DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Instructions

With Effect from academic year

2018-2019

UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)

OSMANIA UNIVERSITY HYDERABAD-

500 007, TELANGANA

UNIVERSITY COLLEGE OF ENGINEERING, OSMANIA UNIVERSITY

VISION OF THE INSTITUTE

The Vision of the Institute is to generate and disseminate knowledge through a harmonious blending of Science, Engineering and Technology. To serve the society by developing a modern technology in students' heightened intellectual, cultural, ethical and humane sensitivities, fostering a scientific temper and promoting professional and technological expertise.

MISSION OF THE INSTITUTE

- To achieve excellence in Teaching and Research.
- To generate, disseminate and preserve knowledge.
- To enable empowerment through knowledge and information.
- Advancement of knowledge in Engineering, Science and Technology.
- Promote learning in free thinking and innovative environment.
- Cultivate skills, attitudes to promote knowledge creation.
- Rendering socially relevant technical services for the community.
- To impart new skills of technology development.
- To inculcate entrepreneurial talents and technology appreciation programmes.
- Technology transfer and incubation.

DEPARTMENT OF MECHANICAL ENGINEERING

VISION OF THE DEPARTMENT

To generate and disseminate knowledge in Mechanical Engineering and nurture professional, technical and scientific temper for serving the needs of the industry, research organizations and society.

MISSION OF THE DEPARTMENT

- Create technically competent mechanical engineers to suit the changing needs of global industry and society.
- To cultivate skills, attitudes to promote knowledge creation and technology development.
- Interact with prominent educational institutions and R&D organizations for enhancing teaching, research and consultancy services.

DEPARTMENT OF MECHANICAL ENGINEERING

B.E (Mechanical Engineering)

PROGRAM EDUCATIONAL OBJECTIVES

PEO 1	To provide the requisite fundamentals of varied subjects related to Mechanical Engineering to conceive, plan, model, design, construct, maintain and improve systems to enhance human comfort.
PEO 2	To provide knowledge of experimental, computational, analytical, simulation tools and techniques require to address the challenges in Mechanical Engineering and other allied fields.
PEO 3	To provide knowledge to apply Mechanical Engineering Fundamentals to design and implement cost effective systems in manufacturing.
PEO 4	To provide effective communication skills, creative methods, ethics and continuous learning techniques to fulfill their professional requirements and societal needs.

PROGRAM ARTICULATION MATRIX

S.No.	PEO Statement	M1	M2	M3
PEO 1	To provide the requisite fundamentals of varied subjects related to Mechanical Engineering to conceive, plan, model, design, construct, maintain and improve systems to enhance human comfort.	3	3	3
PEO 2	To provide knowledge of experimental, computational, analytical, simulation tools and techniques require to address the challenges in Mechanical Engineering and other allied fields.	3	3	3
PEO 3	To provide knowledge to apply Mechanical Engineering Fundamentals to design and implement cost effective systems in manufacturing.	3	3	3
PEO 4	To provide effective communication skills, creative methods, ethics and continuous learning techniques to fulfill their professional requirements and societal needs.	2	2	2

PROGRAM OUTCOMES (POs):

At the end of the program, the student will be able to:

POs	
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an mechanical engineering to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems related to mechanical engineering and allied fields reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**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.
PO4	**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.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**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 Mechanical engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the Mechanical engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the mechanical engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the mechanical 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.
PO12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
Program Specific Outcomes	
PS01	Apply the principles of collaborative and multi disciplinary approach for solving problems
PS02	Able to interact with industry and R&D institutions leading to start-ups/ budding entrepreneurs.

SCHEME OF INSTRUCTION & EXAMINATION
B.E I Semester (Mechanical Engineering)

S. No.	Code	Name of the Course	No of Hours				Scheme of Examination		Credits
			L	T	P	Contact Hrs/wk	CIE	SEE	
1	MT101BS	Engineering Mathematics -I	3	1	-	4	30	70	4
2	PH101BS	Engineering Physics	3	1	-	4	30	70	4
3.	CH103 MC	Environmental Sciences	2	-	-	2	30	70	-
PRACTICALS									
4.	PH151BS	Engineering Physics Lab	-	-	3	3	25	50	1.5
5.	ME 151ES	Workshop Practice	-	-	6	6	25	50	3
6.	ME 152 ES	Engineering Drawing	-	-	6	6	25	50	3
		Total	8	2	15	25	165	360	15.5

SCHEME OF INSTRUCTION & EXAMINATION
B.E II Semester (Mechanical Engineering)

S. No.	Code	Name of the Course	No of Hours				Scheme of Examination		Credits
			L	T	P	Contact Hrs/wk	CIE	SEE	
1.	MT 201 BS	Engineering Mathematics -II	3	1	-	4	30	70	4
2.	CH 102 BS	Engineering Chemistry	3	1	-	4	30	70	4
3.	EG 101 HS	English	2	-	-	2	30	70	2
4.	CS 201 ES	Programming for Problem Solving	3	1	-	4	30	70	4
5.	EE 101 ES	Basic Electrical Engineering	3	1	-	4	30	70	4
6.	HS 201 MC	Essence of Indian Traditional Knowledge	2	-	-	2	30	70	-
PRACTICALS									
7.	CH 152 BS	Engineering Chemistry Lab	-	-	3	3	25	50	1.5
8.	EG 151 HS	English Lab	-	-	2	2	25	50	1
9.	CS 251 ES	Programming for Problem Solving Lab	-	-	4	4	25	50	2
10.	EE 151 ES	Basic Electrical Engineering Lab	-	-	2	2	25	50	1
		Total	16	4	11	31	280	620	23.5

MT101BS

ENGINEERING MATHEMATICS -I

Credits: 4

Instructions: (3L +1T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE: 70 Marks*

Course Objectives:

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

Course Outcomes: After completing this course, the students will able to

- Find the nature of sequences and series
- Sketch the graphs of given curves
- Use the knowledge of multiple integrals in finding the area and volume of any region bounded by given curves
- Apply this knowledge to solve the curriculum problems

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2			3			1							
CO2	2			3			1							
CO3	2			3			1							
CO4	2			3			1							

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 Text/Reference Books:

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.

PH101BS

ENGINEERING PHYSICS

Credits: 4

Instructions: (3L +1T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE:70 Marks*

Course Objectives:

- To make student understand the basic concepts of waves and oscillations.
- To understand the different types of crystals and the analysis of crystal parameters to investigate crystal structures. To classify the type of the defect present in the crystal.
- To make student understand the formation of energy bands and classification of the solids based on the band theory. To understand the concept of semiconductors, ultrasonics and its wide applications.
- To study different types of dielectric polarizations and dielectric properties of materials. To know the significance of Maxwell's equations in engineering applications.
- To make student understand the basic concepts of superconductivity and nanomaterials.

Course Outcomes:

At the end of this course, the student will be able to:

- Student recognize the correct number of significant figures in a measurement or in the results of a computation.
- Students can use a best fit to create a graph from a series of data points. Students can extrapolate and interpolate.
- Students will keep a lab notebook that documents their experience in each lab procedure.
- Develop skills to impart practical knowledge in real time solution and learn to design new instruments with practical knowledge.

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

Unit-I Waves and Oscillations:

Simple harmonic oscillators - Complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – Heavy, critical and light damping - Energy decay in a damped harmonic oscillator - Quality factor - Forced oscillators – Impeadance - Steady state motion of forced damped harmonic oscillator - Power absorbed by oscillator

Unit- II Crystallography:

Introduction – Types of crystal systems - Bravais lattices – Lattice planes and Miller Indices (Cubic system) – Inter planar spacing (Cubic system) - Bragg's law - Powder diffraction method.

Crystal defects: Classification of point defects - Concentration of Schottky defects in metals and ionic crystals - Concentration of Frankel defects – Line defects – Screw and Edge dislocations – Burger's vector.

Unit- III *Band Theory of Solids & Semiconductors:*

Classical free electron theory (qualitative) –Kronig-Penney model (qualitative treatment) - Energy band formation in solids - 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.

***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-IV *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.

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-V 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.

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.
2. M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co.
3. C. Kittel - Introduction to Solid State Physics, Wiley Eastern Ltd.
4. A.K Bhandhopadhya - Nano Materials, New Age International.
5. C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International.

CH103MC

ENVIRONMENTAL SCIENCE

Credits: NIL

Instructions: (2L) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE: 70 Marks*

Course Objectives:

- To know about natural resources and their benefits to the public
- To study the concept of ecosystems and biodiversity
- To understand the types of pollutions, social issues and disaster management

Course Outcomes:

- *W*ill have an awareness of effects of hazardous environment.
- Will have an idea about optimum utilization of natural resources.
- Will be a catalyst in moving towards Green technologies
- Will have information about rules and regulations of pollution control
- Will be able to address social issues related to environment and will be better equipped at disaster management

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	1		1	2		1			1	1	1
CO2	2	2	2	1	1	1	2					1	1	1
CO3	2	2	2	2	2	1	1		1			1	1	
CO4	2			1	1	1	1		1			1	1	
CO5	2	1		1	1	1	1		1			1	1	

Unit-I

Environmental studies: Definition, scope and importance, need for public awareness. Natural resources: Water resources; use and over utilization of surface and ground water, Floods, drought, conflicts over water, dams-benefits and problems. Effects of modern Agriculture, Fertilizer-pesticide problems, water logging and salinity.

Unit-II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem (ponds, streams, lakes, rivers, oceans, estuaries) Energy resources: Growing energy needs renewable and non-renewable energy sources. Land Resources, land as a resource, land degradation, soil erosion and desertification.

Unit-III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

Unit-IV

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, soil pollution, noise pollution , thermal pollution and solid waste management. Environmental protection act: Air, water, forest and wild life Acts, enforcement of Environmental legislation

Unit-V

Social issues and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion. Disaster management: Types of disasters, impact of disasters on environment, infrastructure, and

development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Suggested Text/Reference Books:

1. De A.K., "Environmental Chemistry", Wiley Eastern Ltd.,
2. Odum E.P., "Fundamentals of Ecology", W.B. Sunders Co., USA.
3. Rao M.N and Datta A.K., "Waste Water Treatment", Oxford and IBK Publications.
4. Benny Joseph, "Environmental studies", Tata McGraw Hill, 2005
5. Sharma V.K., "Disaster Management", National Centre for Disaster management, IIPE, Delhi,1999.

PH151BS

ENGINEERING PHYSICS LAB

Credits: 1.5

Instructions: (3T) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

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

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

List of Experiments:

1. To determine the Dielectric constant and Phase transition temperature of Lead Zirconium Titanate (PZT).
2. Determination of Velocity of ultrasonic waves in a liquid by Debye-Sears method.
3. To draw the I-V Characteristics of P-N Junction diode and to evaluate the value of potential barrier of the diode.
4. To find the values of Electrical conductivity and energy gap of Ge crystal by Four probe method.
5. Determination of rigidity of modulus of Torsion pendulum.
6. Determination of Logarithmic decrement of a Torsional pendulum.
7. Determination of carrier concentration, Mobility and Hall Coefficient of Ge Crystal using Hall Effect Experiment.
8. To determine the constants of A, B and α using Thermistor characteristics.

ME 151ES

WORKSHOP PRACTICE

Credits: 3

Instructions: (6P) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

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 successful completion of this course, the student shall be able to

- Study and practice on tools and their operations of different trades.
- Practice on manufacturing of components using workshop trades including carpentry, fitting, foundry, smithy, sheet metal & welding
- Select suitable tools for machining process including facing, turning & knurling
- Attain basic electrical knowledge for house wiring practice

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3				1	1		1	1	
CO2	3				3				1	1		1	1	
CO3	3				3				1	1		1	1	
CO4	3				3				1	1		1	1	

LIST OF EXPERIMENTS:

1. **Carpentry shop**
   - Making of Cross lap joint with Wood
   - Making of End Lap/ Tee Lap Joint with wood
2. **Fitting shop**
   - Making of Step cut with Mild Steel flat
   - Making of semicircular and V- cut with Mild Steel flat
3. **Sheet metal shop**
   - Making of Funnel with GI Sheet
   - Making of Rectangular box with GI Sheet
4. **House wiring**
   - Making of Cleat wiring
   - Making of casing wiring
5. **Welding shop**
   - Making of Butt joint using Arc Welding
   - Making of Lap Joint using Arc Welding
6. **Machine shop**
   - Making of Step turning on MS cylindrical rod
   - Making of Taper turning on MS cylindrical rod
7. **Foundry shop**
   - Preparation of casting using single piece pattern
   - Preparation of casting using core pattern
8. **Smithy shop**
   - Forging of square shape peg from cylindrical work piece
   - Forging of squareshape L- bend pegfrom cylindrical work piece

ME 151ES

Suggested Text/Reference Books:

(i) 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.

ME152ES

ENGINEERING DRAWING

Credits: 3

Instructions: (6P) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

Course Objectives:

- To prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare you to communicate effectively
- To prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Course Outcomes:

- Understand the concept of projection and acquire visualization skills, projection of points
- Draw orthographic projections of lines, planes and solids.
- Draw sections of solids including cylinders, cones, prisms and pyramids.
- Draw projections of lines, planes, solids, isometric projections and sections of solids including cylinders, cones, prisms and pyramids using AutoCAD

CO NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS O1	PS O2
CO1	3	3	1	3	1					1		1		
CO2	3	3	1	3	1					1		1		
CO3	3	3	1	3	1					1		1		
CO4	3	2	1	3	3					1		1		

Detailed contents

Traditional Engineering Graphics:

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Perspective; Reading a Drawing; Sectional Views; Dimensioning & Tolerances; True Length, Angle; intersection, Shortest Distance.

Computer Graphics:

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modelling; Solid Modelling; Introduction to Building Information Modelling (BIM)

Unit I: ***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; Scales – Plain, Diagonal and Vernier Scales.

Orthographic Projections Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Unit II: ***Projections of Regular Solids***

Those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale.

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; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

Isometric Projections Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions

Unit III: ***Overview of Computer Graphics***

listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids.

Customisation & CAD Drawing

Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, 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 IV: ***Annotations, layering & other functions***

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non- parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling;

Unit V: ***Demonstration of a simple team design project***

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modeling software for creating associative models at the component and assemblylevels.

Suggested Text/Reference Books:

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 (Corresponding set of) CAD Software Theory and User Manuals

MT201BS

ENGINEERING MATHEMATICS-II

Credits: 4

Instructions: (3L+ 1T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE:70 Marks*

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

- Solve system of linear equations and eigenvalue problems
- Solve certain first order and higher order differential equations
- Find the series solutions of certain differential equations
- Apply this knowledge to solve the curriculum problems

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2			3			1							
CO2	2			3			1							
CO3	2			3			1							
CO4	2			3			1							

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 eigenvalues , 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 Reading:

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, 17th Edition 2014.
5. James Brown, R.V Churchill, Complex Variables and applications, Mc GrawHill 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.

CH102BS

ENGINEERING CHEMISTRY

Credits: 4

Instructions: (3L+ 1T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE:70 Marks*

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 Nanomaterials

Course Outcomes: The course will enable the student to:

- Attains knowledge about the disadvantages of hard water for domestic and industrial purposes learn the technology of water softening methods
- Analyse microscopic chemistry in terms of atomic ,molecular orbital's and inter molecular forces.
- Rationalize bulk properties and processes using thermodynamic considerations
- Gain knowledge in causes of corrosion and its prevention.
- Distinguish the ranges of electromagnetic spectrum used for various spectroscopic techniques. Acquire the knowledge of engineering applications of polymers

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

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 sludges formation-causes, effects and prevention.Numerical problems.

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

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. Electroplating.

Unit II: Thermodynamics and Electrochemistry:

Thermodynamics: Definition of thermodynamic functions- Enthalpy, Entropy , Free energy and their significance. Entropy and Free energy change for isothermal process. 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.Numerical problems.

Electrochemistry: Electrochemical cells- Electrolytic and Galvanic cells.Cell 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. Numerical problems.

Principle and applications of Conductometric and 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-salient features, Crystal Field Splitting of d-orbitals of transition metal complexes in Octahedral, Tetrahedral and Square planar geometries. Magnetic properties ofcomplexes.

Spetroscopy:

Principles and selection rules of Vibrational , Rotational and Electronic Spectroscopy and their applications. Atomic Absorption Spectroscopy and its applications.

Unit IV: Engineering materials:

Lubricants: Introduction, functions and mechanism of lubrication. Hydrodynamic, Boundary and Extreme pressure lubrication. Classification of lubricants-solid, semi-solid and liquid lubricants. Properties of lubricants: viscosity, viscosity index, saponification number and acid value.

Composites: Introduction, constituents and characteristics of composites. Types of composites-reinforced, Particulate and Layered composites. Advantages and applications of Composites.

Unit V: Energy Sources

Fuels: Introduction. Classification and advantages, disadvantages of solid, liquid and gaseous fuels. Requirements of a good fuel.Biofuels- Biodiesel.

Combustion: Calorific value of the fuel-Lower calorific value (LCV), Higher calorific value(HCV).Theoretical calculations of calorific value by Dulongs formula-Numerical problems.

Solid Fuels: Coal-Proximate and Ultimate analysis and its significance.

Liquid Fuels: Source-Fractional distillation of petroleum, important fractions and their uses. Knocking,fuel rating-Octane and Cetane numbers.

Gaseous Fuels: LPG, CNG composition and uses.

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 fuel cells.

Suggested Text/Reference Books:

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

EG101HS

ENGLISH

Credits: 2

Instructions: (2T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE:70 Marks*

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

- Communicate clearly, accurately and appropriately
- 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, expressions

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1			1	3		1		
CO2						1		2	1	3		1		
CO3								2	2	3		3		
CO4								3	3	3		3		1
CO5						1		3	2	3		3		1

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, Nonverbal 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; Idiomatic usage: 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. Meenakshi Raman and Sangeeta Sharma. Technical Communication: Principles and Practice. OUP, 2011.

CS201ES

PROGRAMMING FOR PROBLEM SOLVING

Credits: 4

Instructions: (3L+1T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE:70 Marks*

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:

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

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

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

For online practice problems : https://projecteuler.net

EE101ES

BASIC ELECTRICAL ENGINEERING

Credits: 4

Instructions: (3L+1T) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE:70 Marks*

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 :

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

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	1	1							1	1
CO2	2	3	2	2	2	1							1	1
CO3	2	2	2	2	2	1							1	1
CO4	2	3	2	2	2	1							1	1
CO5	2	3	2	2	2	1							1	1

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 McGraw Hill, Publications,2009
4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.

HS 201MC

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE

Credits: NIL

Instructions: (2P) hrs per week *Duration of SEE: 3hours*
CIE: 30 Marks *SEE: 70 Marks*

Course Objectives:

- The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

Course Outcomes:

- Ability to understand , connect up and explain basics of Indian Traditional knowledge modern scientific perspective.
- To explain holistic life style of yoga science
- Understand basic structure of Indian knowledge system

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		2		1		2		
CO2						3				1		2		
CO3						2		2		1		2		

Course Content

Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाइग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

- Modern Science and Indian Knowledge System
- Yoga and Holistic Health care
- Case Studies.

Suggested Text/Reference Books

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma (English translation), Shodashang Hridayam

CH152BS

ENGINEERING CHEMISTRY LAB

Credits: 1.5

Instructions: (3P) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

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 CH3COOH by conductometric technique

Course Outcomes: 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:

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

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

Water analysis:

1) Determination of total hardness of water by EDTA method

2) Determination of Chloride content ofwater

Conductance measurements:

3) Determination of cell constant.

4) Estimation of HCl and CH_3COOH by conductometric titration

Potentiometric measurements:

5). Estimation of HCl by potentiometrictitration.

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-Clockreaction.

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 CuSO4.

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)

EG151HS

ENGLISH LAB

Credits: 1

Instructions: (2P) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

Course Objectives:

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

Course Outcomes: The student will be able

- to 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, expressions

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1			1	3		1		
CO2						1		2	1	3		1		
CO3								2	2	3		1		
CO4								3	3	3		1		1
CO5						1		3	2	3		1		1

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.

CS251ES

PROGRAMMING FOR PROBLEM SOLVING LAB

Credits: 2

Instructions: (4P) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

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 :

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

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

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 .

EE151ES

BASIC ELECTRICAL ENGINEERING LAB

Credits: 1

Instructions: (2P) hrs per week *Duration of SEE: 3hours*
CIE: 25 Marks *SEE: 50 Marks*

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.

SNO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2	1			2	1	1			
CO2	1				2	1			2	1	1			
CO3	1				2	1			2	1	1			
CO4	1				2	1			2	1	1			
CO5	1				2	1			2	1	1			

1st 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

2nd 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 McGraw Hill, Publications,2009
4. Hughes, "Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc.,1995.
5.