |
| CO3 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 1 |
| CO4 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | 1 | - | 1 |

Unit I

Fuels: Classification and Characteristics of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, calorific values of fuels, determination of calorific values using Bomb calorimeter, Boy's calorimeter, theoretical calculation of calorific value using Dulong formula and numericals of Calorific values. Types of fuels: - Solid: Coal, proximate and ultimate analysis of coal and numericals, carbonisation of coal in Otto-Hoffman oven with recovery of by-products, metallurgical coke; Liquid: Petroleum products --- refining, cracking-thermal and catalytic, knocking characteristics, Octane and Cetane rating; Gaseous: Natural Gas (NG), CNG, LPG, Coal gas, Oil gas, Producer gas, Water gas; Combustion of fuels numericals. [9Hrs] [T1]

Unit II

Phase rule: Terms used in Gibb's Phase rule, phase diagram and its applications for study of one-component systems: Water and Sulphur and two-component systems: Lead-Silver and Zinc-Magnesium.

Polymers: Classification, functionality and their types; Plastics: Synthesis (reactions) and properties of Polyethylene Plastics (Addition polymers) ---low-density polyethene (LDPE), high-density polyethylene(HDPE), linear low density polyethylene(LLDPE) and ultra-high molecular weight polyethylene (UHMWPE); Vinyl Plastics (Condensation polymers) -Nylons, Phenol-formaldehyde resins(Bakelite) and Glyptal; Speciality Polymers: Engineering thermoplastics, Conducting polymers, Electroluminescent polymers, liquid crystalline polymers and biodegradable polymers. [9Hrs][T1, T2]

Unit III

Water: Introduction, water quality standards, physical, chemical and biological characteristics; hardness of water, disadvantages of hardness, determination of hardness (EDTA method) and related numerical questions. Alkalinity and its determination; Boiler problems with hard water and their prevention: Scale and sludge formation, boiler corrosion, caustic embrittlement, priming and foaming, boiler water treatment -internal or in-situ: carbonate and phosphate conditioning, colloidal and Calgon conditioning; external treatment: (a) Lime soda process and related numericals (b) Zeolite process and numericals, (c) Ion-exchange process. Municipal water supply - its treatment and disinfection using break -point chlorination. Desalination, Reverse Osmosis, Electrodialysis and defluoridation of water. [9Hrs][T1, T2]

Unit IV

Corrosion and its Control: Definition, effects, theory (mechanisms): dry/chemical, wet/electrochemical corrosion, Pilling-Bedworth ratio; Types of corrosion: Galvanic corrosion, Soil corrosion, Pitting corrosion, Concentration cell or Differential Aeration corrosion, Stress corrosion; Mechanism of rusting of iron, Passivity. Factors influencing corrosion; protective measures: galvanization, tinning, cathodic protection, sacrificial anodic protection; electroplating and prevention of corrosion through material selection and design.

Green Technology and Green Chemistry

Twelve Principles of Green Chemistry, Zero Waste Technology, Atom economy, Use of alternative feedstock, innocuous reagents, alternative solvents, designing alternative reaction methodology, minimising energy consumption.

Nano Chemistry: Nanomaterials: Properties, synthesis and surface characterization techniques BET and TEM and applications. [9Hrs][T1, T2]

Textbooks:

1. Applied Chemistry by Achyutananda Acharya and Biswajit Samantray, Pearson, 2017.
2. *Engineering Chemistry: Fundamentals and Applications* by Shikha Agarwal, Cambridge University Press, 2019.

References:

1. *Applied Chemistry: A Textbook of Engineers and Technologists* by O. V. Roussk and H. D. Gesser, Springer, 2013.
2. Engineering Chemistry by Raghupati Mukhopadhyay and Sriparna Datta, New Age Int. (PO Ltd., 2007.
3. *Engineering Chemistry* by K. Shesha Maheswaramma and Mridula Chugh, Pearson, 2017.
4. *Basic Engineering Chemistry* by S.S. Dara, A. K.Singh, and Abhilasha Asthana, S. Cand and Co., 2012.
5. Engineering Chemistry by K. N. Jayaveera, G.V. Subba Reddy, and C. Ramachandraiah, McGraw Hill, 2016.
6. *Engineering Chemistry* by O. G. Palanna, McGraw-Hill, 2017.
7. *Textbook of Engineering Chemistry* by Jaya Shree Anireddy, Wiley, 2017.
8. *Engineering Chemistry* by E.R. Nagarajan and S. Ramalingam, Wiley, 2017.

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|--|--|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: BS-121 / BS-120 | Paper: Basic Chemistry | | L | T/P | C | | | | | | | |
| Year of Inclusion: 2022-23 | | | 3 | - | 3 | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term-end examinations question paper. | | | | | | | | | | | | |
| 2. The first unit will be compulsory and cover the entire syllabus. This question will have Five sub-parts, and the students will be required to answer any THREE parts of 5 marks each. This unit will have a total weightage of 15 marks. | | | | | | | | | | | | |
| 3. Apart from unit 1 which is compulsory, the rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain up to 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course/paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To understand the fuels and their uses. | | | | | | | | | | | |
| 2: | To lay foundation for the application of engineering materials such as cement and glass Also, to understand the properties and industrial applications of polymers. | | | | | | | | | | | |
| 3: | To understand the methods used to make pure water. | | | | | | | | | | | |
| 4: | To understand the chemical aspects of corrosion. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Ability to use fuels and perform energy conversion calculations. | | | | | | | | | | | |
| CO2 | Course will impart knowledge about some important engineering materials such as cement and glass. It will also enable the students to understand the properties and industrial applications of polymers. | | | | | | | | | | | |
| CO3 | Ability to analyse water and use technologies to purify it. | | | | | | | | | | | |
| CO4 | Students will be able to understand the chemical aspects of corrosion and its prevention. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 1 |
| CO2 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 1 |
| CO3 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 1 |
| CO4 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | - | 1 | 1 | - | 1 |

Unit I

Fuels: Classification and Characteristics of fuels, Calorific values, Comparison between solid, liquid and gaseous fuels, calorific values of fuels, determination of calorific values using Bomb calorimeter, Boy's calorimeter, theoretical calculation of calorific value using Dulong formula and numericals of Calorific values. Types of fuels: - Solid: Coal, proximate and ultimate analysis of coal and numericals, carbonisation of coal in Otto-Hoffman oven with recovery of by-products, metallurgical coke; Liquid: Petroleum products --- mining and refining of petroleum, knocking, numericals based on combustion of fuels (excluding flue gas analysis) . [9Hrs] [T1]

Unit II

Engineering Materials: Portland Cement: manufacturing by Rotary Kiln, role of gypsum, chemistry of setting and hardening of cement. Glass: manufacturing by tank furnace, significance of annealing, types and properties of soft glass, hard glass, borosilicate glass. Polymers: Basic concepts & terminology, classification and functionality of polymers, Properties and applications of (excluding

synthesis): polyethylene, polymethacrylate, nylon, bakelite, polycarbonate, conducting polymers, liquid crystalline polymers, biodegradable polymers. [9Hrs][T1, T2]

Unit III

Water: Introduction, water quality standards, physical, chemical and biological characteristics; hardness of water, disadvantages of hardness, determination of hardness (EDTA method) and related numerical questions, Alkalinity of water and related numericals. Boiler problems with hard water and their prevention: Scale and sludge formation, boiler corrosion, caustic embrittlement, priming and foaming, boiler water treatment -internal or in-situ: carbonate and phosphate conditioning, colloidal and Calgon conditioning; external treatment: (a) Lime soda process and related numericals (b) Zeolite process and numericals (c) Ion-exchange process. Desalination, Reverse Osmosis, Electrodialysis. [9Hrs] [T1, T2]

Unit IV

Corrosion and its Control: Definition, effects, theory (mechanisms): dry/chemical, wet/electrochemical corrosion, Pilling-Bedworth ratio; Types of corrosion: Galvanic corrosion, Soil corrosion, Pitting corrosion, Concentration cell or Differential Aeration corrosion, Stress corrosion; Passivity. Factors influencing corrosion; protective measures: galvanization, cathodic protection, sacrificial anodic protection; electroplating. [9Hrs] [T1, T2]

Textbooks:

1. *Engineering Chemistry: Fundamentals and Applications* by Shikha Agarwal, Cambridge University Press, 2019.
2. *Engineering Chemistry* by Jain & Jain, Dhanpat Rai Publication Company, 2021 (Seventeenth Edition).

References:

1. *Applied Chemistry: A Textbook of Engineers and Technologists* by O. V. Roussk and H. D. Gesser, Springer, 2013.
2. *Engineering Chemistry* by Raghupati Mukhopadhyay and Sriparna Datta, New Age Int. (PO Ltd., 2007.
3. *Engineering Chemistry* by K. Shesha Maheswaramma and Mridula Chugh, Pearson, 2017.
4. *Basic Engineering Chemistry* by S.S. Dara, A. K.Singh, and Abhilasha Asthana, S. Cand and Co., 2012.
5. *Engineering Chemistry* by K. N. Jayaveera, G.V. Subba Reddy, and C. Ramachandraiah, McGraw Hill, 2016.
6. *Engineering Chemistry* by O. G. Palanna, McGraw-Hill, 2017.
7. *Textbook of Engineering Chemistry* by Jaya Shree Anireddy, Wiley, 2017.
8. *Engineering Chemistry* by E.R. Nagarajan and S. Ramalingam, Wiley, 2017.

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|---|--|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: BS-105 | Paper: Applied Physics - I | L | T/P | C | | | | | | | | |
| | | 3 | - | 3 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To understand thermodynamic principles. | | | | | | | | | | | |
| 2: | To understand and model oscillations and waves. | | | | | | | | | | | |
| 3: | To understand and model interference, diffraction and polarization phenomenon. | | | | | | | | | | | |
| 4: | To understand and appreciate relativistic systems and Lasers. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Ability to apply thermodynamic principles to solution of engineering problems. | | | | | | | | | | | |
| CO2 | Ability to understand and model oscillations and waves. | | | | | | | | | | | |
| CO3 | Ability to understand and model interference, diffraction and polarization phenomenon. | | | | | | | | | | | |
| CO4 | Ability to understand and appreciate relativistic systems and Lasers. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 |
| CO2 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 |
| CO3 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 |
| CO4 | 2 | 2 | 3 | 3 | 2 | - | - | - | 1 | 1 | - | 2 |

Unit I

Introduction to Thermodynamics: Fundamental Ideas of Thermodynamics, The Continuum Model, The Concept of a "System", "State", "Equilibrium", "Process". Equations of state, Heat, Zeroth Law of Thermodynamics, Work, first and second laws of thermodynamics, entropy [8Hrs]

Unit II

Waves and Oscillations: Wave motion, simple harmonic motion, wave equation, superposition principle. Introduction to Electromagnetic Theory: Maxwell's equations. work done by the electromagnetic field, Poynting's theorem, Momentum, Angular momentum in electromagnetic fields, Electromagnetic waves: the wave equation, plane electromagnetic waves, energy carried by electromagnetic waves [8Hrs]

Unit III

Interference: Interference by division of wave front (Young's double slit experiment, Fresnel's biprism), interference by division of amplitude (thin films, Newton's rings, Michelson's interferometer), Coherence and coherent sources

Diffraction: Fraunhofer and Fresnel diffraction; Fraunhofer diffraction for Single slit, double slit, and N-slit (diffraction grating), Fraunhofer diffraction from a circular aperture, resolving power and dispersive power of a grating, Rayleigh criterion, resolving power of optical instruments

Polarization: Introduction to polarization, Brewster's law, Malu's law, Nicol prism, double refraction, quarter-wave and half-wave plates, optical activity, specific rotation, Laurent half shade polarimeter. [12Hrs]

Unit IV

Theory of relativity: The Michelson-Morley Experiment and the speed of light; Absolute and Inertial frames of reference, Galilean transformations, the postulates of the special theory of relativity, Lorentz transformations, time dilation, length contraction, velocity addition, mass energy equivalence. Invariance of Maxwell's equations under Lorentz Transformation.

Introduction to Laser Physics: Introduction, coherence, Einstein A and B coefficients, population inversion, basic principle and operation of a laser, the He-Ne laser and the Ruby laser [12Hrs]

Textbooks:

1. *Concepts of Modern Physics (SIE)* by Arthur Beiser, Shobhit Mahajan, and S. Rai Choudhury, McGraw-Hill, 2017.
2. *Physics for Scientists and Engineers* by Raymond A. Serway and John W. Jewett, 9th Edition, Cengage, 2017

References:

1. *Modern Physics* by Kenneth S. Krane, Wiley, 2020.
2. *Principles of Physics* by Robert Resnick, Jearl Walker and David Halliday, Wiley, 2015.
3. *Optics* by Ajoy Ghatak, McGraw Hill, 2020.

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|---|--|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: ES-107 / ES-108 | Paper: Electrical Science | L | T/P | C | | | | | | | | |
| | | 3 | - | 3 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To impart knowledge of the basics electrical engineering. | | | | | | | | | | | |
| 2: | To impart knowledge of the working of RLC circuits. | | | | | | | | | | | |
| 3: | To impart basic knowledge about filters and magnetic circuits. | | | | | | | | | | | |
| 4: | To impart basic knowledge about electrical machines. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Ability to understand and use Kirchpff's Laws to solve resistive circuit problems. | | | | | | | | | | | |
| CO2 | Ability to analyse resistive, inductive and capacitive circuits for transient and steady state sinusoidal solutions. | | | | | | | | | | | |
| CO3 | Understand the first order filters and magnetic circuits. | | | | | | | | | | | |
| CO4 | Understand the design of electrical machines. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 1 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 1 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 1 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | - | - | - | 1 | 1 | 1 | 2 |

Unit - I

DC Circuits: Passive circuit components, Basic laws of Electrical Engineering, Temperature Resistance Coefficients. voltage and current sources, Series and parallel circuits, power and energy, Kirchhoff's Laws, Nodal & Mesh Analysis, delta-star transformation, superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem. Time domain analysis of first Order RC & LC circuits.

[9Hrs] [T1]

Unit - II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

[9Hrs] [T1]

Unit - III

D. C. Generators & Motors: Principle of operation of Generators & Motors, Speed Control of shunt motors, Flux control, Rheostatic control, voltage control, Speed control of series motors.

A. C. Generators & Motors: Principle of operation, Revolving Magnetic field, Squirrel cage and phase wound rotor, Starting of Induction motors, Direct on line and Star Delta starters, Synchronous machines. [9Hrs [T1]]

Unit - IV:

Transformers: Construction and principle of operation, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Measuring Instruments: Electromagnetism, Different Torques in Indicating instruments, Moving Iron Instruments: Construction & Principle, Attraction and Repulsion type; Moving Coil instruments: Permanent Magnet type; Dynamometer type Instruments. [9Hrs] [T1]

Textbooks:

1. *Electrical Engineering Fundamentals* by Vincent Del Toro, PHI (India), 1989

References:

1. *An Introduction to Electrical Science* by Adrian Waygood, Routledge, 2nd Ed. 2019.
2. *Electrical Circuit Theory and Technology* by John Bird, Elsevier, 2007.
3. *Principles and Applications of Electrical Engineering* by Giorgio Rizzoni, MacGraw-Hill, 2007.
4. *Electrical Engineering* by Allan R. Hambley, Prentice-Hall, 2011.
5. *Hughes Electrical & Electronic Technology* by Edward Hughes revised by Hohn Wiley, Keith Brown and Ian McKenzie Smith, Pearson, 2016.
6. *Electrical and Electronics Technology* by E. Hughes, Pearson, 2010.
7. *Basic Electrical Engineering* by D.C. Kulshrestha, McGraw-Hill, 2009.
8. *Basic Electrical Engineering* by D. P. Kothai and I.J. Nagrath, McGraw-Hill, 2010.

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|---|---|------------------------------|------|------|------|------|------|------|------|------|------|------|
| PaperCode:BS-109 / BS-110 | | Paper: Environmental Studies | | | L | P | C | | | | | |
| | | | | | 3 | - | 3 | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | The course is designed to impart basic knowledge of the environment and its components. | | | | | | | | | | | |
| 2: | The course deals in creating awareness about the energy resources and current environmental problems faced by the world. | | | | | | | | | | | |
| 3: | To understand and learn about environment pollution, related case studies and measures taken for control to pollution. | | | | | | | | | | | |
| 4: | To understand and explore different approaches of conserving and protecting environment for the benefit of society. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Environmental Studies course will provide necessary information and knowledge about the various aspects of environment, ecosystems and related biodiversity. | | | | | | | | | | | |
| CO2 | Students will be able to learn and understand about the availability and sustainable use of resources, environmental problems and their short term and long term impacts to humans. | | | | | | | | | | | |
| CO3 | Course will help them to learn about environmental policies and protocols, social issues and role of human in conservation and protection of environment. | | | | | | | | | | | |
| CO4 | Overall, course will help students to develop skills and ability of understanding environment- human relationship. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO)) Mapping (scale 1: low, 2: Medium, 3: High) | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | - | 1 | 1 | - | - | 3 | 3 | 2 | 1 | 1 | 1 | 1 |
| CO2 | - | 1 | 1 | - | - | 3 | 3 | 2 | 1 | 1 | 1 | 1 |
| CO3 | - | 1 | 1 | - | - | 3 | 3 | 2 | 1 | 1 | 1 | 1 |
| CO4 | - | 1 | 1 | - | - | 3 | 3 | 2 | 1 | 1 | 1 | 1 |

Unit I

Fundamentals: The Multidisciplinary nature of environmental studies: Definition, components, scope and importance, need for public awareness; Natural Resources.

Ecosystems: Concept, Structure and function of an ecosystem, Types, Functional Components, Different ecosystems, biogeochemical cycles.

Biodiversity: Introduction to biodiversity, biogeographical classification, India as a mega diversity nation, endangered and endemic species of India, threats to biodiversity and conservation of biodiversity. Bioprospecting and Biopiracy. [10Hrs] [T1,T2]

Unit III

Environmental Pollution: (a) Air Pollution: Source, Types, effects on biosphere and Meteorology, Air Quality, Control. (b) Water Pollution: Types and Sources. (c) Soil Pollution: Types and Control. (d)

Noise Pollution: Effect, Control (e) Thermal Pollution. (f) Radiation Pollution (g) Solid waste Management, (h) Pollution Prevention, (i) Disaster Management [10Hrs][T1,T2]

Unit III

Social Issues and Environment: Concept of Sustainable Development; Urban problem related to energy; Water Conservation; Wasteland reclamation; Resettlement and Rehabilitation; Climate Change; Nuclear Accidents; Consumerism and Waste Products; Laws related to Environment, Pollution, Forest and Wild life; Environmental Impact Assessment. [8Hrs] [T1,T2]

Unit IV

Human Population and Environment: Population Growth, Human Rights, Family Welfare Programmes, Environment and Human Health, HIV/AIDS, Women and Child Welfare, Role of IT. [8Hrs] [T1,T2]

Textbooks:

1. *Environmental Studies* by Anindita Basak, Pearson, 2009.
2. *Environmental Studies: Simplified* by Benny Joseph, McGraw-Hill, 2017.

References:

1. *Environmental Studies* by D. L. Manjunath, Pearson, 2007.
2. *Environmental Studies* by Anil Kumar De and Arnab Kumar De, New Age Int. (P) Ltd, Publishers, 2005.
3. *Companion to Environmental Studies* edited by Coel Castree, Mike Hulme, and James D. Proctor, Routledge, 2018.
4. *Environmental Studies* by Deepa Sharma and Bhupendra Singh Chhabra, New Age Int. (P) Ltd, Publishers, 2007.
5. *Environmental Studies: Simplified* by Raj Kumar Singh, McGraw-Hill, 2012.
6. *Basics of Environmental Studies* by U. K. Khare, McGraw-Hill, 2014.

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|---|---|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: BS-111 | Paper: Applied Mathematics - I | L | T/P | C | | | | | | | | |
| | | 4 | - | 4 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To understand use series, differential and integral methods to solve formulated engineering problems. | | | | | | | | | | | |
| 2: | To understand use Ordinary Differential Equations to solve formulated engineering problems. | | | | | | | | | | | |
| 3: | To understand use linear algebra to solve formulated engineering problems. | | | | | | | | | | | |
| 4: | To understand use vector calculus to solve formulated engineering problems. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Ability to use series, differential and integral methods to solve formulated engineering problems. | | | | | | | | | | | |
| CO2 | Ability to use Ordinary Differential Equations to solve formulated engineering problems. | | | | | | | | | | | |
| CO3 | Ability to use linear algebra to solve formulated engineering problems. | | | | | | | | | | | |
| CO4 | Ability to use vector calculus to solve formulated engineering problems. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 2 | 3 | 3 | 3 | 1 | - | - | - | - | - | 1 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 1 | - | - | - | - | - | 2 | 2 |
| CO3 | 2 | 3 | 3 | 3 | 1 | - | - | - | - | - | 2 | 2 |
| CO4 | 2 | 3 | 3 | 3 | 1 | - | - | - | - | - | 2 | 2 |

Unit I

Partial derivatives, Chain rule, Differentiation of Implicit functions, Exact differentials. Maxima, Minima and saddle points, Method of Lagrange multipliers. Differentiation under Integral sign, Jacobians and transformations of coordinates. [8Hrs][T2]

Unit II

Ordinary Differential Equations (ODEs): Basic Concepts. Geometric Meaning of $y' = f(x, y)$. Direction Fields, Euler's Method, Separable ODEs. Exact ODEs. Integrating Factors, Linear ODEs. Bernoulli Equation. Population Dynamics, Orthogonal Trajectories. Homogeneous Linear ODEs with Constant Coefficients. Differential Operators. Modeling of Free Oscillations of a Mass-Spring System, Euler-Cauchy Equations. Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters. Power Series Method for solution of ODEs: Legendre's Equation. Legendre Polynomials, Bessel's Equation, Bessels's functions $J_n(x)$ and $Y_n(x)$. Gamma Function [12Hrs][T1]

Unit III

Linear Algebra: Matrices and Determinants, Gauss Elimination, Linear Independence. Rank of a Matrix. Vector Space. Solutions of Linear Systems and concept of Existence, Uniqueness, Determinants. Cramer's Rule, Gauss-Jordan Elimination. The Matrix Eigenvalue Problem. Determining Eigenvalues and Eigenvectors, Symmetric, Skew-Symmetric, and Orthogonal Matrices. Eigenbases. Diagonalization. Quadratic Forms. Cayley - Hamilton Theorem (without proof)[10Hrs][T1]

Unit IV

Vector Calculus: Vector and Scalar Functions and Their Fields. Derivatives, Curves. Arc Length. Curvature. Torsion, Gradient of a Scalar Field. Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field, Line Integrals, Path Independence of Line Integrals, Double Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals, Stokes Theorem. Divergence Theorem of Gauss. [10Hrs][T1]

Textbooks:

1. *Advanced Engineering Mathematics* by Erwin Kreyszig, John Wiley, 10th Ed., 2011.
2. *Mathematical Methods for Physics and Engineering*, by K. F. Riley, M. P. Hobson and S. J. Bence, CUP, 2013. (for Unit I)

References:

1. *Engineering Mathematics* by K.A. Stroud with Dexter J. Booth, Macmillan, 2020.
2. *Advanced Engineering Mathematics* by Larry Tury, Taylor and Francis, 2014.
3. *Advanced Engineering Mathematics* by Dennis G. Zill, Jones & Bartlett Learning, 2018.
4. *Advanced Engineering Mathematics with MATLAB* by Dean G. Duffy, Taylor and Francis, 2017.
5. *Advanced Engineering Mathematics* by Merle C. Potter, Jack L. Lessing, and Edward F. Aboufadel, Springer (Switzerland), 2019.

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|--|------------------------------|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode:HS-113 / HS-114 | Paper: Communications Skills | L | T/P | C | | | | | | | | |
| | | 3 | - | 3 | | | | | | | | |
| Marking Scheme: 1. Teachers Continuous Evaluation: 25 marks 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: 1. There should be 9 questions in the term end examinations question paper. 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| Course Objectives: 1: To understand the communication system paradigm. 2: To understand how language vocabulary can be increased and difference between Indian, British and American English. 3: To understand how to write a business letter and make a speech. 4: To improve grammar and sentence structure. | | | | | | | | | | | | |
| Course Outcomes (CO): CO1 Ability to Communicate as an Individual and in a Group. CO2 Ability to learn new words, differentiate between Indian, British and American English. CO3 Ability to write business letters and make speeches. CO4 Improved grammar and sentence structure. | | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | - | - | - | - | - | - | - | - | 3 | 3 | - | 3 |
| CO2 | - | - | - | - | - | - | - | - | 3 | 3 | - | 3 |
| CO3 | - | - | - | - | - | - | - | - | 3 | 3 | - | 3 |
| CO4 | - | - | - | - | - | - | - | - | 3 | 3 | - | 3 |

Unit I

Role and Importance of Communications, Attributes of Communications, Verbal and Non-Verbal Communications, Verbal Communications Skills, Non-verbal Communication Methods, Body Language, Barriers to Communications, Socio-psychological barriers, Inter-Cultural barriers, Overcoming barriers, Communication Mediums: Characterization and Choice of medium, Effective Communication: Correctness, Clarity, Conciseness, Courtesy, Group Communication: Meetings (types, purpose), Group Discussions, Conduct of Meeting, Participant Role, Making Presentations. [8Hrs][T1]

Unit II

Spoken and Written English: Attributes of spoken and written communication, Formal & Informal Communication, Variation in between Indian, British and American English. Etiquette and Manners: Personal Behaviour, Greetings, Introductions, Telephone Etiquette. Vocabulary Development: Dictionaries and Thesaurus, Words often confused, generally used one word substitutions, Comprehension. [8Hrs][T1]

Unit III

Letter writing: Planning the message, Planning Content, Structure, Language use, Layout, enquires and replies, asking for or giving quotations, Bargaining letters, Seller's reply, etc.; Complaints and Replies; Memos, Circulars and notices;

Papraph Writing, Writing Scientific and Technical Reports: Types, Structure, Drafting and Delivering a Speech: Understanding the Environment, Understanding the Audience, Text preparing, Composition, Practicing, Commemorative Speeches, Welcome and Introduction, Farewell and Send-offs, Condolence [8Hrs][T1]

Unit IV

Articles: Indefinite, Definite; Tenses: Present, Past, Future, Perfect (Present, Past and Future), Tenses in conditional sentences; Active and Passive Voice: Formation, conversion; Direct and Indirect Speech, Degrees of Comparison, Common errors, Concepts of Learning and Listening [8Hrs][T1]

Textbooks:

1. *English Language Communication Skills* by Urmilla Rai, Himalaya Publishing House, 10th Ed., 2010.

References:

1. *Technical Communication: Principles and Practice* by Meenakshi Raman and Sangeeta Sharma, Oxford University Press, 2015.
2. *Communication Skills for Engineers* by C. Muralikrishna and Sunita Mishra, Pearson, 2011.
3. *Effective Technical Communication* by M. Ashraf Rizvi, McGraw-Hill, 2018.
4. *Business Communication: Skills, Concepts, and Applications* by P.D. Chaturvedi and Mukesh Chaturvedi, Pearson, 2013.
5. *Business Correspondence and Report Writing* by R.C. Sharma and Krishan Mohan, McGraw-Hill, 2016.
6. *English for Technical Communications* by Aysha Viswamohan, Tata McGraw-Hill, 2008.

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|---|---|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode:HS-115 / HS-116 | Paper: Indian Constitution | L | T/P | C | | | | | | | | |
| | | 2 | - | 2 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| 3. This is an NUES paper, hence all examinations to be conducted by the concerned teacher. | | | | | | | | | | | | |
| Instruction for paper setter | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To create awareness among students about the Indian Constitution | | | | | | | | | | | |
| 2: | To create consciousness among students about democratic principles and enshrined in the Constitution of India | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | To understand institutional mechanism and fundamental values enshrined in the Constitution of India | | | | | | | | | | | |
| CO2 | To understand the inter-relation between Centre and State Government | | | | | | | | | | | |
| CO3 | To understand Fundamental Rights and Duties | | | | | | | | | | | |
| CO4 | To understand the structure and functions of judicial systems in the country. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | - | - | - | - | - | 3 | - | 2 | - | - | - | 1 |
| CO2 | - | - | - | - | - | 3 | - | 2 | - | - | - | 1 |
| CO3 | - | - | - | - | - | 3 | - | 2 | - | - | - | 1 |
| CO4 | - | - | - | - | - | 3 | - | 2 | - | - | - | 1 |

Unit I

Introduction to Constitution of India: Definition, Source and Framing of the Constitution of India. Salient features of the Indian Constitution. Preamble of the Constitution. [6Hrs]

Unit II

Fundamental Rights and Duties: Rights To Equality (Article 14-18). Rights to Freedom (Article 19-22). Right against Exploitation (Article 23-24). Rights to Religion and Cultural and Educational Rights of Minorities(Article 25- 30). The Directive Principles of State Policy - Its significance and application. Fundamental Duties - Necessary obligations and its nature, legal status and significance [6Hrs]

Unit III

Executives and Judiciary: Office of President, Vice President and Governor: Power and Functions, Parliament, Emergency Provisions-, President Rule; Union Judiciary: Appointment of Judges, Jurisdiction of the Supreme Court, State Judiciary: Power and functions, Writ Jurisdiction [6Hrs]

Unit IV

Center-States Relation: Is Indian Constitution Federalin Nature, Legislative relations between Union and States, Administrative Relations between Union and States, Financial Relations between Union and States [6Hrs]

Textbooks:

1. *Constitutional Law of India* by J.N Pandey, Central Law Publication, 2018.
2. *Introduction to the Indian Constitution of India* by D.D. Basu, PHI, New Delhi, 2021
3. *The Constitution of India* by P.M. Bakshi, Universal Law Publishing Co., 2020.

References:

1. *Indian Constitutional Law* by M.P. Jain, Lexis Nexis, 2013
2. *Constitution of India* by V.N. Shukla, Eastern Book Agency, 2014

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|---|---|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode:HS-117/HS-118 | Paper: Human Values and Ethics | L | P | C | | | | | | | | |
| | | 1 | - | 1 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| 3. This is an NUES paper, the examinations are to be conducted by the concerned teacher. | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | To help students regulate their behavior in a professional environment as employees | | | | | | | | | | | |
| 2: | To make students aware of the impact of taking non-ethical engineering decisions. | | | | | | | | | | | |
| 3: | To understand that mind and desire control is needed for being ethical. | | | | | | | | | | | |
| 4: | To understand organizational culture and to adapt to varying cultures without compromising ethical values | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Realize the importance of human values. | | | | | | | | | | | |
| CO2 | Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress | | | | | | | | | | | |
| CO3 | Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices. | | | | | | | | | | | |
| CO4 | Assess the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists. | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | - | - | - | - | - | 3 | - | 3 | 1 | 1 | - | 1 |
| CO2 | - | - | - | - | - | 3 | - | 3 | 1 | 1 | - | 1 |
| CO3 | - | - | - | - | - | 3 | - | 3 | 1 | 1 | - | 1 |
| CO4 | - | - | - | - | - | 3 | - | 3 | 1 | 1 | - | 1 |

Unit I

Human Values: Morals, Values, Ethics, Integrity, Work ethics, Service learning, Virtues, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time, Cooperation, Commitment, Empathy, Self-confidence, Challenges in the work place, Spirituality [3Hrs]

Unit II

Engineering Ethics: Senses of engineering ethics, Variety of moral issues, Types of inquiries, Moral dilemma, Moral autonomy, Moral development (theories), Consensus and controversy, Profession, Models of professional roles, Responsibility, Theories about right action (Ethical theories), Self-control, Self-interest, Customs, Religion, Self-respect, Case study: Choice of the theory

Engineering as experimentation, Engineers as responsible experimenters, Codes of ethics, Industrial standards, A balanced outlook on law, Case study: The challenger [3Hrs]

Unit III

Safety definition, Safety and risk, Risk analysis, Assessment of safety and risk, Safe exit, Risk-benefit analysis

Safety lessons from 'the challenger', Case study: Power plants, Collegiality and loyalty, Collective bargaining, Confidentiality, Conflict of interests, Occupational crime, Human rights, Employee rights, Whistle blowing, Intellectual property rights. [4Hrs]

Unit IV

Globalization, Multinational corporations, Environmental ethics, Computer ethics, Weapons development, Engineers as managers, Consulting engineers, Engineers as expert witness, Engineers as advisors in planning and policy making, Moral leadership, Codes of ethics, Engineering council of India, Codes of ethics in Business Organizations [3Hrs]

Textbooks:

1. *A Textbook on Professional Ethics and Human Values*, by R. S. Naagarazan, New Age Publishers, 2006.

References:

1. *Professional Ethics and Human Values* by D. R. Kiran, McGraw-Hill, 2014.
2. *Engineering Ethics*, by Charles E Harris and Micheal J Rabins, Cengage Learning Pub., 2012.
3. *Ethics in Engineering*, Mike Martin and Roland Schinzinger, McGraw Hill Pub., 2017.
4. *Unwritten laws of Ethics and Change in Engineering* by The America Society of Mechanical Engineers, 2015.
5. *Engineering Ethics* by Charles B. Fleddermann, Pearson, 2014.
6. *Introduction to Engineering Ethics* by Mike W. Martin and Roland Schinzinger, McGraw-Hill, 2010.
7. *Engineering Ethics: Concept and Cases* by Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, Cengage, 2009.
8. *Ethics in Engineering Practice and Research* by Caroline Whitbeck, Cambridge University Press, 2007.

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|---|--|------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: ES-119 | Paper: Manufacturing Process | L | T/P | C | | | | | | | | |
| | | 4 | - | 4 | | | | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 25 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 75 marks | | | | | | | | | | | | |
| Instruction for paper setter: | | | | | | | | | | | | |
| 1. There should be 9 questions in the term end examinations question paper. | | | | | | | | | | | | |
| 2. The first (1 st) question should be compulsory and cover the entire syllabus. This question should be objective, single line answers or short answer type question of total 15 marks. | | | | | | | | | | | | |
| 3. Apart from question 1 which is compulsory, rest of the paper shall consist of 4 units as per the syllabus. Every unit shall have two questions covering the corresponding unit of the syllabus. However, the student shall be asked to attempt only one of the two questions in the unit. Individual questions may contain upto 5 sub-parts / sub-questions. Each Unit shall have a marks weightage of 15. | | | | | | | | | | | | |
| 4. The questions are to be framed keeping in view the learning outcomes of the course / paper. The standard / level of the questions to be asked should be at the level of the prescribed textbook. | | | | | | | | | | | | |
| 5. The requirement of (scientific) calculators / log-tables / data - tables may be specified if required. | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | The students will have basic understanding of various manufacturing processes. The students will have knowledge about casting process. | | | | | | | | | | | |
| 2: | The students will have understanding of joining processes. | | | | | | | | | | | |
| 3: | The students will have understanding of forging and sheet metal works. | | | | | | | | | | | |
| 4: | The students will have basic idea of powder metallurgy and manufacturing of plastic components. | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | Understand casting process. | | | | | | | | | | | |
| CO2 | Understand joining process. | | | | | | | | | | | |
| CO3 | Understand forging and sheet metal work. | | | | | | | | | | | |
| CO4 | Basic understanding of powder metallurgy and manufacturing of plastic components. | | | | | | | | | | | |
| Course Outcomes (CO) to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High) | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 2 | 1 | 1 | 1 | 2 | - | - | - | - | - | 1 | 1 |
| CO2 | 2 | 1 | 1 | 1 | 2 | - | - | - | - | - | 1 | 1 |
| CO3 | 2 | 1 | 1 | 1 | 2 | - | - | - | - | - | 1 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 2 | - | - | - | - | - | 1 | 1 |

Unit I

Definition of manufacturing, Importance of manufacturing towards technological and social economic development, Classification of manufacturing processes, Properties of materials. Metal Casting Processes: Sand casting, Sand moulds, Type of patterns, Pattern materials, Pattern allowances, Types of Moulding sand and their Properties, Core making, Elements of gating system. Description and operation of cupola. Working principle of Special casting processes - Shell casting, Pressure die casting, Centrifugal casting. Casting defects. [10Hrs]

Unit II

Joining Processes: Welding principles, classification of welding processes, Fusion welding, Gas welding, Equipments used, Filler and Flux materials. Electric arc welding, Gas metal arc welding, Submerged arc welding, Electro slag welding, TIG and MIG welding process, resistance welding, welding defects. [10Hrs]

Unit III

Deformation Processes: Hot working and cold working of metals, Forging processes, Open and closed die forging process. Typical forging operations, Rolling of metals, Principle of rod and wire drawing, Tube drawing. Principle of Extrusion, Types of Extrusion, Hot and Cold extrusion. Sheet metal characteristics -Typical shearing operations, bending and drawing operations, Stretch forming operations, Metal spinning. [10Hrs]

Unit IV

Powder Metallurgy: Introduction of powder metallurgy process, powder production, blending, compaction, sintering
Manufacturing Of Plastic Components: Types of plastics, Characteristics of the forming and shaping processes, Moulding of Thermoplastics, Injection moulding, Blow moulding, Rotational moulding, Film blowing, Extrusion, Thermoforming. Moulding of thermosets- Compression moulding, Transfer moulding, Bonding of Thermoplastics. [10Hrs]

Textbooks:

1. *Manufacturing Technology: Foundry, Forming and Welding Volume 1*, P. N Rao, , McGrawHill, 5e, 2018.
2. *Elements of Workshop Technology Vol. 1 and 2* by Hajra Choudhury, Media Promoters Pvt Ltd.,2008.

References:

1. *Manufacturing Processes for Engineering Materials*, by Serope Kalpajian and Steven R.Schmid, Pearson Education, 5e, 2014.
2. *Fundamentals of Modern Manufacturing: Materials, Processes, and Systems* by Mikell P. Groover, John Wiley and Sons, 4e, 2010 .
3. *Production Technology* by R.K.Jain and S.C. Gupta, Khanna Publishers. 16th Edition, 2001.

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|--|---------------------------------|---|---|---|
| PaperCode: BS-151 | Paper: Applied Physics - I Lab. | L | P | C |
| | | - | 2 | 1 |
| Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term end Theory Examinations: 60 marks | | | | |
| Instructions: 1. The course objectives and course outcomes are identical to that of (Applied Physics - I) as this is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students | | | | |

1. To determine the wavelength of sodium light by Newton's Rings.
2. To determine the wavelength of sodium light by Fresnel's biprism.
3. To determine the wavelength of sodium light using diffraction grating.
4. To determine the refractive index of a prism using spectrometer.
5. To determine the dispersive power of prism using spectrometer and mercury source.
6. To determine the specific rotation of cane sugar solution with the help of half shade polarimeter.
7. To find the wavelength of He-Ne laser using transmission diffraction grating.
8. To determine the numeral aperture (NA) of an optical fibre.
9. To plot a graph between the distance of the knife-edge from the center of the gravity and the time period of bar pendulum. From the graph, find (a) The acceleration due to gravity (b) The radius of gyration and the moment of inertia of the bar about an axis.
10. To determine the velocity of ultrasound waves using an ultrasonic spectrometer in a given liquid (Kerosene Oil).
11. To verify inverse square law.
12. To determine Planck's constant.

Note: Teacher's may use the prescribed books to choose the practicals in addition to above. Total 8 practicals minimum shall be performed by the students, they may be asked to do more. Atleast 4 experiments must be from the above list.

Textbook:

1. *B.Sc. Practical Physics* by C. L. Arora, S.Chand & Co., 2020.
2. *Practical physics* by R. K. Shukla and A. Srivastava, New Age Int. (P) Ltd., 2006.

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|---|--------------------------------|---|---|---|
| PaperCode: ES-153 / ES-154 | Paper: Programming in 'C' Lab. | L | P | C |
| | | - | 2 | 1 |
| Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term end Theory Examinations: 60 marks | | | | |
| Instructions: 1. The course objectives and course outcomes are identical to that of "Programming in 'C'" as this is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students | | | | |

1. Write a program to find divisor or factorial of a given number.
2. Write a program to find sum of a geometric series
3. Write a recursive program for tower of Hanoi problem
4. Write a recursive program to print the first m Fibonacci number
5. Write a menu driven program for matrices to do the following operation depending on whether the operation requires one or two matrices
 - a. Addition of two matrices
 - b. Subtraction of two matrices
 - c. Finding upper and lower triangular matrices
 - d. Transpose of a matrix
 - e. Product of two matrices.
6. Write a program to copy one file to other, use command line arguments.
7. An array of record contains information of managers and workers of a company. Print all the data of managers and workers in separate files.
8. Write a program to perform the following operators on Strings without using String functions
 - a. To find the Length of String.
 - b. To concatenate two string.
 - c. To find Reverse of a string.
 - d. To copy one string to another string.
9. Write a Program to store records of a student in student file. The data must be stored using Binary File. Read the record stored in "Student.txt" file in Binary code. Edit the record stored in Binary File. Append a record in the Student file.
10. Write a program to count the no of Lowercase, Uppercase numbers and special Characters presents in the contents of text File.

Note:

1. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above.
2. In addition Two Mini Projects based on the skills learnt shall be done by the students. Teachers shall create the mini projects so that the same is not repeated every year. These mini projects may be done in a group not exceeding group size of 4 students.
3. Usage of IDE like Visual Studio Community Edition, Codeblocks, etc. are recommended.

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|---|-------------------------------|---|---|---|
| PaperCode: BS-155 / BS-156 | Paper: Applied Chemistry Lab. | L | P | C |
| | | - | 2 | 1 |
| Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term end Theory Examinations: 60 marks | | | | |
| Instructions: 1. The course objectives and course outcomes are identical to that of “Applied Chemistry” as this is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students | | | | |

1. Determination of alkalinity of water sample.
2. Determination of hardness of water sample by EDTA method.
3. Determine the percentage composition of sodium hydroxide in the given mixture of sodium hydroxide and sodium chloride.
4. Determine the amount of oxalic acid and Sulphuric acid in one litre of solution, given standard sodium hydroxide and Potassium Permanganate.
5. Determine the amount of copper in the copper ore solution, provided hypo-solution (Iodometric Titration).
6. Determine the amount of chloride ions present in water using silver nitrate (Mohr's Precipitation Method).
7. Determine the strength of $MgSO_4$ solution by Complexometric titration.
8. Determine the surface tension of a liquid using drop number method.
9. Determine the viscosity of a given liquid (density to be determined).
10. Determine the cell constant of conductivity cell and titration of strong acid/strong base conductometrically.
11. To determine (a) λ max of the solution of $KMnO_4$. (b) Verify Beer's law and find out the concentration of unknown solution by spectrophotometer.
12. Determination of the concentration of iron in water sample by using spectrophotometer.
13. Determination of the concentration of Iron (III) by complexometric titration.
14. Proximate analysis of coal.
15. Determination of eutectic point and congruent melting point for a two component system by method of cooling curve.

References:

1. *Vogel's Text Book of Quantitative Chemical Analysis* by G.H. Jefferey, J. Bassett, J. Mendham, and R.C. Denney, Logmaan Scientific & Technical, 1989
2. *Essentials of Experimental Engineering Chemistry* by S. Chawla, Dhanpat Rai & Co., 2008.
3. *Experiments in Applied Chemistry* by S. Ratan, S.K. Kataria & Sons, 2003.
4. *Practical Chemistry* by O.P. Pandey, D. N. Bajpai and S. Giri, S.Chand & Co., 2005.
5. *Engineering Chemistry with Laboratory Experiments* by M. S. Kaurav, PHI Learning Pvt. Ltd., 2011.
6. *Laboratory Manual on Engineering Chemistry* by S. K. Bhasin, and Sudha Rani, Dhanpat Rai & Co., 2006.

Note:

1. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above.

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|--|---|-------------------------------|------|------|------|------|------|------|------|------|------|------|
| PaperCode: ES-157 | | Paper: Engineering Graphics-I | | | L | P | C | | | | | |
| | | | | | - | 4 | 2 | | | | | |
| Marking Scheme: | | | | | | | | | | | | |
| 1. Teachers Continuous Evaluation: 40 marks | | | | | | | | | | | | |
| 2. Term end Theory Examinations: 60 marks | | | | | | | | | | | | |
| Course Objectives: | | | | | | | | | | | | |
| 1: | The students will learn the introduction of Engineering graphics, various equipment used, various scales, dimensions and BIS codes used while making drawings for various streams of engineering disciplines. | | | | | | | | | | | |
| 2: | The students will learn theory of projections and projection of points. | | | | | | | | | | | |
| 3: | The students will learn projection of lines and projection of planes. | | | | | | | | | | | |
| 4: | The students will learn the projection of solid and development of surfaces | | | | | | | | | | | |
| Course Outcomes (CO): | | | | | | | | | | | | |
| CO1 | To understand the theory of projections and projection of points. | | | | | | | | | | | |
| CO2 | Ability to do line projections. | | | | | | | | | | | |
| CO3 | Ability to do plane projections. | | | | | | | | | | | |
| CO4 | Ability to do solid projections and development of surfaces | | | | | | | | | | | |
| Course Outcomes (CO to Programme Outcomes (PO) Mapping (scale 1: low, 2: Medium, 3: High | | | | | | | | | | | | |
| CO/PO | PO01 | PO02 | PO03 | PO04 | PO05 | PO06 | PO07 | PO08 | PO09 | PO10 | PO11 | PO12 |
| CO1 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 2 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | - | - | - | 1 | 2 | 1 | 2 |

Unit I

Introduction: Engineering Graphics/Technical Drawing, Introduction to drawing equipments and use of instruments, Conventions in drawing practice. Types of lines and their uses, BIS codes for lines, technical lettering as per BIS codes, Introduction to dimensioning, Types, Concepts of scale drawing, Types of scales

Theory of Projections: Theory of projections, Perspective, Orthographic, System of orthographic projection: in reference to quadrants, Projection of Points, Projection in different quadrants, Projection of point on auxiliary planes. Distance between two points, Illustration through simple problems.

Unit II

Projection of Lines: Line Parallel to both H.P. and V.P., Parallel to one and inclined to other, Other typical cases: three view projection of straight lines, true length and angle orientation of straight line: rotation method, Trapezoidal method and auxiliary plane method, traces of line.

Unit III

Projection of Planes: Projection of Planes Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes, Plane oblique to reference planes, traces of planes.

Planes Other than the Reference Planes: Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.

Unit IV

Projection of Solids: Projection of solids in first or third quadrant, Axis parallel to one and perpendicular to other, Axis parallel to one inclined to other, Axis inclined to both the principal plane, Axis perpendicular to profile plane and parallel to both H.P. and V.P., Visible and invisible details in the projection, Use of rotation and auxiliary plane method.

Development of Surface: Purpose of development, Parallel line, radial line and triangulation method, Development of prism, cylinder, cone and pyramid surface for both right angled and oblique solids, Development of surface.

Note: The sheets to be created shall be notified by the concerned teacher.

Textbooks:

1. *Engineering Drawing* by N.D. Bhatt, 53rd Ed., Charotar Publishing House Pvt. Ltd., Gujarat, 2017.

References:

1. *Engineering Drawing* by P.S. Gill, S.K Kataria & Sons, New Delhi, 2013.
2. *Technical Drawing with Engineering Graphics* by Frederick E. Giesecke, Shawna Lockhart, Marla Goodman, and Cindy M. Johnson, 15th Ed., Prentice Hall, USA, 2016
3. *Engineering Drawing* by M.B. Shah and B.C. Rana, 3rd Ed., Pearson Education, New Delhi, 2009.

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|--|--------------------------------|---|---|---|
| PaperCode: ES-159 / ES-160 | Paper: Electrical Science Lab. | L | P | C |
| | | - | 2 | 1 |
| Marking Scheme: 1. Teachers Continuous Evaluation: 40 marks 2. Term end Theory Examinations: 60 marks | | | | |
| Instructions: 1. The course objectives and course outcomes are identical to that of “Electrical Science” as this is the practical component of the corresponding theory paper. 2. The practical list shall be notified by the teacher in the first week of the class commencement under intimation to the office of the Head of Department / Institution in which the paper is being offered from the list of practicals below. Atleast 8 experiments must be performed by the students | | | | |

1. To Design the circuit for a given load and selection of its various Components and instruments from the safety point of view

OR

To study different types of symbols and standard currently being used in electrical engineering.

2. Study and applications of CRO for measurement of voltage, frequency and phase of signals.
3. Connection of lamp by (1) Single Switch Method. (2) Two-way Switch Method.

OR

Performance comparison of fluorescent Tube & CFL Lamp.

3. To Verify Thevenin's & Norton's Theorem

OR

To Verify Superposition & Reciprocity Theorem.

OR

To Verify Maximum Power Transfer Theorem.

4. To Measure Power & Power Factor in a Single-Phase A.C Circuit using Three Ammeters or three Voltmeters.
5. To Measure Power & Power Factor in a Balanced Three Phase Circuit using Two Single Phase Wattmeters.
6. To study of Resonance in a series R-L-C or Parallel R-L-C Circuits.
7. To perform open circuit and short circuit test on 1-phase transformer.
8. Starting, Reversing and speed control of DC shunt Motor
9. Starting, Reversing and speed control of 3-phase Induction Motor
10. To Study different types of Storage Batteries & its charging system.
11. To Study different types of earthing methods including earth leakage circuit breaker (GFCI)

Note:

1. At least 8 Experiments out of the list shall be performed by the students. Teachers may introduce new experiments for the class in addition to above.