DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Scheme of Instruction
and
Syllabi of

BE (ARTIFICIAL INTELLIGENCE &MACHINE LEARNING)
I & II- SEMESTER

2021-2022

UNIVERSITY COLLEGE OF ENGINEERING

(AUTONOMOUS)

OSMANIA UNIVERSITY

HYDERABAD – 500 007, TELANGANA

With effect from the academic year 2021-2022

SCHEME OF INSTRUCTION

BE (ARTIFICIAL INTELLIGENCE & MACHINE LEARNING)

SEMESTER-I

S.No	Course Code	Course Title	Scheme of Instruction			Contact Hrs/Wk	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
Theory									
1.	MT 101 BS	Engineering Mathematics-I	3	1	0	4	30	70	4
2.	CH 102 BS	Engineering Chemistry	3	1	0	4	30	70	4
3.	EE 101 ES	Basic Electrical Engineering	3	1	0	4	30	70	4
4.	EG 101 HS	English	3	1	0	4	30	70	2
Practicals									
5	CH 152 BS	Engineering Chemistry Lab	0	0	2	2	25	50	1.5
6	EE 151 ES	Basic Electrical Engineering Lab	0	0	2	2	25	50	1
7	EG 151 HS	English Lab	0	0	2	2	25	50	1
Total			**12**	**4**	**6**	**22**	**195**	**430**	**17.5**

L : Lectures T : Tutorials

P : Practicals CIE : Continuous Internal Evaluation

SEE : Semester End Examination

MT 101 BS

ENGINEERING MATHEMATICS – I

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives:

- To introduce the concepts of sequences, series and their properties
- To Study Fourier Series and its applications.
- To introduce the concepts of functions of several variables and multiple integrals
- To study vector differential and integral calculus

Course Outcomes:

The student will be able to :

1. find the nature of sequences and series
2. Expand functions as a Fourier Series.
3. use the knowledge of multiple integrals in finding the area and volume of any region bounded by given curves
4. apply this knowledge to solve the curriculum problems

UNIT-I

Sequences and Series:

Sequences, Series, General properties of series, Series of positive terms, Comparison tests, tests of Convergence D'Alembert's ratio test, Cauchy's n^{th} root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence ; Fourier Series, Half range Sine and Cosine Series, Parseval's theorem.

UNIT-II

Calculus of one variable:

Rolle's theorem, Lagrange's , Cauchy's mean value theorems (without proof) Taylor's series, Curvature, Radius of curvature, Circle of curvature, Envelope of a family of curves, Evolutes and Involutes, Evaluation of definite and improper integrals, Beta, Gamma and Error functions.

UNIT-III

Multivariable Calculus (Differentiation):

Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian , Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions two variables, Lagrange's method of multipliers.

UNIT-IV

Multivariable Calculus (Integration) :

Double integrals,Change of order of integration, Triple integrals, Change of variables in integrals and applications-areas and volumes.

UNIT-V

Vector Calculus:

Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals , Green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

Suggested Readings:

1. R.K.Jain & S.R.K Iyengar, *Advanced Engineering Mathematics*, Narosa Publications,4th Edition 2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley, 9th Edition, , 2012.
3. B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
4. G.B.Thomas , Maurice Weir and Joel Hass, *Thomas' Calculus* , Peterson, 12th Edition,2010.
5. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
6. N.P.Bali and M. Goyal, A text book of *Engineering Mathematics*, Laxmi Publications 2010.
7. H.K. Dass, Er. Rajnish Varma, *Higher Engineering Mathematics*, Schand Technical Third Edition.

CH 102 BS

ENGINEERING CHEMISTRY

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives:

To provide students with knowledge of engineering chemistry for building technical competence in Industry, Research and Development in the following fields:

- Thermodynamics and Electrochemistry
- Water chemistry and Corrosion
- Molecular Structure and Spectroscopy
- Engineering Materials
- Energy Sources and Nano materials

Course Outcomes:

The students will be able to:

1. Analyze microscopic chemistry in terms of atomic, molecular orbital's and intermolecular forces.
2. Rationalize bulk properties and processes using thermodynamic considerations.
3. Distinguish the ranges of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
4. Gain knowledge in causes of corrosion and its prevention.
5. Attain knowledge about the disadvantages of hard water for domestic and industrial purposes. Also learns the techniques of softening of hard water and treatment of water for drinking purpose.

UNIT-I

WATER CHEMISTRY AND CORROSION :

Water chemistry: Hardness of water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion exchange and Reverse Osmosis methods. Boiler troubles-scales and sludge's formation-causes, effects and prevention. Numerical problems

Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by Chlorination.

Corrosion-causes and its effects. Types of corrosion-Dry or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion and its types. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods- Sacrificial anodic and Impressed current cathodic protection methods. Surface coating methods: Hot dipping-Galvanizing and Tinning.

UNIT-II

THERMODYNAMICS AND ELECTROCHEMISTRY :

Thermodynamics: Definition of thermodynamic functions- Enthalpy, Entropy , Free energy and their significance. Variation of free energy change with temperature and pressure. Concept of spontaneity. Criteria of spontaneity in terms of entropy and free energy. Carnot cycle-efficiency of heat engine. Numericals.

Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells-notation, cell reaction and cell potentials. Types of electrodes-Calomel, Quinhydrone and Glass electrodes. Determination of P^H of a solution by using Quinhydrone electrode. Thermodynamics of emf of cells- Nernst equation and its derivation. Application of Nernst equation to electrode potential and emf of cells. Numericals. Principles and applications of Potentiometric titrations.

UNIT-III

MOLECULAR STRUCTURE AND SPECTROSCOPY :

Molecular Orbital Theory. Linear Combination of Atomic Orbitals (LCAO).Molecular Orbital energy level diagrams of diatomic molecules-O_2,N_2 and NO. Crystal field theory, Crystal Field Splitting of d-orbitals of transition metal complexes in Octahedral, Tetrahedral and Square planar geometries. Magnetic properties of complexes.

Basic principles of Spectroscopy and selection rules of Vibrational, Rotational and Electronic Spectroscopy and their applications.

UNIT-IV

ENGINEERING MATERIALS:

Polymers: Introduction. Classification of polymers -Plastics, Fibres and Elastomers.

Preparation, properties and engineering applications of the following polymers:

Plastics: PVC and Bakelite

Fibers: Nylon 6:6, and Dacron.

Elastomers: Buna-S and Butyl Rubber.

Conducting polymers: Introduction. Mechanism of conduction in polymers. Intrinsic conducting

polymers: Poly-acetylene and poly-aniline. Applications of conducting polymers.

Liquid Crystals: Introduction. Classification of liquid crystals. Thermotropic, Lyotropic liquid crystals. Chemical constitution and liquid crystalline behavior. Nematic, Smectic and Cholestric liquid crystals and their applications.

UNIT-V

ENERGY SOURCES AND NANOMATERIALS

Batteries: Primary batteries-Zn carbon battery. Secondary batteries-Pb- Acid battery and Ni-Cd battery.

Lithium-ion batteries- advantages and applications.

Fuel cells: Concept of fuel cells and their advantages. Construction and working of H_2-O_2 and methanol-Oxygen fuel cells.

Solar cells: Concept of solar energy conversion, photovoltaic cells.

Nanomaterials: Introduction. Properties of nanomaterials. Synthesis of nanomaterials-Top down, Bottom up approach and Sol-gel method. Applications of nanomaterials.

Suggested Readings:

1. Jain & Jain, *Engineering chemistry*, Dhanpat Rai publishing Co.,16th Edition.
2. B.L.Tembe,Kamaluddin and M.S.Krishnan, Engineering Chemistry(NPTELWeb-book)
3. Prashanth Rath, Engineering Chemistry, Cengage Learning.
4. M.J.Sienko and R.A.Plane, Chemistry: Principles and Applications, MGH Publishers.
5. B.H.Mahan, University Chemistry, Pearson Publishing Co., 4th Edition.
6. C.N. Banwell, *Fundamentals of Molecular Spectroscopy*, TMH

EE 101 ES

BASIC ELECTRICAL ENGINEERING

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives:

- To understand the fundamentals of DC and AC electrical circuits.
- To understand the working principles of DC motor, DC generator, Transformers and single phase induction motors.
- To understand working principles of protection devices used in electrical circuits.

Course Outcomes:

The student will be able to:

1. Analyze the performance of simple electrical circuits exciting with Dc and AC excitations.
2. Apply different theorems to solve complicated electrical circuits to obtain the current, voltage and power.
3. Understand the main components, Characteristics, applications of different DC and AC electrical machines used in industry.
4. Understand the importance of protective devices and their rating used in electrical circuits.

UNIT-I DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

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, and RL, RC, RLC combinations (series only). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III Transformers and 3-ph Induction Motors

Transformers : Electromagnetic induction, Faradays laws, Statically induced emf, Lenz law, BH characteristics, ideal and practical transformer, losses and efficiency, Auto-transformer and three-phase transformer connections.

Three Phase Induction motor: Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, squirrel cage IM, slip-ring IM, Applications

UNIT-IV Single-phase induction motor & DC Machines

Single-phase induction motor: Construction and principle of operation, Capacitor start & capacitor run motor, applications

DC Generators: Dynamically induced emf, Flemming's Right hand and Left hand rules, Construction and principle of operation of DC generator, EMF equation, Types of DC Generators, OCC characteristics, applications

DC Motors: principle of operation of DC Motor, Types of DC motors, applications

UNIT-V: Electrical Installations

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Suggested Reading:

1. J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.
2. J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications,2010
3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, " Basic Elactrical Engineering" Tata
4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

EG 101 HS

ENGLISH

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	2

Course Objectives:

- communicate clearly, accurately and appropriately
- learn different models of interpersonal communication
- learn to communicate grammatically
- learn to write essays, formal letters and technical reports
- comprehend the different types of texts

Course Outcomes:

The student will be able to

1. communicate clearly, accurately and appropriately
2. learn different models of interpersonal communication
3. learn to communicate grammatically
4. learn to write essays, formal letters and technical reports
5. comprehend the different types of texts

UNIT – I

Effective Communication: Role and importance of communication; Features of human communication; Process of communication; Barriers to communication; Oral and Written Communication; Importance of listening, speaking, reading, and writing; Types of communication: Verbal – formal versus informal communication, one-way versus two-way communication, Non-verbal communication.

UNIT – II

Personality Development and Interpersonal Communication: Models of interpersonal development: Johari window, Knapp's model; Styles of communication; Time management; Emotional Quotient; Teamwork; Persuasion techniques.

UNIT – III

Remedial English: Tenses, Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Clichés. (Note: The focus is on appropriate usage)

UNIT – IV

Vocabulary Building and Written Communication: Roots and affixes; Words often confused: Homonyms, Homophones, Homographs; One-word substitutes; Idiomaticusage: Idioms, Phrases,

Phrasal Verbs; Synonyms; Antonyms; Paragraph writing; Précis writing; Essay writing; Official letters; E-mail etiquette; Technical report writing: Feasibility and Progress reports.

UNIT – V

Reading Comprehension: Unseen Passages, A.P.J. Abdul Kalam, Azim Premji, Sachin Tendulkar, Sathya Nadella, Sam Pitroda (Note: No descriptive questions to be set from this unit and only Reading Comprehension/s from unseen passages should be set in the Examination Question Papers)

Suggested Readings:

1. E. Suresh Kumar, *Engineering English*, Orient BlackSwan, 2014
2. *Language and Life A Skills Approach*, Orient Black Swan, 2018
3. Michael Swan, *Practical English Usage*. OUP, 1995
4. Ashraf Rizvi, M, *Effective Technical Communication*, Tata McGraw Hill, 2009.
5. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice*. OUP, 2011.

CH 152 BS

ENGINEERING CHEMISTRY LABORATORY

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Course Objectives:

- Estimation of hardness and chloride content in water to check its suitability for drinking purpose.
- To determine the rate constant of reactions from concentrations as an function of time.
- The measurement of physical properties like surface tension and viscosity.
- Estimation of HCl and CH_3COOH by conductometric technique

Laboratory out comes:

The chemistry laboratory course use consists of experiments illustrating the principle of chemistry relevant to the study of science and engineering. The student will be able to:

1. Estimate rate constants of reactions from concentration of reactants / products as a function of time.
2. Measure molecular /system properties such as surface tension ,viscosity ,conductance of solutions , redox potentials and chloride content of water
3. Synthesize a small drug molecules

Water analysis:

1) Determination of total hardness of water by EDTA method
2) Determination of Chloride content of water
3) Determination of cell constant.
4) Estimation of HCl and CH_3COOH by conductometric titration

Potentiometric measurements:

5). Estimation of HCl by potentiometric titration.
6). Estimation of ferrous iron by potentiometric titration.

Kinetic Studies:

7).Determination of rate constant of acid catalyzed hydrolysis of methyl acetate.
8).Study of kinetics of Iodine-Clock reaction.

Synthesis of a drug molecule:

9).Synthesis of Aspirin.

Distribution Studies:

10).Determination of partition coefficient of acetic acid between Butanol and Water.

Physical constants:

11).Determination of a viscosity of a given liquid.
12).Determination of surface tension of a given liquid.

Colorimetry:

13) Verification of Beers law and Estimation of the given permanganate.
14) Verification of Beers law and Estimation of the given $CuSO_4$.

***Suggested Readings*:**

1. Senior Practical Physical Chemistry, B.D.Khosla, A.Gulati and V.Garg (R.Chand&Co.,Delhi)
2. An Introduction to Practical Chemistry ,K.K.Sharma and D.S.Sharma (Vikas publishing,N.Delhi)

EE 151 ES

BASIC ELECTRICAL ENGINEERING LABORATORY

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1

Course Outcomes:

The student will be able to

- Get an exposure to common electrical components and their ratings.
- Make electrical connections by wires of appropriate ratings.
- Understand the usage of common electrical measuring instruments.
- Understand the basic characteristics of transformers and electrical machines.
- Get an exposure to the working of power electronic converters.

1^{st} cycle Experiments

Dem 1. Basic safety and precautions - Introduction and use of measuring instruments
Exp 1. Verification of Kirchhoff's Laws
Exp 2. Verification of Thevenin's & Norton's Theorem
Exp 3. Steady- state and transient time-response of R-C circuit to a step change in voltage.
Exp 4. Sinusoidal steady state response of R-L and R-L-C circuits- impedance calculation and verification
Exp 5. Measurement of three-phase power in balanced three-phase circuits using Two-Wattmeter method

2^{nd} cycle Experiments

Dem 2. Demonstration of cut-out sections of machines: DC machine, induction machine, synchronous machine and single-phase machine
Exp 6. Load test on single phase transformer: measurement of primary and secondary voltages, currents and power
Exp 7. Three-phase Transformer: Star and Delta connections. Voltage and current relationship
Exp 8. Torque speed characteristics of separately excited DC motor
Exp 9. Synchronous speed of two- pole and four-pole, three-phase induction motor . Speed reversal by change of phase-sequence
Exp 10. Magnetization curve of a separately excited DC Generator

Suggested Reading:

1. J.B.Gupta, "Fundamentals of Electrical Engineering and Electronics" S.K.Kataria & Sons Publications, 2002.
2. J.B.Gupta, "Utilization of Electric Power and Electric Traction" S.K.Kataria & Sons Publications,2010
3. Abhijit Chakrabarti, Sudipta Nath, Chandan Kumar Chanda, " Basic Elactrical Engineering" Tata

4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

EG 151 HS

ENGLISH LABORATORY

Instruction	2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1

Course Objectives:

- learn IPA
- learn minimal pairs and types of syllables
- overcome the difficulties with sounds of English
- learn to participate well in GDs, Debates and Presentations
- communicate with appropriate body language and expressions

Course Outcomes:

The student will be able to

1. learn IPA
2. learn minimal pairs and types of syllables
3. overcome the difficulties with sounds of English
4. learn to participate well in GDs, Debates and Presentations
5. communicate with appropriate body language, expressions

1. Introduction to English Phonetics: Organs of Speech: respiratory, articulatory and phonatory systems; Sounds of English: Introduction to International Phonetic Alphabet; Minimal pairs; Syllable; Word Stress; Introduction of rhythm and intonation; Difficulties of Indians speakers with stress and intonation.

2. Speaking Activities : Self Introduction, Picture perception, JAM.

3. Group discussion, Debate, Presentation skills

4. Listening Activities: Listening to different types of materials for effective comprehension

5. Role play: Use of dialogues in a variety of situations and settings

Suggested Readings:

1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD)*. Revised edition, Cambridge University Press India Pvt. Ltd. 2014
2. T. Balasubramanian. *A Textbook of English Phonetics for Indian Students.* Macmillan, 2008.
3. J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.
4. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. Tata McGraw Hill, 2006.

With effect from the academic year 2021-2022

SCHEME OF INSTRUCTION

B.E. (AI&ML)

II - SEMESTER

S. No.	Course Code	Course Title	Scheme of Instruction			Contact hr/week	Scheme of Examination		Credits
			L	T	P		CIE	SEE	
Theory									
1	MT 201 BS	Engineering Mathematics-II	3	1	0	4	30	70	4
2	PH 201 BS	Applied Physics	3	1	0	4	30	70	4
3	CS 201 ES	Programming for Problem Solving	3	1	0	4	30	70	4
Practicals									
4	PH 251 BS	Applied Physics Laboratory	0	0	3	3	25	50	1.5
5	CE 151 ES	Engineering Graphics	0	0	4	6	50	50	3
6	CS 251 ES	Programming for Problem Solving Laboratory	0	0	4	4	25	50	2
7	ME 151 ES	Workshop Practice	0	0	4	6	25	50	3
Total			**9**	**3**	**15**	**31**	**215**	**410**	**21.5**

L : Lectures T : Tutorials

P : Practicals CIE : Continuous Internal Evaluation

SEE : Semester End Examination BSC : Basic Science Courses

ESC : Engineering Science Courses

HSM : Humanities, Social Sciences & Management Courses

MT 201 BS

ENGINEERING MATHEMATICS – II

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives:

- To study matrix algebra and its use in solving system of linear equations and in solving eigen value problems
- To provide an overview of ordinary differential equations
- To study special functions like Legendre and Bessel functions
- To introduce the concept of functions of complex variable and their properties

Course Outcomes:

The student will be able to

1. solve system of linear equations and eigen value problems
2. solve certain first order and higher order differential equations
3. determine the analyticity of complex functions and expand functions as Taylor and Laurent series
4. evaluate complex and real integrals using residue theorem

UNIT-I

Matrices :

Elementary row and column operations, Rank of a matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Linear transformation, Orthogonal transformation, Eigenvalues, Eigenvectors, Properties of eigen values , Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by orthogonal transformation , Nature of quadratic forms.

UNIT-II

First Order Ordinary Differential Equations:

Exact first order differential equations , Integrating factors, Linear first order equations , Bernoulli's , Riccati's and Clairaut's differential equations ,Orthogonal trajectories of a given family of curves.

UNIT-III

Differential Equations of Higher Orders :

Linear independence and dependence, Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogeneous second order differential equations with variable coefficients , Solutions of non-homogeneous linear differential equations, Method of variation of parameters, solution of Euler-Cauchy equation, Simultaneous linear differential equations, Power Series
solution, Legendre Polynomial of first kind, Bessel's function of first kind and their properties.

UNIT-IV

Functions of a Complex Variable:

Limits and continuity of a function, differentiability and analyticity, Elementary Analytic functions, Necessary and Sufficient conditions for a function to be analytic,Cauchy- Riemann equations in polar form, harmonic functions, complex integration, Cauchy's integral theorem, extension of Cauchy's integral theorem for multiply connected regions, Cauchy's integral formula, Cauchy's inequality, Cauchy's formula for derivatives, Liouville's theorem, Maximum Modulus principle (without proof)and its applications

UNIT-V

Residue Calculus:

Power series, Taylor's series, Laurent's series, zeros and singularities, residues, residue theorem, evaluation of real integrals using residue theorem, Argument principle, Rouche's Theorem and their applications, conformal mapping Bilinear transformations. (**All Theorems without Proof)**

Suggested Readings:

1. R.K. Jain & S.R.K. lyengar, *Advanced Engineering Mathematics*, Narosa Publications, 4th Edition, 2014.
2. Erwin Kreyszig, *Advanced Engineering Mathematics*, John Wiley , 9th Edition, 2012.
3. Dr.B.S.Grewal, *Higher Engineering Mathematics*, Khanna Publications, 43rd Edition, 2014.
4. Dr.M.D.Raisinghania, *Ordinary and Partial differential equations*, S.CHAND, 17thEdition 2014.
5. James Brown, R.V Churchill, *Complex Variables and applications*, Mc Graw Hill 9th Edition 2013.
6. B.V. Ramana, *Higher Engineering Mathematics*, 23rd reprint, 2015.
7. S.L Ross, *Differential Equations* 3rd Edition, Wiley India.
8. G.F. Simmons and S.G. Krantz, *Differential Equations*, Tata Mc Graw Hill, 2007.
9. N. Bali, M.Goyal, A text book of *Engineering Mathematics*, Laxmi publications, 2010
10. H.K. Dass, Er. Rajnish Varma, *Higher Engineering Mathematics*, Schand Technical Third Edition.

PH 201 BS

Applied Physics

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	70 Marks
Sessionals	30 Marks
Credits	4

Course Objectives:

- To make student understand the basic concepts of wave mechanics and to know the significance of Maxwell's equations in engineering applications.
- To state the principle of optical fiber and to understand the design and applications of optical fibers. To explain the principles of laser and to demonstrate the applications of laser. To understand the concept of ultrasonics and its wide applications.
- To study different types of dielectric polarizations and dielectric properties of materials. To understand the concept of semiconductors and its wide applications.
- To make student understand the basic concepts of superconductivity. To know the significance of magnetic materials in normal life.
- To study the preparation of thin films and their importance. To understand the basic concepts of nanomaterials.

Course Outcomes:

The student will be able to:

1. Solve engineering problems using the concepts of wave and particle nature of radiant energy. Explain the significance of electromagnetic waves.
2. Compile the applications of laser and fiber optics in the field of industry, medical and telecommunication.
3. Show their understanding about the conductivity nature of semiconductors and its wide applications. Demonstrate the knowledge in dielectric materials applications and its importance.
4. Apply the basic concepts of superconductivity and magnetic materials in engineering applications.
5. Understand the widely used current technologies such as solar cells, fire alarms etc., which are based on thin films. Explain about the importance of nano materials.

UNIT-I

Wave mechanics: matter waves–de-Broglie wavelength, properties of wave function, Physical significance - Schrödinger time dependent and time in-dependent wave equation. Particle in a 1-D box.

Electromagnetic theory: Basic laws of electricity and magnetism - Maxwell's equations in integral and differential forms - Conduction and displacement current – Relation between D, E and P - Electromagnetic waves: Equation of plane wave in free space – Poynting theorem.

UNIT – II

Fibre Optics: Introduction – Propagation of light through an optical fiber - Acceptance angle - Numerical aperture (NA)– Types of optical fibers and refractive index profiles – Fibre drawing process (double crucible method)- Application of optical fibers

Lasers: Characteristics of lasers - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby laser - Helium-Neon laser – Semiconductor laser – Applications of lasers.

***Ultrasonics*:** Introduction to Ultrasonic waves – Production of ultrasonic waves by Piezoelectric method – Detection of ultrasonic waves : Piezoelectric detector – Properties of Ultrasonics – Wavelength of Ultrasonics by Debye-Sears method – Applications.

UNIT- III

Semiconductors: Intrinsic and Extrinsic semiconductors - Concept of a hole - Carrier concentration and conductivity in intrinsic semiconductors – Formation of P-N junction diode and its I-V characteristics – Thermistor and its characteristics - Hall effect and its applications.

Dielectric Materials: Dielectrics - Types of polarizations – Electronic, Ionic, Orientational and Space charge polarizations – Expression for Electronic polarizability - Frequency and temperature dependence of dielectric polarizations - Determination of dielectric constant by capacitance Bridge method - Ferro electricity - Barium titanate - Applications of Ferroelectrics.

UNIT- IV

Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – Introduction to High T_c superconductors - Applications of superconductors.

Magnetic Materials: Classification of magnetic materials: dia, para, ferro, antiferro and ferrimagnetic materials – Weiss molecular field theory of ferromagnetism - Magnetic domains - Hysteresis curve - Soft and hard magnetic materials – Ferrites: Applications of ferrites.

UNIT-V

Thin films: Distinction between bulk and thin films - Thin film preparation techniques: Thermal evaporation methods, Electron beam evaporation – Construction and working of Solar cell – Applications.

Nanomaterials: Introduction - Properties of materials at reduced size - Surface to volume ratio at nano scale – Classification of nanomaterials - Preparation of nanomaterials: bottom–up methods (sol gel and CVD), Top-down methods (ball milling) - Basic ideas of carbon nanotubes – Applications nanomaterials and their health hazards.

Suggested Reading:

1) B.K.Pandey and S. chaturvedi. Engineering Physics. Cengage Learning 2012

2) C. Kittel - Introduction to Solid State Physics, Wiley Eastern Ltd. 5th Edition, 1976

3) S.L. Gupta and V. Kumar - Solid State Physics, K. Nath & Co., 8th Edition, 1992.

4) A. Goswami - Thin Film Fundamentals, New Age International, 2007.

5) A.K Bhandhopadhya - Nano Materials, New Age International, Ist Edition, 2007.

6) M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co., Ist Edition, 1992.

7) C.M.Srivastava and C.Srinivasan -Science of Engg. Materials,New Age International, 2002.

CS 201 ES

PROGRAMMING FOR PROBLEM SOLVING

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evalaution	30 Marks
Credits	4

Course Objectives:

- To introduce the basic concepts of Computing environment, number systems and flowcharts
- To familiarize the basic constructs of C language – data types , operators and expressions
- To understand modular and structured programming constructs in C
- To learn the usage of structured data types and memory management using pointers
- To learn the concepts of data handling using files

Course Outcomes:

Student will be able to :

1. Explain various functional components in computing environment
2. Develop algorithmic solutions to problems and draw the flow charts
3. Explain and use basic constructs of C in writing simple programs
4. Use standard library functions in C and develop modular programs using user defined functions and structured data types

UNIT – I

Introduction to Computers: Computer Systems, Computing Environments, Computer Languages, Creating and Running Programs, Software Development, Flow charts. **Number Systems**: Binary, Octal, Decimal, Hexadecimal.

Introduction to C Language - Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output Statements

Arithmetic Operators and Expressions: Evaluating Expressions, Precedence and Associativity of Operators, Type Conversions.

UNIT-II

Conditional Control Statements: Bitwise Operators, Relational and Logical Operators, If, If-Else, Switch-Statement and Examples. Loop Control Statements: For, While, Do-While and Examples. Continue, Break and Goto statements

Functions: Function Basics, User-defined Functions, Inter Function Communication, Standard Functions, Methods of Parameter Passing. **Recursion-** Recursive Functions. **Storage Classes:** Auto, Register, Static, Extern, Scope Rules, and Type Qualifiers.

UNIT – III

Preprocessors: Preprocessor Commands
Arrays - Concepts, Using Arrays in C, Inter-Function Communication, Array Applications, Two-
Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection and Bubble Sort.

UNIT - IV

Pointers - Introduction, Pointers for Inter-Function Communication, Pointers to Pointers, Compatibility, L -value and R-value, Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocation Functions, Array of Pointers, Programming Applications, Pointers to void, Pointers to Functions, Command-line Arguments.

Strings - Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT - V

Structures: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions, Type Definition (typedef), Enumerated Types.

Input and Output: Introduction to Files, Modes of Files, Streams, Standard Library Input/Output Functions, Character Input/Output Functions.

Suggested Reading:

1. B.A. Forouzan and R.F. Gilberg, "*A Structured Programming Approach in C"* , Cengage Learning, 2007
2. Kernighan BW and Ritchie DM, "*The C Programming Language"*, 2nd Edition, Prentice Hall of India, 2006.
3. Rajaraman V, "*The Fundamentals of Computer"*, 4th Edition, Prentice-Hall of India, 2006.
4. Dromey " *How to Solve it By Computer* , Pearson education, 2006

PH 251 BS

Applied Physics Laboratory

Instruction	3 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Course Objectives:

- Demonstrate an ability to make physical measurements and understand the limits of precision in measurements.
- Demonstrate the ability to use experimental statistics to determine the precision of a series of measurements.
- Demonstrate the ability to prepare a valid laboratory notebook.
- Demonstrate the ability to understand the construction and working of different experiments.

Course Outcomes:

Student will be able to :

1. Recognize the correct number of significant figures in a measurement or in the results of a computation.
2. Use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
3. Keep a lab notebook that documents their experience in each lab procedure.
4. Develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.

List of Experiments:

1. To calculate the Numerical aperture (NA), acceptance angle of a given optical fibre.
2. Determination of wavelength of LASER using diffraction grating.
3. Determination of Velocity of ultrasonic waves in a liquid by Debye-Sears method.
4. To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
5. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
6. To draw the curve between the magnetizing field and the intensity of magnetization of the specimen (soft iron rod) and to find out i) Coercivity ii) Retentivity and iii) Hysteresis loss.
7. To draw the I-V Characteristics of a solar cell and to calculate the i) Fill factor ii) Efficiency and iii) Series resistance.
8. To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.
9. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).
10. To determine the constants of A, B and α using Thermistor characteristics.

CE 151 ES

Engineering Graphics

Instruction	6 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evalaution	50 Marks
Credits	3

Course Objectives

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modelling

Course Outcomes:

Student will be able to:

1. Create working drawings
2. Communicate through drawings
3. Create standard solid sections by drawing

UNIT - I Overview of Computer Graphics: listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

UNIT-II Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command.

UNIT-III Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute.

UNIT-IV Scales : Reduced and Enlarged scales, representative fraction, Plain, Diagonal and Vernier Scales, Projections of Points – placed in different quadrants, Projection of straight lines parallel to one plane, perpendicular to one plane, inclined to one plane and lines inclined to both planes.

UNIT-V Projections of planes : inclined Planes - Auxiliary Planes, Projections of Regular Solids covering, those inclined to both the Planes.

Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone.

Suggested Reading:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
5. S.N. Lal., Engineering Drawing (2018), M/S. Cengage Learning India Pvt. Ltd., Pratap Gunj, Delhi

CS 251 ES

PROGRAMMING FOR PROBLEM SOLVING LABORATORY

Instruction	4 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	2

Course Objectives:

- To use tools available under LINUX for C programming
- To gain hands-on experience on basic constructs of C programming
- To formulate problems and implement algorithmic solutions in C
- To write modular programs in C using structure programming techniques and data files.

Course Outcomes:

Student will be able to :

1. Write, compile and debug C programs in Linux environment
2. Write simple programs using control structures, user defined functions and data manipulation using arrays
3. Use standard C library functions to develop modular programs in C

1. Introducing to programming Environment(Linux commands, editing tools such as vi editor, sample program entry, compilation and execution)
2. Write programs using arithmetic, logical, bitwise and ternary operators.
3. Write programs simple control statements : Roots of a Quadratic Equation, extracting digits of integers, reversing digits ,finding sum of digit ,printing multiplication tables, Armstrong numbers, checking for prime, magic number,
4. Sin x and Cos x values using series expansion
5. Conversion of Binary to Decimal, Octal, Hexa and Vice versa
6. Generating a Pascal triangle and Pyramid of numbers
7. Recursion: Factorial, Fibonacci, GCD
8. Finding the maximum, minimum, average and standard deviation of given set of numbers using arrays
9. Reversing an array ,removal of duplicates from array
10. Matrix addition , multiplication and transpose of a square matrix .using functions
11. Bubble Sort, Selection Sort ,
12. Programs on Linear Search and Binary Search using recursion and iteration
13. Functions of string manipulation**:** inputting and outputting string , using string functions such as strlen( ),strcat( ),strcpy( )……etc
14. Writing simple programs for strings without using string functions.
15. Finding the No. of characters, words and lines of given text file
16. File handling programs : student memo printing
17. Create linked list, traverse a linked list, insert a node, delete a node, reversing list .

ME 151 ES

Workshop Practice

Instruction	6 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	3

Course Objectives:

- To learn about different tools used in workshop.
- To understand the different manufacturing processes.
- To learn about fabrication of components using different materials.

Course Outcomes:

Upon completion of this laboratory course, students will be able to fabricate components with their own hands.

1. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
2. By assembling different components, they will be able to produce small devices of their interest.

1. Machine shop **(10 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(6 hours)**
4. Electrical & Electronics **(8 hours)**
5. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6. Casting **(8 hours)**
7. Smithy **(6 hours)**
8. Plastic moulding & Glass Cutting **(6 hours)**

Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Suggested Reading:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I
   2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.