JAIDEV EDUCATION SOCIETY'S
J D COLLEGE OF ENGINEERING AND MANAGEMENT
KATOL ROAD, NAGPUR
Website: www.jdcoem.ac.in E-mail: info@jdcoem.ac.in
An Autonomous Institute, with NAAC "A" Grade
Department of Basic Science & Humanities

Vision	Mission
To lay a robust foundation for the Institute to reach its Zenith.	▪ Achieving academic excellence through rigorous teaching, learning and evaluation practices. ▪ To develop an ability to apply knowledge of basic science and Mathematics to excel in the field of Engineering. ▪ To provide salutary environment for the betterment of faculty and the students.

Course Title : Engineering Physics **Semester : II**
Course Code : CE2T005 **Course Type : Compulsory**
Pre-requisite : Basic knowledge of Physics **L – T – P : 3 – 1– 0**
Stream : Core subject **Credits : 4**

COURSE OBJECTIVES

1. To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
2. To understand and study the Physics principles behind the developments of engineering materials.
3. To provide problem solving experience and learning of concepts through it in engineering physics, in both the classroom and the laboratory learning environment.

COURSE OUTCOMES

At the end of the course students will be able to

CO1- Define ultrasonic waves, Newton's law of motion, Optics, LASER, oscillations & basics of crystal structure.

CO2- Illustrate reverberation and acoustic theory, production of ultrasonic, derived forces , optics, laser, differential wave equation, Bragg law , x-ray diffraction & classification of solids.

CO3- Apply the concept of reflection of sound waves, concept of forces in friction & pressure, laser, optics , concept of oscillations & its characteristics, properties of crystalline solids.

CO4- Analyze the effect of ultrasonic waves, frame of reference and its transformations, laser and optics, different types of oscillation, different type of cubic crystal structure.

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CO5- Interpret acoustic & Ultrasonic waves, Newton's laws of motion, laser and optics, oscillation & crystal structure.

CO6- Develop models based on ultrasonic waves, laws of motion, laser optics, oscillations & crystal structure.

Unit I

Architectural Acoustics and Ultrasonic **(08 Hrs)**

Sound, Reflection of Sound Waves, Absorption of Sound Waves, Sabine's Formula, Reverberation Theory, Acoustic designing of a Hall, Common Acoustic Defects, Acoustical Materials, Ultrasonic Waves, Production of Ultrasonic (Piezoelectric effect, Magnetostriction effect) and its Applications,

Unit II

Forces, Newton's Laws **(10 Hrs)**

Newton's Laws of Motion, First law (law of inertia), inertial frame; Second law, concept of force; Third law; Forces in Nature, derived forces; friction, Work, Power, Energy, Pressure

Unit III

Lasers & Wave Optics **(09 Hrs)**

Quantum Transitions: Absorption, Spontaneous emission & stimulated Emission, Metastable states, Pumping schemes, Principle of laser, Laser characteristics, Components of a laser, , Applications of LASER. Interference in thin films, Interference in Wedge shape thin film, Newton's rings, Anti-reflection coating.

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Unit IV

Oscillation **(08 Hrs)**

Harmonic oscillator, Free oscillation, Damped oscillation- over-damped, critically damped and under damped oscillators, Forced oscillation and Resonance, differential wave equation.

Unit V

Solids, Crystal Structure and X-rays **(10 Hrs)**

Structure of Solids, characteristic properties crystalline and amorphous of solids, Classification of solids (ionic, molecular, covalent (network), or metallic, factor affecting on increasing strength of material, Bonding in Solids, correlation between bonding and the properties of solids. Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplanner spacing for cubic system, Bragg's law, X-ray diffraction, Line and Continuous Spectrum of X-ray.

Text books:

1. Engineering Physics M.N. Avadhanulu and P.G. Kshirsagar. S.Chand and Company LTD.
2. Engineering Physics – Dr. L. N. Singh. Synergy Knowledgeware-Mumbai.
3. Engineering Physics - R.K. Gaur and S. L. Gupta. Dhanpat Rai Publications Pvt. Ltd.-New Delhi.
4. Fundamental of Physics - Halliday and Resnik. Willey Eastern Limited.
5. M. Srivastava, C. Srinivasan, "Science of Engineering Materials and Carbon Nanotubes", New Age I International Publication, 3rd edition, 2010.
6. Engineering Physics-Hitendra K Malik, Ajay Kumar Singh, Tata McGraw Hill Education Private Limited, New Delhi.

Reference books:

1. Concept of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company Limited.

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2. Optics – Ajoy Ghatak.MacGraw Hill Education (India) Pvt. Ltd.
3. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New AgeInternational Pvt.Ltd.
4. Solid State Physics – A.J. Dekker. McMillan India –Limited.
5. The Feynman Lectures on Physics Vol I, II, III.
6. Introduction to solid state physics – Charles Kittel. John Willey and Sons.
7. Michael F.Ashby "Nanomaterials, Nanotechnologies & Design" by Butterworth-Heinemann: an imprint of Elsevier.

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Course Title : Engineering Physics-Lab **Semester : II**
Course Code : CE2L005 **Course Type: Compulsory**
Pre-requisite : Basics of Physics Practical **L – T – P : 0 – 0– 2**
Stream : Core subject **Credits : 1**

Course Objective:

Students will be able to

1. Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
2. Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
3. Enhance the comprehensibility of the practical concepts and their application.
4. Apply the analytical techniques and graphical analysis to the experimental data
5. Develop the skills to identify various parts of the apparatus used in the experiment in laboratory.
6. Design and apply the practical knowledge of engineering physics in daily life

Course Outcome:

Students will be able to

1. Visualize and understand the concepts of various phenomenon of light, principle of LASER, Optical fiber and electric and magnetic field.
2. Understand the working principles of Semiconducting devices and their application.
3. Apply the theoretical concepts to demonstrate the ability to measure properties of a variety of electrical and optical systems
4. Analyze the different crystal structure with the help of crystal models.
5. Construct the various devices based on optical phenomenon.
6. Design the frame work of various electronic circuitries based on semiconducting materials.

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List of Experiment

1. Ultrasonic Interferometer
2. Magnetron Tube – Determination of e/m of electron
3. ser –Determination of wavelength of He-Ne Laser
4. Hall Effect – Determination of Hall Coefficient
5. Experiment on Fiber Optics
6. Crystal Planes- Study of planes with the help of Models related Miller Indices
7. Energy Band gap of semiconductor
8. B-H Curve Experiment
9. Study of I-V Characteristics of P-N Junction Diode
10. Newton's Ring- To determine the radius of curvature of Plano-convex lens

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B. Tech. SEM-II

Course Title : Engineering Physics **Semester : II**
Course Code : ME2T005 **Course Type: Compulsory**
Pre-requisite : Basic knowledge of Physics **L – T – P : 3 – 1– 2**
Stream : Core **Credits : 4**

Objectives:-

- To provide a firm grounding in the basic physics principles and concept to resolve many Engineering and technological problems.
- To understand and study the Physics principles behind the developments of engineering materials.
- To provide problem solving experience and learning of concepts through it in engineering physics, in both the classroom and the laboratory learning environment.

Outcomes

- Acquire fundamental understanding of concepts specifically concern to Ultrasonic, Dielectrics, Laser, optical fibre, Electron Optics, Quantum Mechanics, Crystal Structure, Electrodynamics, Magnetics and Semiconducting Materials and their engineering applications.
- Develop the ability to recognize the appropriate physics that applies to experiments based on the Engineering Physics.
- To develop a systematic, logical approach to problem – solving that can be applied to problems in physics and to problems in general.

Syllabus

Unit I: Ultrasonics and Dielectric Materials: (08 Hrs)
Ultrasonic waves, production of ultrasonic (Piezoelectric effect, Magnetostriction effect) and its applications.
Dielectric parameters (Dielectric constant, Electric displacement, Polarization & Polarizability),
Types of polarization, temperature and frequency dependences of dielectric materials.

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Unit II: Laser and Fibre Optics : (07Hrs)

Interaction of radiation with matter, Population Inversion and Optical resonance cavity , Three and four level laser, Ruby laser, He-Ne laser, Semiconductor laser , Properties and engineering applications of laser.

Optical fibers: Propagation by total internal reflection, structure and classification (based on material, refractive index and number of modes), Modes of propagation in fiber, Acceptance angle, Numerical aperture, Attenuation and dispersion.. Applications: I) As a Sensors - i) Temperature Sensor ii) Pollution / Smoke detector iii) Liquid level sensor. II) As a Detectors- i) PIN detector ii) Avalanche Detector.

Unit III: Electron Optics and Quantum Mechanics: (07Hrs)

Introduction to Electron motion in electric and magnetic field (No detail derivations), measurement of 'e/m' by Thomson's method, Determination of electronic charge by Millikan's oil drop method, Bainbridge mass spectrograph.

Heisenberg's uncertainty principle, Schrödinger's time dependent and time independent wave equations, physical significance of wave function, De Broglie Hypothesis.

Unit IV: Crystal Structure, X-rays and Electrodynamics: (06 Hrs)

Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, Bragg's law, X-ray diffraction, Line and Continuous Spectrum of X-ray.

Introduction of Maxwell equations (no derivation), Electromagnetic wave in free space.

Unit V: Magnetic and Semiconducting materials: (07 Hrs)

Types of magnetic materials (Ferromagnetic & Antiferromagnetic), B-H curve.

Classical free electron theory-electrical conductivity, resistivity and its temperature dependence, Microscopic Ohm's law, Band theory of solids, conductivity of semiconductors, Hall Effect.

Text books:

1. Engineering Physics M.N. Avadhanulu and P.G. Kshirsagar. S.Chand and Company LTD.
2. Engineering Physics – Dr. L. N. Singh. Synergy Knowledgeware-Mumbai.

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3. Engineering Physics - R.K. Gaur and S. L. Gupta. Dhanpat Rai Publications Pvt. Ltd.-New Delhi.
4. Fundamental of Physics - Halliday and Resnik. Willey Eastern Limited.

Reference books:

- Introduction to Electrodynamics –David R. Griffiths.
- Concept of Modern Physics – Arthur Beizer. Tata McGraw-Hill Publishing Company Limited.

1. Optics – Ajoy Ghatak.MacGraw Hill Education (India) Pvt. Ltd.
2. Science of Engineering Materials- C.M. Srivastava and C. Srinivasan. New Age International Pvt.Ltd.
3. Solid State Physics – A.J. Dekker. McMillan India –Limited.
4. The Feynman Lectures on Physics Vol I,II,III.
5. Introduction to solid state physics – Charles Kittel. John Willey and Sons

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Course Title : Engineering Physics-Lab **Semester : II**

Course Code : ME2L005 **Course Type : Compulsory**

Pre-requisite : Basics of Physics Practical **L – T – P : 0 – 0– 2**

Stream : Core subject **Credits : 1**

Course Objective:

Students will be able to

1. Draw the relevance between the theoretical knowledge and to imply it in a practical manner with respect to analyze various electronic circuits and its components.
2. Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
3. Enhance the comprehensibility of the practical concepts and their application.
4. Apply the analytical techniques and graphical analysis to the experimental data
5. Develop the skills to identify various parts of the apparatus used in the experiment in laboratory.
6. Design and apply the practical knowledge of engineering physics in daily life

Course Outcome:

Students will be able to

1. Visualize and understand the concepts of various phenomenon of light, principle of LASER, Optical fiber and electric and magnetic field.
2. Understand the working principles of Semiconducting devices and their application.
3. Apply the theoretical concepts to demonstrate the ability to measure properties of a variety of electrical and optical systems
4. Analyze the different crystal structure with the help of crystal models.
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6. Design the frame work of various electronic circuitries based on semiconducting materials.

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List of Experiment

1. Ultrasonic Interferometer
2. Magnetron Tube – Determination of e/m of electron
3. ser –Determination of wavelength of He-Ne Laser
4. Hall Effect – Determination of Hall Coefficient
5. Experiment on Fiber Optics
6. Crystal Planes- Study of planes with the help of Models related Miller Indices
7. Energy Band gap of semiconductor
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9. Study of I-V Characteristics of P-N Junction Diode
10. Newton's Ring- To determine the radius of curvature of Plano-convex lens

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Course Title : Engineering Mathematics-1 **Semester : I**

Course Code : MAT001 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Mathematics **L – T – P : 3 – 1– 0**

Stream :Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Mathematics
2. To understand the application of Mathematics in engineering and in real life.
3. To investigate the key concepts of Mathematics.
4. To enable students to analyze a problem.

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe rank, Bernoulli's theorem, Taylor's and Maclaurin's theorems for functions of two variables, – Euler's Theorem for functions containing two and three variables, Lagrange's theorem
2. Illustrate the examples of ordinary differential equation, partial differential equation,matrices.
3. Solve questions related to ordinary differential equation, partial differential equation,matrices and their applications.
4. Apply the knowledge of matrices, ordinary differential equation, partial differential equation, and their applications to real world problems.
5. Interpret the results of matrices, ordinary differential equation, partial differential equation and their applications.

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6. Design a method or modal on matrices, ordinary differential equation, and partial differential equation.

Unit 1: Linear Algebra- Matrices [09 Hours]

Determinants & Matrix, Inverse of Matrix by adjoint method, Inverse by partitioning method ,solution of system of linear equations, Rank of Matrix, Consistency of linear system of equation, Linear dependency and independency.

Unit 2: Ordinary Differential Equations of First Order and First Degree and Their Applications [09 Hours]

Indeterminate form, Linear equations; Reducible to linear equation,(Bernoulli's equation);Exact differential equations; Equations reducible to exact equations ; Applications to orthogonal trajectories , mechanical systems and electrical systems.

Unit3: Linear Differential Equations with Constant Coefficients [09 Hours]

Introductory remarks - complementary function, particular integral; Rules for finding complementary functions and particular integrals; Method of variation of parameters; Cauchy's homogeneous and Legendre's linear equations.

Unit 4: Partial Differentiation [09 Hours]

Partial derivatives of first and higher orders; Homogeneous functions – Euler's Theorem for functions containing two and three variables (with proofs); Total derivatives; Change of variables.

Unit 5: Applications of Partial differentiation [09 Hours]

Jacobians - properties; Taylor's and Maclaurin's theorems (without proofs) for functions of two variables; Maxima and minima of functions of two variables; Lagrange's method of undetermined multipliers, classification of partial differential equation.

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Text Books

1) Higher Engineering Mathematics by B. S. Grewal, Khanna Publishers, NewDelhi.

2) Advanced Engineering Mathematics by Erwin Kreyszig, John Wiley & Sons, NewYork.

3) A Course in Engineering Mathematics (Vol I) by Dr. B. B. Singh, Synergy Knowledgeware,Mumbai.

4) A Text Book of Applied Mathematics (Vol I & II) by P. N. Wartikar and J. N. Wartikar, Pune Vidyarthi Griha Prakashan,Pune.

5) Higher Engineering Mathematics by H. K. Das and Er. Rajnish Verma, S. Chand & CO. Pvt.Ltd., New Delhi.

Reference Books

1) Higher Engineering Mathematics by B. V. Ramana, Tata McGraw-Hill Publications, New Delhi.

2) A Text Book of Engineering Mathematics by Peter O' Neil, Thomson Asia Pte Ltd., Singapore.

3) Advanced Engineering Mathematics by C. R. Wylie & L. C. Barrett, Tata Mcgraw-Hill Publishing Company Ltd., NewDelhi.

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B.Tech. First Year (2020-21)

Branch: Mechanical Engineering

SEMESTER-I

Course Title : Engineering Chemistry **Semester : I**

Course Code : ME1T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream : Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry
2. To understand the application of Chemistry in engineering and in real life.
3. To investigate the key concepts of Chemistry knowledge
4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe types of fuel, refining of Petroleum, concentration of ores, chemical and physical properties of lubricants, nanomaterials and polymers.
2. Interpret the various classification of fuel, refining of petroleum, reduction of ores, classification of lubricants, various properties of nanomaterials and polymers.
3. Apply the Knowledge of characteristics of good fuel, Chemical and physical methods of separation of metals from ores. Mechanisms of lubricants, Synthesis of nanomaterials, liquid crystal polymers
4. Analyze the question on Proximate and Ultimate analysis of coal, industrial selection of lubricants, electrolysis of metals, potential use of nanomaterials, phases of thermotropic polymers

5. Estimate a Modal on commercial grading of coal, extraction of metals from ores, lubricants, synthesis of nanomaterials, advanced polymers.

6. Organize coal, lubricants, ores and their metals, nanomaterials and polymers.

Unit-1 **[9 Hr]**

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon),Treatment of waste water.

Unit-2 **[9 Hr]**

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

Unit-3 **[8 Hr]**

Energy Source: Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel-Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel and Gaseous fuel. Flue Gas Analysis, Batteries, capacitor battery.

Unit-4 **[9 Hr]**

A. Metallurgy: Introduction, Occurrence of metals, types of ores, concentration of ores by physical methods- Crushing and Sizing, Froth- Flotation, Magnetic Separation, Gravity separation method. Chemical methods-Calcination, Roasting, Reduction of Ore- by Pyrolysis, Chemical reductions, Refining of Metals.

B. Lubricants: Introduction, function of lubricants, types of lubrication – Thick film, Thin film and Extreme pressure lubrication, classification of lubricants - Solid, Semi – solid and Liquid Lubricants, properties of lubricants, Physical properties – Viscosity, Viscosity index, surface tension, Oiliness, Flash point and Fire point, Pour point and Cloud point, Chemical properties – Acidity, Emulsification, Saponification.

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To be a center of excellence imparting professional education satisfying societal and global needs.	1. Transforming students into lifelong learners through, quality teaching, training and exposure to concurrent technologies. 2. Fostering conducive atmosphere for research and development through well equipped laboratories and qualified personnel in collaboration with global organizations.

Unit-5 **[9 Hr]**

Polymers: Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys Definition, Examples, Concepts of polymer processing, injection molding, rheology, polymer properties, polymer analysis.

Text Books:

1) A Text book of Engineering Chemistry, Dr. S. S. Dara, Dr. S. S. Umre,S. Chand and Company Ltd., Twelfth/ 2011

2) Material Chemistry, Dr. Avinash Bharti, A. K. Welekar, Tech Max, First/2016.

3) Nanomaterials, Nanotechnology and Design, Michael F. Ashby, Paulo J. Ferreira, Daniel L. Schodek, Elsevier, First/2013

Reference Books:

1) Engineering Chemistry, P. C. Jain And Monika Jain, Dhanpatrai Publishing Company Ltd., 15th Ed/ 2009

2) Principles of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan S. Pathania, Vishal Publishing Company, First/2002

3) Chemistry, John E McMurry and Robert C Fay, Pearson, First/2008,

4) Nanotechnology A gentle Introduction to the Next big Idea, Mark Ratner, Daniel Ratner, Pearson, First/2017

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B.TECH. FIRST YEAR (2020-21)

BRANCH: CIVIL ENGINEERING

BRANCH CODE: CE

SEMESTER-I

Course Title : Engineering Chemistry **Semester : I**

Course Code : CE1T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream :Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry

2. To understand the application of Chemistry in engineering and in real life.

3. To investigate the key concepts of Chemistry knowledge

4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe various properties of water, nanomateral, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, spectrophotometric techniqes .

2. Illustrate the various types of water, carbon nanotubes, Molecular orbital theory, Transport number by Moving Boundary method, Ostwald's theory of acid-base indicator, various batteries, UV and NMR spectroscopy.

3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various unknown sample by UV and NMR spectroscopy .

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4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, spectroscopic techniques.

5. Develop a Modal on softening of water, standardization of acid and base by various instruments, doping on band structure, spectroscopic techniques.

6. Organize water as per quality, carbon nanotubes, electrodes, Energy level diagrams of diatomic molecules, various elements as per their spectroscopic techniques.

Unit-1 **[9 Hr]**

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon),Treatment of waste water.

Unit-2 **[9 Hr]**

A] Nanomaterials: Definition of nanomaterials, nano scale. Carbon nano tubes: Different types of CNT; applications of nanomaterials in construction, environment and electronics. Threats of Nanomaterials.

B] Corrosion: Dry and Wet corrosion and Preventive Methods: Different types of corrosion (Pitting, Stress, Intergranular and Galvanic), protection against corrosion, design and selection of engineering materials, cathodic and anodic protection, Brief discussion about Protective Coatings.

Unit-3 **[8 Hr]**

Cement: Portland cement: Manufacture, role of microscopic constituents. Properties-setting and hardening, heat of hydration and soundness Types of cement-Rapid hardening, High alumina, Portland Pozzolana cement; Introduction to Grading of cement.

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Unit-4 **[9 Hr]**

Environmental Chemistry: Introduction- Air pollution; Noise pollution, optimum decibel levels; Water pollution; Greenhouse effect and Global warming; e-Waste and Radioactive pollution; Role of electromagnetic radiation in global warming, Carbon Credit, Chemicals affecting- factors for depletion of ozone layer.

Unit-5 **[9 Hr]**

Polymers and Plasticizer: Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications. Polymers used in cement, its Properties and Limitation.

Text Books:

A Text book of Engineering Chemistry, Dr. S. S. Dara, Dr. S. S. Umre, S. Chand and Company Ltd., Twelfth/ 2011

Selected Topics in Inorganic Chemistry, Dr. Wahid U. Malik, Dr. G. D. Tuli and Dr. R. D. Madan, S. Chand and Company Ltd., Seventh/2001

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Education to Eternity

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An Autonomous Institute, with NAAC "A" Grade

VISION	MISSION
To be a center of excellence imparting professional education satisfying societal and global needs.	1. Transforming students into lifelong learners through, quality teaching, training and exposure to concurrent technologies. 2. Fostering conducive atmosphere for research and development through well equipped laboratories and qualified personnel in collaboration with global organizations.

B.Tech. First Year (2020-21)

Branch: Electrical Engineering

SEMESTER-I

Course Title : Engineering Chemistry **Semester : I**

Course Code : EE1T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream :Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry

2. To understand the application of Chemistry in engineering and in real life.

3. To investigate the key concepts of Chemistry knowledge

4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

At the end of the course students will be able to

1. Describe various properties of water, fuel, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, polymer and battries

2. Illustrate the various types of water, Ostwald's theory of acid-base indicator, polymer, various batteries, fuel cell.

3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various batteries and fuel cell.

4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, fuel cell and batteries..

5. Develop a Modal on softening of water, standardization of acid and base by various instruments, polymers, fuel cell and batteries..

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6. Organize water as per quality, and fuel, types of electrodes, polymers and fuel cell and batteries..

Unit-1 **[9 Hr]**

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon),Treatment of waste water.

Unit-2 **[9 Hr]**

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

Unit-3 **6 hrs**

Fuels: Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuel- Coal, Various types of Coal, Analysis of coal-Proximate and Ultimate analysis, liquid fuel- Refining of Petroleum.

Unit-4 **8 hrs**

A] Electrochemistry: Introduction-basic concepts, Transport number and its determination by Moving Boundary method, Debye-Hückel theory, Conductometric titrations, Ostwald's theory of acid-base indicator, Quinonoid theory, Electrodes – Glass electrode, Quinhydrone electrode.

B] Battery Technology:

Classification of batteries: Primary, Secondary- Electricity storage density, power density, energy efficiency, cycle life, shelf life. Rechargeable alkaline storage batteries, Ni-metal hydride,

Lithium ion batteries and H2-O2 Fuel cell.

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Unit-5 **8 hrs**

Advanced Polymeric Materials: Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications

Text Books:

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B.TECH. FIRST YEAR (2020-21)

BRANCH: COMPUTER SCIENCE ENGINEERING

BRANCH CODE: CS

SEMESTER-II

Course Title : Engineering Chemistry **Semester : II**

Course Code : CS2T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream :Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry

2. To understand the application of Chemistry in engineering and in real life.

3. To investigate the key concepts of Chemistry knowledge

4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

At the end of the course students will be able to

6. Describe various properties of water, nanomateral, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, spectrophotometric techniqes .

7. Illustrate the various types of water, carbon nanotubes, Molecular orbital theory, Transport number by Moving Boundary method, Ostwald's theory of acid-base indicator, various batteries, UV and NMR

spectroscopy.

8. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various unknown sample by UV and NMR spectroscopy .

9. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, spectroscopic techniques.

10. Develop a Modal on softening of water, standardization of acid and base by various instruments, doping on band structure, spectroscopic techniques.

6. Organize water as per quality, carbon nanotubes, electrodes, Energy level diagrams of diatomic molecules, various elements as per their spectroscopic techniques.

Unit-1 **[9 Hr]**

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon),Treatment of waste water.

Unit-2 **6 hrs**

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

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Unit-3 **8 hrs**

Atomic and molecular structure: Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbital. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

Unit-4 **8 hrs**

Periodic properties: Effective nuclear charge, penetration of orbital's, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

Unit-5 **6 hrs**

Spectroscopic techniques and applications (UV and NMR):

Part A) Ultraviolet Spectroscopy: Principles of spectroscopy and selection rules. Ultraviolet spectroscopy and its application. Fluorescence and its applications in medicine.

Part B) NMR Spectroscopy: Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques.

Text Books:

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B.Tech. First Year (2020-21)

Branch: Information Technology Engineering

SEMESTER-II

Course Title : Engineering Chemistry **Semester : II**

Course Code : IT2T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream : Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry

2. To understand the application of Chemistry in engineering and in real life.

3. To investigate the key concepts of Chemistry knowledge

4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

At the end of the course students will be able to

11. Describe various properties of water, nanomateral, transition metal ions and their magnetic properties, Debye-Hückel theory, Quinonoid theory, various electrode, spectrophotometric techniqes .

12. Illustrate the various types of water, carbon nanotubes, Molecular orbital theory, Transport number by Moving Boundary method, Ostwald's theory of acid-base indicator, various batteries, UV and NMR spectroscopy.

13. Analyze the question on water characteristics, electrochemistry and various types of instrumental

titration, various unknown sample by UV and NMR spectroscopy .

14. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, spectroscopic techniques.

15. Develop a Modal on softening of water, standardization of acid and base by various instruments, doping on band structure, spectroscopic techniques.

6. Organize water as per quality, carbon nanotubes, electrodes, Energy level diagrams of diatomic molecules, various elements as per their spectroscopic techniques.

Unit-1 **[9 Hr]**

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon),Treatment of waste water.

Unit-2 **6 hrs**

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

Unit-3 **8 hrs**

Atomic and molecular structure: Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbital. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

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Unit-4 **8 hrs**

Periodic properties: Effective nuclear charge, penetration of orbital's, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

Unit-5 **6 hrs**

Spectroscopic techniques and applications (UV and NMR):

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B.TECH. FIRST YEAR (2020-21)

BRANCH: ARTIFICIAL INTELLIGENCE

BRANCH CODE: AI

SEMESTER-II

Course Title : Engineering Chemistry **Semester : II**

Course Code : AI2T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream :Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry
2. To understand the application of Chemistry in engineering and in real life.
3. To investigate the key concepts of Chemistry knowledge
4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied.

COURSE OUTCOMES

At the end of the course students will be able to

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Debye-Hückel theory, Quinonoid theory, various electrode, spectrophotometric techniqes .

2. Illustrate the various types of water, carbon nanotubes, Molecular orbital theory, Transport number by Moving Boundary method, Ostwald's theory of acid-base indicator, various batteries, UV and NMR spectroscopy.

3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various unknown sample by UV and NMR spectroscopy .

4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, spectroscopic techniques.

5. Develop a Modal on softening of water, standardization of acid and base by various instruments, doping on band structure, spectroscopic techniques.

6. Organize water as per quality, carbon nanotubes, electrodes, Energy level diagrams of diatomic molecules, various elements as per their spectroscopic techniques.

Unit-1 **[9 Hr]**

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Unit-2 **6 hrs**

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in electronics, sensors, catalysis, environment and cosmetics. Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

Unit-3 **8 hrs**

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orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

Unit-4 **8 hrs**

Periodic properties: Effective nuclear charge, penetration of orbital's, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

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B.Tech. First Year (2020-21)

Branch: Electronics and Telecommunication Engineering

SEMESTER-II

Course Title : Engineering Chemistry **Semester : II**

Course Code : ET2T002 **Course Type : Compulsory**

Pre-requisite : Basic knowledge of Chemistry **L – T – P : 3 – 1– 0**

Stream :Core subject **Credits : 4**

COURSE OBJECTIVES

1. To understand the importance of Chemistry

2. To understand the application of Chemistry in engineering and in real life.

3. To investigate the key concepts of Chemistry knowledge

4. To enable students to analyze a Chemistry problem so that appropriate problem solving techniques may be applied

COURSE OUTCOMES

At the end of the course students will be able to

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2. Illustrate the various types of water, Ostwald's theory of acid-base indicator, polymer, various batteries, fuel cell.

3. Analyze the question on water characteristics, electrochemistry and various types of instrumental titration, various batteries and fuel cell.

4. Apply the Knowledge of zeolite process, Ion exchange process, Hot Lime –Soda process, acid base concept, fuel cell and batteries..

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6. Organize water as per quality, and fuel, types of electrodes, polymers and fuel cell and batteries.

Unit-1 **[9 Hr]**

Water Conditioning: Specifications of water for industries (paper, textile, beverages and power generation), types of hardness; softening of water by lime-soda process, Zeolite process, De-mineralization process (principle, advantages and limitations). Numerical based on lime-soda and Zeolite process. Boiler troubles, sequestration (carbonate, phosphate and calgon),Treatment of waste water.

Unit-2 **6 hrs**

Nanomaterials: General introduction to nanotechnology, timeline and milestone, overview of different nanomaterials available, potential use of nanomaterials in computer, catalysis, environment and cosmetics. Synthesis of nanomaterials: ' Top-Down'- photolithography and 'Bottom-Up'- sol-gel method. Carbon nanotubes: single-walled and multi-walled carbon nanotubes, their structures, properties and applications. Potential risks of nanomaterials- environmental impact.

Unit-3

Atomic and molecular structure **8 hrs**

Molecular orbitals of diatomic molecules and plots of the multicenter orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene and aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structure.

Unit-4

Periodic properties **6 hrs**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries.

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Unit-5

A. Advanced Polymeric materials: **6 hrs**

Introduction to reactions involving substitution, addition, elimination, cyclization and ring opening. Liquid crystals and liquid crystal polymers (thermotropic and lyotropic), phases of thermotropic polymers: nematic, smectic, cholesteric; advantages, disadvantages and applications.

B. Magnetic Materials: Introduction, Magnetic fields or quantities, types of magnetism, classification of magnetic materials, soft magnetic materials, H magnetic materials, Ferrites, Ferro, and Para Magnetic materials

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Course Title : Engineering Chemistry-Lab **Semester : I/II**

Course Code : ---- **Course Type : Compulsory**

Pre-requisite : Basics of Chemistry Practical **L – T – P : 0 – 0– 2**

Stream : Theory subject **Credits : 1**

Course Objective:

Students will be able to

1. Students will explore new areas of research in both chemistry and allied fields of science and technology.
2. Students will understand safe handling of chemicals, environmental issues and key issues facing our society in energy, health and medicine.
3. Students will recognize common laboratory techniques including pH measurement, acid/base titrations, UV/Visible spectroscopy.

Course Outcome

Students will be able to

1. Recall hardness of water, acid value, saponification number of oils.
2. Demonstrate an ability to make chemical measurements and understand the limits of precision in measurements.
3. Enhance the comprehensibility of the practical concepts and their application.
4. Apply the analytical techniques to the experimental data
5. Making judgments based on criteria and standards through checking and critiquing
6. Design and apply the practical knowledge of engineering chemistry in daily life

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List of Experiments: (Perform any 8– 10 Experiments)

1. Determination of Hardness of water sample by EDTA method.
2. Determination of flash point by Pensky Martin Apparatus
3. Determination of Dissolve Oxygen by Iodometric method.
4. Determination of percent purity of Bleaching Powder.
5. pH – metric Titration (any one type of Acid Base titration)
6. Conductometric Titration (any one type of Acid Base titration)
7. Surface tension: Determination of relative surface tension of liquid with respect to water using drop number method.
8. Viscosity: Determination of relative viscosity of liquid with respect to water using Ostwald's viscometer method.
9. To determine the normality in Normal term and Strength in gms/lit of HCl solution by titrating with Na2CO3 solution.
10. To find out Morality, Normality and Strength of the given KMnO4 solution by titrating against N/10 Mohr's solution.
11. Determination of Acid value of an oil sample.
12. Determination of Saponification value of an oil sample.
13. Verification of Beer-Lambert Law
14. To determine the heat of neutralisation of strong acid by strong base.
15. To determine chemical parameters such as hardness, alkalinity, and chemical oxygen demand COD) of water samples.
16. Determination of Viscosity of Organic Solvents
17. To determine the amount of substance in a solution of unknown concentration using various titrimetric methods. (pH)
18. To determine the amount of substance in a solution of unknown concentration using various titrimetric methods. (Conductometer)

Reference Books:

1. Systematic experiments in Chemistry, A. Sethi, New Age International Publication, New Delhi.
2. Practical Inorganic Chemistry, A. I. Vogel, ELBS Pub.
3. Practical in Engineering Chemistry, S. S. Dara.