Faculty of Engineering & Technology
Jamia Millia Islamia, New Delhi

VISION

To become a leading engineering institute through knowledge creation, acquisition and dissemination for the benefit of society and industry.

MISSION

1. To develop a center of excellence by imparting quality education to produce technically sound and research oriented professionals to face the emerging challenges of society and industry.
2. To enhance knowledge by innovative teaching, engaging in cutting edge research and developing linkage with industry.
3. To impart ethical, social and environmental values to produce competent engineers for the service of mankind.
4. To inculcate technological capabilities through continuous interaction with academia and industry in emerging areas for sustainable development.

Department of Applied Sciences And Humanities

VISION

To develop and maintain a tradition of excellence in interactive teaching and creative research in sciences and humanities in consonance with the best standards at national and global level and to develop the young generation as morally upright, informed, skilled and responsible individuals equipped with best capacities.

MISSION

1. To participate in undergraduate teaching of Bachelor of Technology Programs.
2. To promote an environment of frontier research in basic as well as applied fields in sciences and humanities creating necessary facilities.
3. To attract well motivated academically well qualified and responsible faculty members with excellent moral character.
4. To participate in collaborative activities with academic and industrial centers and encourage appropriate socially relevant research.

Program Outcomes (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and Write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Course Structure
B. Tech Ist and IInd year

Semester I

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
AS-101	Communication Skills	3	--	--	3	3
AS-151	Language Lab	--	--	2	2	1
AS-102	Engineering Physics - I	2	1	--	3	3
AS-152	Engineering Physics Lab. - I	--	--	2	2	1
AS-103	Engineering Chemistry - I	2	1	--	3	3
AS-153	Engineering Chemistry Lab. - I	--	--	2	2	1
AS-104	Engineering Maths - I	3	1	--	4	4
CE-101	Basics of Civil Engineering	2	1	--	3	3
ME-101	Basics of Mechanical Engineering	2	1	--	3	3
EE-101	Basics of Electrical Engineering	2	1	--	3	3
ME-151	Workshop Practice	--	--	4	4	2
ME-102	Engineering Mechanics Lab	--	--	2	2	1
Total		**16**	**6**	**12**	**34**	**28**

Semester II

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
AS-201	Human Resource Management	3	-	-	3	3
AS-202	Engineering Physics - II	2	1	--	3	3
AS-252	Physics Lab. - II	--	--	2	2	1
AS-203	Engineering Chemistry & Environmental Science	2	1	--	3	3
AS-253	Chemistry Lab. - II	--	--	2	2	1
AS-204	Engineering Maths. - II	3	1	--	4	4
AS-205	Innovative Technology & Biosciences	3	-	--	3	3
EC-201	Basics of Electronics and Comm.	2	1	--	3	3
CS-201	Fundamentals of Computing	2	1	--	3	3
ME-250	Engineering Graphics	--	--	4	4	2
Total		**17**	**5**	**8**	**30**	**26**

COMMUNICATION SKILLS
AS-101

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Developing the concepts of communication skills and soft skills
2. Developing the syntactical concepts of grammar
3. Command over technical writing skills
4. Developing critical interpretation sense of literature.
5. Proficiency in language through English phonetics.

SYLLABUS

Unit-I : Art of Communication

English Communication, Technical, Verbal and Non-Verbal Communication, Barriers in Communication, Reading, Writing, Listening, Speaking; Strategies to overcome challenges in effective communication.

Unit-II : Fundamentals of English Syntax

Parts of Speech, Determiners, Use of tenses, Transformation of sentences, Active- Passive; Direct-Indirect; Simple-Compound-Complex sentences, Use of Prepositions, Discourse Markers, Subject Verb Concord, Use of Conjunctions, Use of Verbs.

Unit-III : Writing

Formal and informal letters, Demand Communication, Note Making, Report writing, Book Review, Abstracts and Research Proposals, creative writing, Email correspondence, Résumé writing, Executive summary.

Unit-IV: Vocabulary and Phonetics

Word formation, foreign roots, Suffix, Prefix, Antonyms, Synonyms, Homonyms, one word substitution, Idioms and Phrases, Acronyms, IPA Symbols, Vowels and Consonants, Place and Manner of Articulations, Phonetic transcription and Accentuation.

Unit-V : Literature

Poetry

Where the Mind is Without Fear- Rabindranath Tagore
The Express- Stephan Spender
Amalkanti-Nirendranath Chkrabarti
Road Not taken- Robert Frost

Prose

Of Studies- Francis Bacon,
Vanishing Animals- Gerald Durrell
Old man and the Sea – E Hemmingnoy
The Child- Munshi Premchand
Soapnut Leaves- Chaaso

Text Books:

1. The Joy of Reading: Orient Blackswan Pvt. Ltd, New Delhi
2. Fluency in English: Macmillan Publishers, New Delhi
3. Intermediate Grammar Usage and Composition : M.L.Tikoo and Subramanian , Orient Blackswan Pvt. Ltd, New Delhi
4. A Text Book of English Phonetics for Indian Students: T. Balasubramanian, Macmillan Publishers, New Delhi.
5. Practical English Usage: Michael Swan, Oxford University Press.

Suggested Reading:

1. The Oxford Guide to effective writing and speaking skills: John Seely, Oxford University Press
2. English Pronouncing Dictionary: Daniel Jones, Cambridge University Press.
3. Technical communication Principles and Practice: Meenakshi Raman and Sangeeta Sharma, Oxford.

ENGINEERING PHYSICS – I
AS-102

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Enhancing the concepts of conservative and non-conservative forces.
2. Understanding the basics of optics and introduction to wave nature.
3. Expanding the concepts of electromagnetism and its various applications.
4. Exploring the basics of quantum ideas.
5. Understanding the physics of solids.

SYLLABUS

UNIT-1: Physics Of Motion
Inertial and non-inertial frames, conservation principles of momentum and energy; conservative systems, simple harmonic motion, damped harmonic motion.

UNIT-II: Optics
Two views about nature of light, concept of coherence, interference of light, single slit and N-slits diffraction, hydrogen atom spectrum, diffraction grating.

UNIT-III: Electromagnetism
Cylindrical coordinates, Gradient, divergence and curl, line integral and surface integral Lorentz force, Gauss's law, Ampere's Law, Maxwell's equations, electromagnetic waves and Poynting vector.

UNIT-IV: Quantum Ideas
Difficulties of classical Physics, wave particle duality, photoelectric effect, Compton effect, uncertainty principle and its implications, wave packets, group velocity and phase velocity.

UNIT-V: Physics of Materials
Classification of materials, Bragg's law and X-ray diffraction, classical free electron theory, its success and failures, Wiedemann Franz law, Maxwell Boltzmann distribution.

Text Books:

1.	Halliday, Resnick	Physics
2.	Jenkins, White	Optics
3.	Wahab	Solid State Physics

Reference Books:

1.	G. Gamow	Physics, Foundations and frontiers
2.	Mathews	Optics
3.	Islam s.s.	Solid State Physics

Revised on 05.09.2019

B. Tech. Ist Semester

Engineering Chemistry- AS 103

CO 1- To study and understand about chemical methods of analysis and phase rule.

CO 2- To understand the fundamentals of instrumental methods of analysis.

CO 3- To develop an understanding of basics of electrochemistry and surfactants.

CO 4- To understand about the fundamentals of polymers.

CO 5- To study and understand about the fundamentals of nanomaterials and composites.

ENGINEERING CHEMISTRY – I **AS – 103**

L	T	P
2	1	2/2

UNIT – 1: CHEMICAL METHODS OF ANALYSIS AND PHASE RULE (Lectures- 7)

Gravimetric Analysis; Digestion and its Importance, Favorable Conditions for Precipitation, Volumetric Methods of Analysis; Expression of concentration of solutions, Acid-Base (pH metry and conductometry), Redox, Precipitation and Complexo metric Titrations. Phase Rule; Phase Rule Applications to One and Multiple Component systems, Fe-C Phase Equilibrium Diagram.

UNIT – 2: INSTRUMENTAL METHODS OF ANALYSIS (Lectures- 7)

Chromatography; Definition and Different Types of Chromatography, Adsorption chromatography and its types, Partition chromatography and its type, High Pressure Liquid Chromatography, Fundamentals of Spectroscopy; Principles and Applications of UV-Visible, Infra-Red and Atomic Absorption Spectrometry.

UNIT – 3: ELECTROCHEMISTRY AND SURFACTANTS (Lectures- 8)

Electrolytic and Galvanic cell, Electrode Potential, Standard Electrode Potential, EMF series, Nernst Equation, Cell emf Measurement, Reversible and Irreversible cell, Thermodynamic Overview of Electrochemical Processes, Conductance, Cell Constant and its Determination. Surface Active Agents, Soaps, Types of detergents and their disadvantages, Micelle, Critical Miceller Concentration, Hydrophilic and Hydrophobic Interactions, HLB values of Surfactants.

UNIT – 4: POLYMERS (Lectures- 8)

Basics of polymer chemistry, Molecular weight, Glass transition temperature and Melting point, Methods of polymerization, Structure property relationship, Thermoplastics and Thermosets, Fabrication of polymers by Compression, Injection, Extrusion and Transfer Moulding. Synthesis, Properties and uses of Polyethylene, Polyvinyl Chloride, Poly Methyl Methacrylate, Urea formaldehyde resin and Melamine formaldehyde resin, Conducting polymers and their applications.

UNIT – 5: NANOMATERIALS AND COMPOSITES (Lectures- 8)

General Introduction, Fullerenes, Carbon nanotubes, Nanowires, Electronic and Mechanical properties of nanomaterials, Synthesis of nanomaterials, Top down and Bottom up approaches, Applications of nanomaterials.

Adhesives, their classification and uses, Composites; their Compositions, types and Characteristics.

ENGINEERING MATHEMATICS – I (05.09.2019)

AS – 104 **L-3, T-1, P-0, Cr-4**

Course outcomes

1. Successive differentiation, expansion of functions, partial derivatives, double points and asymptotes.
2. Tracing of curve of two-dimensional, curvature, quadrature, rectification, volume and surface area of solids of revolutions.
3. Theory of two variable calculus, Eigen values, Eigen vectors, consistency of system, vector space and linear transformations.
4. Solution of ordinary differential equations with its applications.
5. Learning the concepts of partial differential equations.

UNIT-I: CALCULUS OF ONE VARIABLE AND PARTIAL DERIVATIVES (CO-1)

Successive differentiation, Leibnitz's theorem of n^{th} derivative; Maclaurin's and Taylor's expansion of a function; Partial derivatives and their geometrical interpretation, Total derivative, Total differential coefficient, change of variables i.e. use of Jacobeans.
Double point and its nature; Concavity, convexity and points of inflexion; Oblique and parallel asymptotes.

UNIT-II: CURVE TRACING, CURVATURE AND APPLICATIONS OF INTEGRATION (CO-2)

Two-Dimensional curve tracing in cartesian, polar and parametric forms; Curvature, radius of curvature in cartesian, polar, parametric and implicit forms, radius of curvature at the origin, centre and chord of curvature, evolutes of curves; Finding length, volume and surface area of the curve in cartesian, polar and parametric forms; Formation of pedal and intrinsic equation.

UNIT-III: CALCULUS OF SEVERAL VARIABLES & LINEAR ALGEBRA (CO-3)

Taylor's expansion of a function of two and more variables; Leibnitz's rule for differentiation under the sign of integration; Maxima and minima of a function of two and more variables including Lagrange's method;
Consistency of a system of simultaneous linear equations using rank, Eigen values and Eigen vectors of a square matrix, Properties of Eigen values, Applications of Cayley-Hamilton theorem and diagonalization of a matrix, vector space, basis, linear dependence and independence of vectors, Linear transformations and related problems.

UNIT-IV: ORDINARY DIFFRENTIAL EQUATIONS (CO-4)

Orthogonal and isogonal trajectories of a family of curves, complementary function, particular integral and general solution of ordinary linear differential equations of higher order with constant and variable coefficients (Cauchy and Legendre forms); Method of variation of parameters, method of undetermined coefficients and solutions of simultaneous differential equations with constant coefficients.

UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS (CO-5)

Introduction to partial differential equations, change of independent variables in P.D.E.; Lagrange's method of undetermined multipliers for the solution of linear partial differential equations of first order solution of non-linear partial differential equations of first order by means of transformations and Charpit's methods; Complete solution of homogeneous and non-homogeneous L.P.D.E. of higher order with constant and variable coefficients.

Text/ Reference Books

1. A. B. Mathur and V.P. Jaggi; **Advanced Engineering Mathematics**, Khanna Publishers, 2nd edition, 2001.
2. B.S. Grewal; **Higher Engineering Mathematics**, Khanna Publishers, 44th edition, 2017.
3. B. V. Ramana: **Higher Engineering Mathematics,** McGraw Hill Education India, 26th edition 2016.
4. R. K. Jain and S. R. K. Iyengar: **Advanced Engineering Mathematics,** Narosa, 5th Edition, 2018.
5. H. K. Dass; **Advanced Engineering Mathematics**, S. Chand Publishing, 22nd edition, 2018.

BASICS OF CIVIL ENGINEERING
CE-101

L: 2 T: 1 P: 0 Cr: 3

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

1. Determine the engineering properties of the materials and solids.
2. Analyze the internal forces for statistically determinate and compound members.
3. Apply the concept of compound stresses for axial, flexure, shear and torsion.
4. Apply the concept of principal strain and strain tensor for the analysis of different structural members.
5. Apply the concepts of shear force, bending moment, axial force for statically determinate beams.

SYLLABUS

Unit-I :Stresses & Strains:
Introduction, normal stress & strain, shear stress & strain, relationship between stress and strain, Uniaxial tension test: Stress-Strain diagrams for different materials, Mechanical properties of materials: isotropy, homogeneity, continuity, elasticity, brittleness, yielding, plasticity, work hardening, ductility, hardness, toughness, creep, relaxation, fatigue; Uniaxial deformations: Saint Venant's principle, principle of superposition, free body diagrams, bars of uniform cross sections.

Unit-II : Uniaxial Deformations:
Bars of variable cross sections, compound/ composite bars, temperature stresses.

Unit-III : Analysis of Stresses:
Tensor notations, equilibrium equations, transformation of stresses, invariants of stress tensor, plane stress condition, principal stresses, maximum shear stress and their planes, Mohr's circle.

Unit-IV : Analysis of Strains:
Transformation of strains, invariants of stain tensor, plane strain condition, principal strains, maximum shear strain and their planes; Strain Rosettes; Stress –Strain relationship, generalized Hooke's law, relation between elastic constants.

Unit-V : Structures and Their Forms:
Loads, idealization of structures, supports and connections, elastic and linear behaviour of structures, determinate and indeterminate structures, SF & BM: relation between B.M., S.F. and loads, S.F. & B.M. diagrams in statically determinate simply supported (without overhang) and cantilever beams subjected to concentrated loads and UDL

Text Books

1. Engineering Mechanics of Solids By E.P. Popov, Pearson Education.
2. Solid Mechanics by S.M.A. Kazimi, Tata McGRAW HILL.
3. Mechanic of Materials by R.C. Hibbeler, Pearsons Education

Reference Books

1. Mechanics of Materials by Beer & Jonhson, Dewolf, McGRAW HILL.
2. Strength of Materials by S. Timoshenko, CBS Publisher
3. Strength of Materials by R. K. Rajput, S Chand

BASICS OF MECHANICAL ENGINEERING
ME-101

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Understanding various thermodynamic systems, properties and other related concepts
2. Expanding the knowledge of reversible and irreversible cycles
3. Learning the basics of first law and second law equations and related theories with numerical
4. Studying the kinematics of fluid flow
5. Understanding the dynamics of fluid flow

SYLLABUS

UNIT-1 :

Thermodynamics systems, Properties, Thermal equilibrium, Zeroth Law of thermodynamics and concept of temperature. Work, displacement work in various Quasi-state systems, First law of thermodynamics, application to cyclic process, Internal energy, Enthalpy. Pure substance, control volumes, Application of first law to non-cyclic process, Steady Flow energy equation.

UNIT-II :

Reversible and Irreversible process, Second law of thermodynamics, Kelvin-Planck and Clausius statement and their equality. Entropy generation, Entropy balance equation for closed and open systems.

UNIT-III :

First law and second laws equations, Maxwell's relation, Carnot cycle. Definition and properties of fluids, Classification of fluids, Normal and shear stresses in fluids.

UNIT-IV :

Kinematics of fluid flow; Types of flow, flow pattern, Velocity and rotation, acceleration of fluid particle, velocity potential function, Differential equation of conservation of mass.

UNIT-V :

Dynamics of ideal fluids flow; Euler's equation of motion, Bernoulli's equation and its application, Flow measuring device, Venture-meter, orifice-meter and nozzle meter, pilot-static tube, hydraulic co-efficient, Flow through pipes, Major and Minor losses in pipe flow.

Text books:

1. Engineering Thermodynamics by: P. K. Nag, TMH.
2. Fundamental of classical thermodynamics by: Wan- Wylen&sontag, John wiley&sons.
3. Engineering thermodynamics by: Spalding & code.
4. Engineering Mechanics: Statics and Dynamics: by J. L. Meriam and L. G. Kraige, John Wiley & Sons, Inc.
5. Engineering Mechanics: Dynamics: 12th Edition by R. C. Hibbeler, Prentice Hall
6. Engineering Mechanics: by K.L. Kumar, Tata Mc Graw Hill.

BASICS OF ELECTRICAL ENGINEERING
EE-101

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES:

1. To analyse circuit systems using direct application of Kirchoff current and voltage laws along with Ohms law
2. To understand basic concept of "*j*" operator, RLC series circuit, reactive power, true power and apparent power
3. To prepare the students to have basic knowledge of transformers, the equivalent circuit model of single phase transformers, transformer parameters using open circuit and short circuit tests, compute transformer efficiency and voltage regulation
4. Construction and understanding of working principles of DC generators and motors
5. The ability to select a suitable measuring instrument for a given application like PMMC and MI

SYLLABUS

UNIT-I :

Fundamentals of electric circuits, Kirchhoff's laws, mesh analysis, node analysis, delta-star and star-delta conversion, classification of network elements, Thevenin's theorem, Nortan's theorem maximum power transfer theorem, superposition theorem.

UNIT-II :

Single phase AC circuits, average and effective values of sinusoids, solution of R,L,C series circuits, the j operator, complex representation of impedances, phasor diagram, concept of power factor, power factor improvement, power in complex notation, solution of parallel and series-parallel circuits, resonance. Introduction to balance three phase AC circuits.

UNIT-III :

Ampere's circuital law, B-H curve, solution of magnetic circuits, hysteresis and eddy current losses. Relays as an application of magnetic force. Transformers- construction, e.m.f. equation, ratings, phasor diagram for no load and full load, equivalent circuit, regulation and efficiency calculations, open circuit and short circuit tests, Introduction to Auto-Transformer.

UNIT-IV :

Introduction to Electromechanical Energy Conversion, DC motors- construction, e.m.f. and torque equations, characteristics of DC generators and motors, speed control of DC motors. DC motor starter- working principle, ratings. Introduction to three phase induction motor, Introduction to alternator and synchronous motor and their applications.

UNIT-V :

PMMC instruments, shunts and multipliers, multi-meters, moving iron ammeters and voltmeters, dynamometer wattmeter, AC watt-hour meters, extension of instrument ranges.

Text Book:

1. D.C. Kulshrestha, "Basic Electrical Engineering", Tata McGraw Hill.
2. T.K. Nagsarkar&M.S.Sukhija, "Basic Electrical Engineering", Edition 2008, Oxford University Press.

Reference books:

1. V. Del Torro, Electrical Engineering Fundamentals, Second Edition, Prentice Hall of India Pvt. Ltd.
2. E. Hughes, Electrical Technology, English Language Book Society Publication with Longman.
3. H. Cotton, Advanced Electrical Technology, Issae Pitman, London.
4. S.S. Parker, Problems in Electrical Engineering, Asia Publications.
5. I. J. Nagarath, "Basic Electrical Engineering", 2nd Edition, Tata McGraw Hill.

WORKSHOP PRACTICE
ME-151

L: 0 T: 0 P: 4 Cr: 2

COURSE OUTCOMES:

1. To instill fundamentals of materials, properties, various tools and their specifications employed in various shops/trades
2. To understand science and engineering of every task and tool employed in each shop/trade
3. To understand the drawing and specification of various tasks/jobs; plan, operate and acquire tools to make jobs as per specifications
4. Encourage student to use web/computing resources and relate the completed task with real life processes
5. Educate them for safety and security while performing assigned tasks in group of small size, prepare the record of tasks and submit

SYLLABUS

I-FOUNDRY :

Mould cores, core prints, gates runner, risers, chaplets, common defects in casting, defects due to mould, metal pouring, solidification.

II-METAL JOINING :

Oxy acetylene gas welding equipment, types of flame, electric arc and contact welding, electrodes and equipments for AC and DC welding, electrode coating functions and constitutes, common welding defects.

III-METAL CUTTING OPERATION AND TOOLS :

Common metal cutting machine like lathe, milling, shaper, slotter and drill, lathe operations like turning, chamfering, facing, taper turning and knurling, material for lathe tools and other tools, bench grinder and use.

Related Labs :

1. Gas welding: simple joint like joint.
2. Electric Arc Welding: Simple joints like butt joint.
3. Tin Smithy: Mechanical joining, jobs like box, tray, funnel and soldering of joints.
4. Turning: Plane turning, taper turning, threading, knurling, facing and chamfering on the same job.
5. Shaping: Surface finishing at right angles.
6. Milling: Making a slot two or three surface finishing at angles of 1200C.
7. Drilling: Making drilled holes in plates or flats and grinding the corner of a plate to round.

Text books/ Reference books:

1. Elements of Workshop Technology by, Choudhary Vol. 1 & 2. Media promoters and publisher, 1996.
2. Workshop Technology, Vol. 1-3 by W A J Chapman, ELB. S

HUMAN RESOURCE MANAGEMENT
AS-201

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Formative conceptualization of human resource management
2. Understanding human resources
3. Realizing the importance of appraisals and evaluation
4. Learning importance of training and development
5. Analysing the management of job stress and ensuring employee health and well being

SYLLABUS

Unit-1: Foundation's of Human Resource Management of HRM

Meaning, definition, nature, scope, characteristics objectives of HRM Opportunities and challenges HRM functions.

Unit-II: Acquisition of Human Resources

Human Resource Planning (HRP): need, objectives, determinates, HRP models, HRP process; Job Analysis (JA): sources, methods, process, uses, importance; job description, job specification; Recruitment and selection: sources, process, barriers, objectives, objectives of selection, selection tests, interview, induction, placement, employee socialization.

Unit-III: Appraising and evaluating Human Resources

Performance Appraisal (PA) and feedback: approaches, and techniques of PA, process of PA, interview, Job Evaluation (JE): principles, process, methods importance and limitations.

Unit-IV: Development of Human Resources

Human Resource Development (HRD): functions, benefits, importance, barriers Training and Development: models, methods, training process, evaluation and barriers.

Unit-V: Employees Health and Well being

Stress: Nature, Causes and consequences; Management of Stress: Personal and organizational based strategies; Burnout: Nature, symptoms, causes, relationship with stress, management of burnout.

Text Books:

1. Gary Dessler (2015), Human Resource Management, Person Prentice Hall of India, New Delhi
2. VSP Rao, Human Resource Management, Text & Cases (2nd edition), Excel Books, New Delhi

Reference Books:

1. Tapomony Deb, (2009), Managing Human Resource and Industrial Relations (First edition), Excel Books, New Delhi
2. John M. Ivancevich (2005), Human Resource Management 93rd edition) Tata McGraw Hill Publishing Co. Ltd., New Delhi

ENGINEERING PHYSICS – II
AS-202

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Learning to apply relativity in describing physics of motion
2. Appreciation of the importance of lasers and grasp the physical basis
3. Learn the calculation methods of quantum theory
4. Apply quantum ideas to explain behaviour of materials
5. Appreciation of physics conservation laws and be acquainted with new areas

SYLLABUS

UNIT-1 : RELATIVITY

Difficulties of classical theory, Michelson Morley Experiment, Galilean transformations, postulates of special theory of relativity, Lorentz transformations, Einstein velocity addition theorem, time dilation, length contraction, relativistic mass, momentum and energy, natural units.

UNIT-II : LASERS

Principle of laser action, Einstein's transition probabilities, lifetime of transitions, rate equation for atomic transition, He-Ne laser, general characteristics of lasers, applications of lasers.

UNIT-III : QUANTUM THEORY

Schrodinger equation, time dependent and time independent forms, wave function, probabilistic interpretation, one-dimensional problems, particle in a box, elementary treatment of harmonic oscillator.

UNIT-IV: PHYSICS OF MATERIALS

Bose Einstein statistics, Fermi Dirac statistics, intrinsic and extrinsic semi conductors, carrier concentration, energy gap, semiconductor devices, Electrical properties of semiconductors.

UNIT-V: FRONTIERS OF PHYSICS

Basic interactions, symmetry and conservation laws, elementary particles and their classification, last Nobel prize in Physics, its back ground, significance and directions of future development.

Text Books:

1. Halliday, Resnick: Physics
2. Mani, Mehta: Modern Physics
3. Beiser: Modern Physics
4. Silvfast: Lasers

Reference Books:

1. Resnick: Relativity
2. Ghatak: Optics
3. Garcia, Damask: Physics for computer science students

Revised on 05.09.2019

B. Tech. IInd Semester

Engineering Chemistry & Environmental Sciences- AS 203

CO 1- To develop an understanding of water, its quality, properties and treatment in industries.

CO 2- To study and understand about various fuels and renewable & non renewable sources of energy.

CO 3- To understand the chemistry of corrosion, its types and protection from it.

CO 4- To study and understand about the basics of environment and pollution.

CO 5- To develop knowledge and understanding of biotechnology.

ENGINEERING CHEMISTRY & ENVIRONMENTAL SCIENCE – II (AS – 203)

L	T	P
2	1	2/2

UNIT – 1: WATER TREATMENT (Lectures- 8)

Water Quality Parameters (BIS & WHO Standards), types of hardness, Units, Determination of hardness by EDTA method, Alkalinity of water & its significance, Numerical problems, Problems with boiler feed water and its treatment; Scale & Sludge formation, Boiler corrosion, Caustic Embrittlement, Priming & foaming, Softening methods; Lime-soda, Zeolite & Ion Exchange processes, Numerical problems, Chlorination of water, Coagulation, Sedimentation and Desalination.

UNIT – 2: ENERGY RESOURCES (Lectures- 8)

Types of fuels, Calorific values, HCV & LCV and its determinations by Bomb and Boys gas calorimeter, Numerical problems, Coal; Types of coal, Analysis of coal, Liquid Fuel; Refining of petroleum, Knocking, Octane and Cetane Values, Pollution from fossil fuels, Combustion and Problems. Renewable; (Solar Cells, Rechargeable Batteries, Fuel Cells) and Non-renewable Sources of energy; (Wind Energy, Geothermal Energy, Ocean Energy), Resources.

UNIT – 3: CORROSION AND ITS PROTECTION (Lectures- 7)

Corrosion; Definition and its scope, Chemical Corrosion, Electrochemical Corrosion, Mechanism of Chemical and Electrochemical Corrosion, Types of Corrosion; Intergranular Corrosion, Soil Corrosion, Waterline Corrosion, Differential Aeration Corrosion, Galvanic and Concentration Cell Corrosion, Factors affecting corrosion, Protection of corrosion.

UNIT – 4: ENVIRONMENTAL CHEMISTRY (Lectures- 8)

Environment and its Segments, Zones of Atmosphere, Air Pollution: Air pollutants and their resources; Aerosol and its Types, RSPM, SPM, Acid rain, Green House Effect, Global warming, Ozone Layer Depletion, Water Pollution; Sources of water pollution, Sewage Treatment, Determination and Significance of COD, BOD, TOC, Noise Pollution, Soil Pollution, Radioactive Pollution and e-Waste.

UNIT – 5: ENVIRONMENTAL BIOTECHNOLOGY (Lectures- 7)

Biotechnology and its applications, Fermentation, Production of alcohol and vitamins, Biotechnology for environmental Protection, Biological indicators, Biosensors, Bioremediation, Phytoremediation, Bio-pesticides, Bio-fertilizers, Bioreactors, Social issues, Biodiversity and its conservation.

ENGINEERING MATHEMATICS – II (05.09.2019)

AS – 204 **L-3, T-1, P-0, Cr-4**

Course outcomes

6. Tracing of 3D curves, evaluation of multiple integrals by change of order of integration, change of variables.
7. Series solution and applications of partial differential equations.
8. Study of analytical functions, expansion of complex functions, zeros and singularities of functions, theory of residues, evaluation of contour integrals and conformal mappings.
9. Laplace transform and its applications in solving differential and integral equations.
10. Learning of theory and applications of Fuzzy mathematics.

UNIT-I: SOLID GEOMETRY & MULTIPLE INTEGRALS (CO-1)

Formation of equations of cylinder and cone under the given geometrical conditions; Tracing of some quadric (or conicoid) three dimensional surfaces.

Evaluation of multiple integrals by change of order of integration, change of variables i.e. use of Jacobian and applications of multiple integrals in finding plane area, mass, centre of gravity, centre of pressure, moment of inertia, product of inertia, curved surface area and volume.

UNIT-II: SERIES SOLUTION AND APPLICATIONS OF P.D.E. (CO-2)

Ordinary point, regular singular point, series solutions of ordinary differential equations of second order, Frobenius method for the solution of O.D.E. with variable coefficients; Solutions of one-dimensional wave equation, one dimensional heat conduction equation and two-dimensional Laplace (cartesian and polar forms) equation using method of separation of variables.

UNIT-III: COMPLEX ANALYSIS (CO-3)

Analytical function, C-R equations in cartesian and polar forms, geometrical representation of $w = f(z)$; Determination of conjugate harmonic function, Milne – Thomson method and related problems; Evaluation of complex integrals using Cauchy's integral theorem, Cauchy's integral formula for the n^{th} order derivative of an analytic function.

Taylor series, Maclaurin series and Laurent series expansions of functions, conformal mapping, sufficient condition for conformality of $w = f(z)$, some standard transformations; Zeros, singularities and residues of an analytic function; Application of Cauchy's residue theorem in solving contour integrals and evaluation of real definite integrals using residue method.

UNIT-IV: LAPLACE TRANSFORM & ITS APPLICATIONS (CO-4)

Laplace and inverse Laplace transforms of some well-known elementary functions and Special functions, Change of scale property, First and second shifting theorems, Laplace transforms of Derivative, Integral, $t^n f(t)$, $f(t)/t$, Convolution theorem & Periodic function.

Applications of Laplace and inverse Laplace transform in finding the particular solutions of ordinary linear differential equations with constants and variables coefficients, system of differential equations, integral equation, Integro-differential equations, difference equations and, conversion of differential equations into integral equations & vice versa.

UNIT-V: FUZZY MATHEMATICS (CO-5)

Introduction to Fuzzy logic, Fuzzy sets and membership functions, Fuzzy number and Fuzzy arithmetic, operations on Fuzzy sets, Fuzzy relations, Pattern classification based on Fuzzy relations, distance between Fuzzy sets, area perimeter, height, width of fuzzy subsets, and applications of Fuzzy logic.

Text/ Reference Books

6. A. B. Mathur and V.P. Jaggi; **Advanced Engineering Mathematics**, Khanna Publishers, 2nd edition, 2001.
7. B.S. Grewal; **Higher Engineering Mathematics**, Khanna Publishers, 44th edition, 2017.
8. B. V. Ramana: **Higher Engineering Mathematics,** McGraw Hill Education India, 26th edition 2016.
9. R. K. Jain and S. R. K. Iyengar: **Advanced Engineering Mathematics,** Narosa, 5th Edition, 2018.
10. H. K. Dass; **Advanced Engineering Mathematics**, S. Chand Publishing, 22nd edition, 2018.
11. Timothy J. Ross; **Fuzzy Logic with Engineering Applications,** Wiley; 2nd edition, 2004.

BASICS OF ELECTRONICS & COMMUNICATION ENGINEERING

EC– 201

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Studying semiconductor diodes and their various characteristics
2. Expanding the ideas: construction and working of BJTs and introducing JFET
3. Exploring various types of operational amplifiers
4. Understanding the idea of feedback and thus studying various electronic instruments
5. Learning various parameters of communication systems

Syllabus

UNIT – 1: Semiconductor Diodes:

P-N junction diode, V-I characteristics, static and resistance, linear and non-linear applications of diodes; half wave, full wave and bridge rectifiers, zener diode, characteristics and its use as a voltage regulator, AND, OR, NAND, NOR and Ex-OR gates.

UNIT – 2: TRANSISTORS (BJT & JFET):

Bipolar junction transistor (BJT) , biasing and amplifier action, load line analysis of transistor amplifier, BJT amplifier configurations and their comparison using small signal h-parameter model, Junction field Effect transistor (FET), biasing and amplifier action.

UNIT – 3: OPERATIONAL AMPLIFIER:

Op-am- basics, practical op-ampcircuits, inverting and non-inverting amplifier, summing amplifier, integrators and differentiators.

UNIT – 4: FEEDBACK AND ELECTRONIC INSTRUMENTS:

Feedback concept, Barkhausen Criteria of oscillation, Wein Bridge and phase shit oscillator, cathode Ray oscilloscope (CRO), electronics multimeters.

UNIT – 5: COMMUNICATION SYSTEMS:

Introduction to modulation, amplitude modulation generation of AM waves, demodulation of AM wave, introduction to FM.

Text Books:

1. Boylestad & Nashelsky, Electronic Devices and Circuit Theory, 9th Ed, Pearsons
2. Dinesh Prasad, Basic of Analog Electronics, Scitech Publications

Reference Books:

1. Sedra and Smith, Micro Electronic Circuits, 6th Ed, Oxford Press

FUNDAMENTAL OF COMPUTING

CS- 201

L: 2 T: 1 P: 0 Cr: 3

COURSE OUTCOMES

1. Students will able to understand the basics of computer, generation & types of computer, its components and number system
2. Students will able to understand the concept of algorithms, flowchart and c programming language
3. Students will able to develop c programs for string manipulation, sorting and searching techniques
4. Students will able to describe the functions, structure and different types of operating systems
5. Students will able to understand basics of networking, internet and database management systems

Syllabus

UNIT 1: BASICS OF COMPUTERS

Computer fundamentals, Bits and Bytes, CPU, Memory, Types of memory, Input and output devices, I/O devices, Operating system, applications software's, system software. Number system, decimal number system, Binary number system, octal number system, hexadecimal number system. Generation of computer, Classification of computer,

UNIT 2: C PROGRAMMING

Algorithms, flow chart, The C character set, constants, variable, keywords, operator and expressions, decision controls, if and else, conditional operator, for loop, while loop and do-while loop,, switch case, user defined functions, call by value and by reference, array, and single dimensional, 2D matrix, multidimensional arrays

UNIT 3: SEARCHING AND SORTING

Strings, library string functions, pointers and structures, searching and sorting, linear search, binary search, sorting techniques: bubble sort, selection sort

UNIT 4: OPERATING SYSTEM

OS definition, role of OS in computer system, multi programming, time sharing OS, multitasking OS, multiprocessing OS, real time system OS , client server computing, distributed OS, function of OS (user interface, GUI, program execution, I/O management, Resource management,

UNIT 5: NETWORKING & DBMS

Network, communication models, transmission media, connection topologies, LAN, WAN, MAN, ISO-OSI model of networking, Internet, ISP, WWW, Email, URL, Web browsers, websites, intranet,

DBMS, DBMS applications, Advantage of DBMS, Data abstraction.

Books:

1. "Computer Fundamentals & Programming in C", Reema Thareja, Oxford University Press
2. Ashok Kamthane, "Programming with C ".
3. M N Doja, "Introduction to Computers and Information Technology"
4. C Programming by Yaswant Kanetkar

ENGINEERING GRAPHICS
ME-250

L: 0 T: 0 P: 4 Cr: 2

COURSE OUTCOMES

1. Student will able to understand basics of drawing and design of engineering components
2. Student will able to understand scaling of designs
3. Student will able to understand the different view of any object
4. Student will able to understand detail construction of any object
5. Student will able to understand sheet metal work

SYLLABUS

Unit I

ORTHOGRAPHIC PROJECTION: Conversion of pictorial/ isometric views into orthographic views of machine block. Identification of surface in orthographic views. Some practice on auto-Cad package.

Unit II

ISOMETRIC PROJECTION: Isometric scale, isometric projection of solids, missing line and missing views. Isometric view of simple objects when their orthographic views are given. Preparation of isometric views using Auto-Cad package.

Unit III

SECTIONING: Conventional representation in section of engineering materials. Methods of sectioning, sectional views of machine components, brackets, bushed bearing and foot step bearing. Unit IV FASTENERS: Sketches of different types of threads, permanent fasteners (riveted and welded joints), temporary fasteners (nut and bolt assembly, studs, keys. etc.)

Unit V

BUILDING DRAWINGS: Symbols of electrical and sanitary items. Terminology used in building drawing, plan and elevation of 2/3- rooms building using Auto-CAD package, from corrosion, refractories, their manufacturer and properties: neutral, acid and basic refractors; glass its types and manufacture.

Text Books:

1. A.N. Siddiqui, Z.A. Khan and Mukhtar, Engineering Graphics with Primer on Autocad

Reference Books:

1. N.D. Bhutt, Engineering Drawing

INNOVATIVE TECHNOLOGY & BIO-SCIENCE AS-105

L	T	P
2	1	2/2

Course Objectives

- ***CO1***: Understanding the concept of nanotechnology.
- ***CO2***: Learning the application of nanotechnology in multiple disciplines.
- ***CO3***: Understanding the concepts of biological sciences, genetics, biological indicators and biosensors.
- ***CO4***: Exploring the field of advanced biological sciences and biotechnology.
- ***CO5***: Exploring nano-biotechnology and its various application.

Unit-I Introduction to Nanotechnology

Introduction to Nanotechnology, Theoretical Basis of nanotechnology, Quantum confinement and size effect, Classification of Nanomaterials: Nanowires, Quantum Well and Quantum Dots, Properties of Nanomaterials, Carbonaceous Nanomaterials and their examples. Molecular Nanotechnology, Green Nanotechnology.

Unit-II Applications of Nanotechnology

Microelectromechanical Systems (MEMS) & Nanoeletromechanical Systems (NEMS), Nanorobotics, Nano-fluidics, Micro-gears and Nano-gears, Nanocomposites and their applications, Nanomaterials for Civil Engineers, Nano-paints, Light and flexible Civil Engg. structures based on carbon Nanomaterials, Nano-memories. Nano-sensors. Nano-transistors, Introduction to organic electronics.

Unit-III Introduction to Biological Sciences

Introduction to the cell as a unit of life, Principles involved in the maintenance of life processes, Ultra-structure and function of cellular components-Prokaryotic and Eukaryotic cells, cell-wall, plasma membrane, endoplasmic reticulum, Biomolecules- Carbohydrates. Lipids, Amino Acids, Proteins, Nucleic Acids, Tissue Systems. Metabolism, Chromosomes and Cell Division. Basic Genetics-biological indicators, bio-sensors, Mutation-causes, types and effect.

Unit-IV Advanced Biological Sciences

Introduction to microbiology, Industrial microbiology, Introduction to immunology, Introduction to molecular genetics, Structure of RNA aid DNA, Concept of Gene, Gene regulation, Basic concepts of biotechnology: Totipotency and cell manipulation, Classifications of biotechnologies.

Unit-V Nanobiotechnology

Introduction to Nanobiotechnology, Nanobiotechnology in medicine: regenerative medicine, Targeted drug delivery. Nanotechnology in pharmacy, Nanobiotechnology in Ayurveda, Alternative medicines. Nanobiotechnology in Agricultural, Industrial Nanobiotechnology, Nanoimaging, Cancer treatment using Nanotechnology.

Reference Books-

Introduction to Nanotechnology – by Risal Singh and Shipra Mital Gupta
Nanotechnology- An Introduction – by Ramsden
Introduction to Nanotechnology – by Charles P Poole Jr, Frank J Owens
Nanostructure & Nanomaterials- Synthesis, properties & Applications – by Guozhong Cao