DEPARTMENT OF MECHANICAL ENGINEERING

Scheme of Instructions

With Effect from academic year

2015-2016

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
BE I Semester (Common to all branches (Except for Mechanical))
With effect from the Academic year 2015-2016

SEMESTER – I

S. No	Course Code	Course Title	Scheme of Examination		L	T	Dr	P	Hrs/ Wk	Credits
			CIE	SEE						
1.	BS 101 MT	Engineering Mathematics I	30	70	3	1		0	4	3
2.	BS 102 PH	Engineering Physics I	30	70	3	0		0	3	3
3.	BS 103 CH	Engineering Chemistry I	30	70	3	0		0	3	3
4.	ES 105 CE	Engineering Mechanics I	30	70	3	0		0	3	3
5.	ES 106CS	Computer Programming and Problem Solving	30	70	3	0		0	3	3
6.	MC 107EG	Engineering English	30	70	3	0		0	3	1
		Practicals								
7.	ES 156 CE	Engineering Graphics- I	50	50	0	0	2x2	-	4	2
8.	BS 151 PH	Engineering Physics Lab I	25	50	0	0		2	2	1
9.	BS 152 CH	Engineering Chemistry Lab I	25	50	0	0		2	2	1
10.	ES 153 CS	Computer Programming Lab	25	50	0	0		2	2	1
11.	ES 154 ME	Engineering Workshop	25	50	0	0		2	2	1
12.	MC155EG	Engineering English Lab	25	50	0	0		2	2	1
Total			**355**	**720**	**18**	**1**	**4**	**10**	**33**	**23**

SCHEME OF INSTRUCTION
BE I Semester (Mechanical)
With effect from the Academic year 2015-2016

SEMESTER – I

S. No	Course Code	Course Title	Scheme of Examination		L	T	Dr	P	Hrs/ Wk	Credits
			CIE	SEE						
1.	BS 101 MT	Engineering Mathematics I	30	70	3	1		0	4	3
2.	BS 102 PH	Engineering Physics I	30	70	3	0		0	3	3
3.	BS 103 CH	Engineering Chemistry I	30	70	3	0		0	3	3
4.	ES 105 CE	Engineering Mechanics I	30	70	3	0		0	3	3
5.	ES 106CS	Computer Programming and Problem Solving	30	70	3	0		0	3	3
6.	MC 107EG	Engineering English	30	70	3	0		0	3	1
		Practicals								
7.	ES 156 CE	Engineering Drawing - I	50	50	0	0	2x2	-	4	2
8.	BS 151 PH	Engineering Physics Lab I	25	50	0	0		2	2	1
9.	BS 152 CH	Engineering Chemistry Lab I	25	50	0	0		2	2	1
10.	ES 153 CS	Computer Programming Lab	25	50	0	0		2	2	1
11.	ES 154 ME	Engineering Workshop	25	50	0	0		2	2	1
12.	MC155EG	Engineering English Lab	25	50	0	0		2	2	1
Total			**355**	**720**	**18**	**1**	**4**	**10**	**33**	**23**

BS 101 MT

MATHEMATICS – I

(Common to all branches)

Instruction	: 4 Hours / week (3 Theory + 1 Tutorial)
Duration of SEE	: 3 hours
SEE	: 70 Marks.
CIE	: 30 Marks.
Credits	3

Objectives:

- To introduce the concepts of sequences, series and their properties
- To provide the knowledge of curve sketching
- To introduce the concepts of functions of several variables and multiple integrals
- To study vector differential and integral calculus

OUTCOMES:

- find the nature of sequences and series
- Expand functions as a Fourier Series.
- 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

	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							
CO5														

UNIT I

Sequences and Series:

Sequences, Series, General properties of series, Series of positive terms, Comparison tests, D'Alembert's ratio test, Raabe's test, Cauchy's root test, Alternating series, Series of positive and negative terms, Absolute convergence and Conditional convergence.

UNIT – II

Differential Calculus:

Rolle's theorem, Lagrange's and Cauchy's mean value theorems, Taylor's series, Curvature, Circle of curvature, Radius of curvature, Center of circle of curvature, Envelope of a family of curves, Asymptotes to a curve, Curve sketching.

UNIT – III

Functions of Several Real Variables:

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

UNIT – IV

Multiple integrals:

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 proof).

Suggested Reading:

1. R.K.Jain & S.R.K Iyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition 2014.
2. B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition, 2014.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9th Edition, , 2012.
4. G.B.Thomas , Maurice Weir and Joel Hass, Thomas' Calculus , Peterson, 12th Edition,2010.

With effect from the Academic Year 2015 – 2016

BS 102 PH

ENGINEERING PHYSICS-I

(Common to All Branches**(**Except for Mechanical**)**)

Instructions	3 Hours/week
Duration of University Examination	3 Hours
University Examination	70 Marks
Sessional	30 Marks
Credits	3

OBJECTIVES: The objective of the course is to acquire the knowledge on basic concepts in Physical Optics, Lasers, Fibre Optics, Wave mechanics, Statistical mechanics and Electromagnetic theory. It is also aimed at understanding various phenomena that are present in the course content and their applications in Engineering and Technology.

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.

	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 (8 periods)

Interference: Coherent and non-coherent sources - Division of amplitude and division of wave front - Interference in thin films (reflected light) - Newton's rings - Fresnel's biprism
Diffraction: Distinction between Fresnel and Fraunhoffer diffraction - Diffraction at a single slit - Double slit diffraction - Diffraction grating (N-slits)

UNIT - II (9 Periods)

Polarization: Introduction - Malus's law - Double refraction - Nicol's prism - Quarter wave and half wave plates - Optical activity - Laurent's half shade polarimeter
Lasers: Characteristics of lasers - Spontaneous and stimulated emission of radiation - Einstein's coefficients - Population inversion - Ruby laser - Helium-Neon laser – Semiconductor laser – Applications of lasers.
Basic principles of holography – Construction and reconstruction of image on hologram –

Applications of holography

UNIT- III (9 periods)

Fibre Optics: Introduction – Propagation of light through an optical fiber - Critical angle - Acceptance angle - Numerical aperture (NA)– Types of optical fibers and refractive index profiles – Fibre drawing process (double crucible method)- Application of optical fiber 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 (7 Periods)

Elements of Statistical Mechanics: Introduction – Ensembles – Phase space - Probability – Thermodynamical probability – Boltzmann's theorem on entropy and probability – Maxwell-Boltzmann statistics - Bose-Einstein statistics - Fermi-Dirac statistics – Photon gas - Planck's law of black body radiation distribution – Wien's law and Rayleigh Jeans law.

UNIT-V (9 Periods)

Wave mechanics: Debroglie concept of matter waves – Debroglie wavelength – Physical significance and properties of wave function - Schrödinger time dependent and time independent wave equations - Particle in an Infinite Square well potential (Particle in a box). Electromagnetic theory: Review of steady and varying fields - Conduction and displacement current - Maxwell's equations in integral and differential forms - Electromagnetic waves: Plane wave – Poynting theorem.

Suggested reading :

1) Resnick, Halliday and Krane – Physics Volume 2, 5th Edition, Wiley-India (P) Ltd. (2007).
2) M.S. Avadhanulu and P.G. Kshirasagar – Engg. Physics, S. Chand & Co., 9th Ed. (2010).
3) R. Murugeshan and K. Sivaprasath – Modern Physics, S. Chand & Co.,13th Ed. (2007).
4) R.K. Gaur and S.L. Gupta – Engg. Physics, Dhanpat Rai Publications, 8th Ed. (2001).
5) B.K. Pandey and S. Chaturvedi, *Engineering Physics,* Cenage Learning India (P) Ltd., 2012.

With effect from the Academic Year 2015 – 2016

BS 103 CH

ENGINEERING CHEMISTRY - I

(Common to All Branches)

Instruction	: 3 Hours/week
Duration of University Examination	: 3 Hours
University Examination	: 70 Marks
Sessional	: 30 Marks
Credits	3

Objectives:

- To acquaint a knowledge in thermodynamic principles and their applications
- To explore water softening methods and domestic water treatment
- To study the classification, preparation, properties and uses of polymers.

Course Outcomes:

- Attains knowledge about the disadvantages of hard water for domestic and industrial purposes learn the technology of water softening methods
- Analyze 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	2	2	2	-	2	2	1							
CO2	1	1	-	2	2	2	-							
CO3	3	-	2	-	2	2	1							
CO4	2	2	2	1	1	-	2							
CO5	2	2	1	-	2	1	2							

Unit–I:<u>THERMODYNAMICS</u>:Definitionof the terms-system and surroundings. Types of thermodynamic systems and processes. State and path function. Extensive and Intensive properties. The concept of reversible and irreversible processes. Work done in isothermal and adiabaticreversible and irreversible processes. First law of thermodynamics and itslimitations.

Need for Second law and its statement. Spontaneous and non-spontaneous processes. The Carnot cycle, efficiency of reversible heat engine. Carnot theorem. Concept of entropy – entropy changes in reversible and irreversible processes. Physical significance of entropy. Gibbs and Helmholtz free energy and their significance. Variation of free energy with temperature and pressure.Criteria for spontaneity of a process in terms of entropy and free energy.Numerical problems.

Unit–II: PHASE RULE: Definition of terms phase, component and degrees of freedom. Statement of Phase rule. Phase rule equation and its application to one component system - water system. Condensed phase rule and two components system - Pb-Ag system. Pattinson's process of desilverization of lead. Copper –Nickel(Cu-Ni) system.Safety fuses and Solders.

Unit–III:WATER CHEMISTRY: Hardness of water – Types-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-scale and sludge formation-causes, effects and prevention. Priming and foaming. Specifications of potable water. Water treatment for drinking purpose-coagulation, sedimentation, filtration, sterilization by a) Chlorination b) Ozonolysis. Concept of break point chlorination. Numerical problems.

Unit–IV:POLYMER CHEMISTRY: Definition of the terms-monomer, polymer, homo, co, homo-chain, hetero-chain and graft Co-polymers. Classification - natural and synthetic polymers, Addition and condensation polymers, thermo-plastic and thermosetting polymers, plastics, elastomers and fibers.

Preparation, properties and engineering applications of the following polymers:

a) **Plastics:**PVC and Bakelite
b) **Fibers**: polyesters and polyamides- Nylon-6,6 and Kevlar
c) **Elastomers**: Natural rubber and its chemical structure, vulcanization of rubber and its significance. Buna-S and Butyl rubbers.

Conducting polymers-Introduction, mechanism of conduction in polymers. Intrinsic conducting polymers: Poly-acetylene and poly-aniline. Applications of conducting polymers.

Unit–V:ENGINEERING MATERIALS:-I:Lubricants: Definition, 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.

Refractories: Definition –classification- Requirements of a good refractory material. Properties of Refractories: i) Refractoriness ii) Refractoriness under Load (RUL) iii) Porosity iv) Thermal Spalling.

Clay Products: Whitewares-manufacture, purpose and method of glazing.

Suggested Reading:

1. Principles of Physical Chemistryby Puri, Sharma and Pathania Vishal Publishing Co., Jhalandar, 44th Edn (2011)
2. Engineering Chemistry by P.C Jain & Monica Jain, , Dhanapathi Rai publishing Co. (2008)
3. Text book of Engineering Chemistry by Shashi Chawla, Dhanapathi Rai publishing Co. (2008)
4. Engineering ChemistryC. Parameshwara Murthy, CV Agarwal, Andra Naidu-, BS Publcations
5. Engineering Chemistry by O.G. Palanna, TMH edn. New Delhi

ES 156 CE

ENGINEERING GRAPHICS-I

(Common to all Branches)

Instruction	: 4 Hours/week
Duration of University Examination	: 3 Hours
University Examination	: 50 Marks
Sessional	: 50 Marks
Credits	2

Course Objectives:

- To learn the engineering graphics through AutoCAD
- To evaluate the language of the drawing for-geometric constructions and to understand the engineering perspective of drawings.
- To understand projection of points and lines using 2-Dimensional drawing tools
- To learn the section of solids or object from various views / angles etc.,

Course Outcomes:

- Develop the surfaces of geometrical solids and intersection of surfaces
- Construct isometric scale, isometric projections and views.
- Interpret Orthographic, Isometric and Perspective views of objects.
- Create and visualise 3-D solid computer model
- Create simple 3-D Assemblies of computer models.

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	3	1					1		1		
CO2	3	3	1	3	1					1		1		
CO3	3	2	1	3	3					1		1		1
CO4	3	2	1	3	3					1		1		1

UNIT-I

Introduction to Engineering drawing: Size of Drawing Sheet, Drawing sheet format, Types of lines, lettering, types of dimensioning, Title Block, Engineering Scales. Free hand sketches: Sketch straight line, circles, arcs, and fillet.

Introduction to AutoCAD: Initial setup commands, utility commands, function keys, entity draw commands, display commands, edit commands, setting limits of sheet size, dimensioning and dimension style, Tile Block.

UNIT-II

Engineering curves: Conic sections, Cycloids, Involutes.

Projections: Elements of projections, multi view projections, principal plane of projections, Methods of projections, first angle and third angle projection methods.

Orthographic projections: Concept of quadrant, projection of point, projection of a line inclined to one plane and parallel to other plane, line inclined to both the planes, lines parallel to profile plane, Traces of line.

UNIT-III

Projection of Planes: Introduction, Types of planes, Traces of a planes, Projection of a planes parallel to one reference planes, projections of planes inclined to one reference planes and perpendicular to the other, projections of oblique planes.

Auxiliary projections: Types of auxiliary projection planes, Single and double auxiliary views.

UNIT-IV

Projection of Solids: Introduction, Types of solids, Projection of solids in simple positions, Projections of solids axes inclined to one of the reference planes and parallel to the other, Axis inclined to the V.P. and parallel to the H.P. , Axis inclined to the H.P. and parallel to the H.P. and parallel to the V.P., Transfer of point from one view to other.

UNIT-V

Sections of Solids: Introduction- Section planes, Sections, True shape of a section, Sections of Prisms, Sections of Pyramids, Sections of Cylinders, Sections of Cones and Sections of Spheres.

Suggested Reading:

1. Kulkarni, D.M., Rastogi, A.P. and Sarkar, A.K. (2013). “Engineering Graphics with AutoCAD.” *PHI publications*, New Delhi.
2. Butt,N.D. (2011). “ Engineering Drawing.” *5th Edition, Charotar publishing house Pvt. Ltd.*
3. Sham Tickoo, and Saravanan, D. (2010). “AutoCAD 2010 for engineers and designers.” *Dreamtech Press.*
4. Sham Tickoo. (2011). “AutoCAD 2011: A Problem solving approach” *Autodesk Press*, USA
5. Venugopal, K. (1998). "Engineering Drawing and Graphics + Autocad", *New Age International [P] Ltd*., New Delhi.

ES 105 CE

ENGINEERING MECHANICS - I

(Common to all Branches)

Instruction	: 3 Hours/week
Duration of University Examination	: 3 Hours
University Examination	: 70 Marks
Sessional	: 30 Marks
Credits	3

Course Objectives:

- To understand the resolution of forces, equilibrium and compatibility conditions of static loads
- To determine the various forces in the members, and analyze the sections using various methods
- To obtain friction, centroid, and moment of Inertia for various regular and irregular bodies

OUTCOMES:

- A basic understanding and determine the equilibrium of a particle in space using principle of laws of mechanics.
- The ability to draw Free Body Diagram and label the reactions on it.
- Analyze planar and spatial systems to determine the forces in members of trusses, frames.
- problems related to friction and understanding of the assumptions and limitations of the approaches used
- Calculate the principal moment of inertia of plane areas and determine the centroid and second moment of area

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

UNIT-I

Force Systems: Resultant of collinear, parallel, coplanar and non-coplanar concurrent and non-concurrent force systems. Resolving a planar or non-coplanar force system into different directions. Moment of force and its applications, Couples and Wrench of a force system.

UNIT -II

Equilibrium of Force Systems: Free body diagram, Equations of equilibrium, Equilibrium of planner and spatial system.

UNIT -III

Analysis of structures: Analysis of trusses by method of joints and method of sections, Analysis of frames by method of members.

UNIT -IV

Friction: Laws of friction. Application to simple systems, connected systems and belt friction. Wedge friction.

UNIT -V

Centroid and Moment of Inertia: Centroids of lines, areas and volumes, Areas and volumes of revolution, Pappu's theorems and their applications, Area moment of inertia, Product moment of Inertia, Composite areas, radius of gyration.

Suggested Readings:

1. Ferdinand L. Singer (1975). "Engineering Mechanic" Collins, Singapore.
2. Timoshenko, S.P. and D.H. Young. (1983). "Engineering Mechanics." McGraw-Hill International Edition.
3. Rajeshakharam, S. and Sankarasubrahmanyam, G. (2002). Mechanics." Vikas Publications.
4. Junarkar, S.B. and H.J. Shah. (2001). "Applied Mechanics, Publishers.
5. Shames, J.H (1987). "Engineering Mechanics", Prentice Hall.
6. Bhattacharyyya, B. (2015). "Engineering Mechanics." Oxford Higher Education.

ES 106 CS

COMPUTER PROGRAMMING AND PROBLEM SOLVING

(Common to all Branches)

Instruction	: 3 Hours/Week
Duration of SEE	: 3 Hours
SEE	: 70 Marks
CIE	: 30 Marks
Credits	3

Course Objectives:

- To acquire problem solving skills
- To be able to develop flowcharts
- To understand structured programming concepts
- To be able to write programs in C Language

OUTCOMES:

- 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

	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, Lvalue and Rvalue, 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.

With effect from the Academic Year 2015 – 2016

MC 107 EG

ENGINEERING ENGLISH

(Common to All Branches)

Instruction	: 3 Hours/week
Duration of University Examination	: 3 Hours
University Examination	: 70 Marks
Sessional	: 30 Marks
Credits	3

objectives :

- communicate clearly, accurately and appropriately
- know and use verbal and non-verbal communication appropriately
- infer information from texts
- learn basic grammar of the English language
- use appropriate idiomatic expressions, one word substitutes etc.

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; Importance of listening, speaking, reading, and writing, Types of listening, Tips for effective listening, Types of communication: Non-verbal communication, Verbal – Formal versus informal communication, One-way versus two-way communication**;** Barriers to communication

UNIT – II

Remedial English : Common errors, Tense and aspects, Connectives and correlative conjuncts, Simple, complex and compound sentences, Voice, concord, Direct and indirect speech, Degrees of comparison, Question tags, Punctuation

UNIT - III

Written Communication : Paragraph writing, Précis writing, Expansion, Essay writing, Personal Letters, General reports

UNIT – IV

Vocabulary: Technical vocabulary, Homonyms, Homophones, Synonyms, Antonyms, Words often confused, One-word substitutes, Idiomatic usage, Affixes

UNIT – V

Reading comprehension and reading strategies.

The following five lessons are prescribed:

1. Dr. A.P.J. Abdul Kalam
2. Sathya Nadella
3. Azim Premji
4. Sachin Tendulakar
5. Sam Pitroda

Textbook prescribed:

E. Suresh Kumar, *Engineering English,* Orient Blackswan, 2014.

Books Recommended:

1.E. Suresh Kumar et al., *Communication Skills and Soft Skills,*Pearson, 2011.

2. Sanjay Kumar and Pushp Lata, *Communication Skills, OUP, 2011.*

3.Kavita Tyagi and Padma Misra, *Professional Communication,* PHI, 2011.

*4.*Meenakshi Raman and Sangeeta Sharma, *Technical Communication: Principles and Practice, OUP, 2011.*

With effect from the Academic Year 2015 – 2016

BS 151 PH

ENGINEERING PHYSICS LAB -I

(Common to All Branches)

Instructions	3 Hours/week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks
Credits	2

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			

1. **Biprism**: To determine the wavelength (λ) of the given monochromatic source of light using Fresnel's Biprism.
2. **Diffraction Grating**: To determine the wavelength of a spectral line by a plane transmission diffraction grating.
3. **Laser:** To determine the wavelength of laser using diffraction grating.
4. **Polarimeter:** To determine the specific rotation of sugar solution using Polarimeter.
   Ultrasonics : To find the ultrasonic velocity in the given liquid using Debye Sears method.
5. **Fiber Optics-I:** (a) To determine the numerical aperture (NA) of the Optical Fiber.
   (b) To determine the losses in optical fiber due to i) bending and ii) coupling.
6. **Newton's Rings:** To determine the radius of curvature of a plano convex lens using Newton's rings experiment.
7. **e/m of an electron:** To determine the specific charge (e/m) of an electron by J.J. Thomson's method.
8. To study the double refraction characteristics of a crystal.

Demonstration Experiment:

CRO – Measurement of amplitude, frequency and phase.

With effect from the Academic Year 2015 – 2016

BS 152 CH

ENGINEERING CHEMISTRY LAB-1

(Common to All Branches)

Instruction	: 3 Hours/week
Duration of University Examination	: 3 Hours
University Examination	: 50 Marks
Sessional	: 25 Marks
Credits	2

Course Outcomes:

- 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			

VOLUMETRIC ANALYSIS

1. Introduction to Volumetric Analysis.
2. Techniques of Weighing and usage of analytical balance

PERMANGANAMETRY

3. Preparation of a standard solution of Oxalic acid or Sodium oxalate and standardization of KMnO4 solution
4. Preparation of standard solution of Mohr salt, standardization of $KMnO_4$ solution and estimation of ferrous Iron in the given solution

DICHROMETRY

5. Preparation of a standard solution of potassium dichromate, standardization of Mohr salt solution and estimation of dichromate in the given solution.
6. Estimation of ferrous and ferric ions in the given mixture by using standard $K_2Cr_2O_7$ solution

7. Preparation of a standard solution of Potassium dichromate – Standardization of Mohr salt solution –determination of chemical oxygen demand.

ACIDMETRY

8. Preparation of a standard sodium carbonate solution and standardization of hydrochloric acid and estimation of carbonate and bicarbonate in the given mixture.
9. Estimation of alkalinity of Water.

COMPLEXOMETRY

10. Preparation of standard magnesium sulphate solution and standardization of EDTA solution and estimation of total hardness in the given sample of water.
11. Estimation of temporary and permanent hardness of water by the EDTA method.

Suggested Reading:"Vogel's Text book of quantitative chemical analysis"J. Mendham and Thomas, Person education Pvt. Ltd. New Delhi 6th ed. 2002.

ES 153 CS **COMPUTER PROGRAMMING LAB**

(Common to all Branches)

Instruction	: 2 Hours/Week
Duration of SEE	: 2 Hours
SEE	: 50 Marks
CIE	: 25 Marks
Credits	1

Course Objectives:

- To be able to understand the fundamentals of programming in C Language
- To be able to write, compile and debug programs in C
- To be able to formulate problems and implement in C.
- To be able to effectively choose programming components to solve computing problems in real-world.

Course Outcomes:

- 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. Finding the maximum and minimum of given set of numbers

2. Finding Roots of a Quadratic Equation

3. Sin x and Cos x values using series expansion

4. Conversion of Binary to Decimal, Octal, Hexa and Vice versa

5. Generating a Pascal triangle and Pyramid of numbers

6. Recursion: Factorial, Fibonacci, GCD

7. Matrix addition and multiplication using arrays

8. Bubble Sort, Selection Sort

9. Programs on Linear Search and Binary Search using recursive and non-recursive procedures.

10. Functions for string manipulations

11. Finding the No. of characters, words and lines of given text file

12. File Handling programs.

ES 154 ME

WORKSHOP PRACTICE-I

(Common to all branches)

Instruction	: 2 Hours/week
Duration of University Examination	: 2 Hours
University Examination	: 50 Marks
Sessional	: 25 Marks
Credits	1

Objectives

1. To understand the usage and applications of hand tools.
2. To acquire the skills in pattern/model making.
3. To familiarize with various work materials and tool 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, , sheet metal
- Attain basic electrical knowledge for house wiring practice

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

LIST OF EXERCISES

FITTING

1. Marking and Punching
2. Cutting and Filing
3. Matching of two parts Including Scrapping
4. Drilling and Tapping

HOUSE WIRING

1. Single Lamp Controlled by Single Switch
2. Two Lamps Series Connection
3. Two Lamps Parallel Connection
4. Stairs Case Wiring Connection

CARPENTRY

1. Half lap Joint
2. Dove Tail Joint
3. Briddle Joint
4. Briddle Dove Tail Joint

SHEET METAL WORKS

1. Making a Funnel with G.I. Sheet
2. Making a tray with G.I. Sheet
3. Making Tee Joint with Metal Tubes
4. Making a Cylindrical Jug with Riveted Handle

Suggested Reading

1. K.C. John, "Mechanical Workshop" 2nd Edn., PHI, 2010.
2. Hajra Choudary, "Elements of Workshop Technology-Vol. 1, Asian Publishers, 6th Edn., 1993.
3. G.S. Sawhney, "Mechanical Experiments and Workshop Practice", I.K. International Publishing House, New Delhi, 2009.

MC 155 EG

ENGINEERING ENGLISH LABORATORY

(Common to all branches)

Instruction	: 2 Hours/ week
Duration of University Exam	: 3 Hours
University Examination	: 50 marks
Sessionals	: 25 marks

The following are the objectives of the course:

- learn the sound systems of English
- learn the word stress in English
- learn the rhythm and intonation of English
- improve their articulation skills and participation skills

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

Note: While teaching the following items, emphasis may be laid on intensive practice in the language lab. Lecturing may be avoided as far as possible.

1. **Introduction to English Phonetics**: Organs of Speech: the respiratory, articulatory and phonatory systems
2. **Sounds of English**: Phonemic sounds, Introduction to International Phonetic Alphabet, Classification and description of English phonetic sounds; Minimal pairs; The syllable
3. **Word Stress**: Primary stress, Secondary stress, Functional stress, Rules of word stress

4. **Aspects of Connected Speech**: Strong forms, Weak forms, Contracted forms, Elision

5. **Rhythm and Intonation**: Introduction of rhythm and intonation; Major patterns of intonation in English with their semantic implications; Difficulties of Indians speakers with stress and intonation

6. **Use of Dictionary and Thesaurus**: Advantages of using a dictionary and a thesaurus, Effective use of a dictionary and a thesaurus

7. **Speaking Activities**: JAM, Picture perception

8. **Listening Activities**: Activities based on listening

9. **PowerPoint Presentations**: General topics

Lab Manual Recommended:

E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).* Revised edition, Cambridge University Press India Pvt. Ltd. 2014

Suggested Reading:

1. T. Balasubramanian. *A Text book of English Phonetics for Indian Students.* Macmillan, 2008.
2. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.
3. J. Sethi et al., *A Practical Course in English Pronunciation (with CD).* Prentice Hall of India, 2005.
4. Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. Tata McGraw Hill, 2006.

With effect from the Academic Year 2015 – 2016

SCHEME OF INSTRUCTION
BE (Mechanical Engineering)
Proposed from the Academic year 2015-2016

SEMESTER – II

S.No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P/ Dg	Contact Hrs/wk	CIE	SEE	
1.	BS 201 MT	Mathematics-II	3	1	-	4	30	70	3
2.	BS 202 PH	Engineering Physics-II	3	-	-	3	30	70	3
3.	BS 203 CH	Engineering Chemistry-II	3	-	-	3	30	70	3
4.	HS 204 EG	Business Communication and Presentation Skills	3	-	-	3	30	70	3
5.	ES 205 CE	Engineering Mechanics-II	3	-	-	3	30	70	3
6.	ES 207 ME	Engineering Graphics-II	2	-	2	4	50	50	3
7.	BS 251 PH	Engineering Physics Lab-II	-	-	2	2	25	50	1
8.	BS 252CH	Engineering Chemistry Lab-II	-	-	2	2	25	50	1
9.	ES 253 CS	Computer Skills Lab.	-	-	2	2	25	50	1
10.	HS 254 EG	Communication Skills Lab	-	-	2	2	25	50	1
11.	ES 258 ME	Engineering Workshop – II	-	-	2	2	25	50	1
			17	01	12	30	325	650	23

Service Courses Offered to Other Departments
(Common to ECE & EEE)

S.No.	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credits
			L	T	P	Contact Hrs/wk	CIE	SEE	
Theory									
1.	ES210 ME	Elements of Mechanical Engineering (For ECE & EEE)	3	-	-	3	30	70	3

With effect from the Academic Year 2015 – 2016

BS 201 MT

MATHEMATICS –II

(Common to all branches)

Instructions	3 Hours/week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

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 introduce series solutions of differential equations
- To study special functions like Legendre and Bessel function

Outcomes :

- 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

	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							
CO5														

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, Reduction of quadratic form to canonical form by orthogonal transformation , Nature of quadratic forms.

UNIT – II

Ordinary Differential Equations of First Order:

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

Linear Differential Equations of Higher Order :

Linear independence and dependence, Solutions of second and higher order linear homogeneous equations with constants coefficients, Method of reduction of order for the linear homogenous 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.

UNIT – IV

Series Solutions of differential equations:

Ordinary and Singular points of an equation, Power series solution ,Series solution about a regular singular point, Frobenius method, Beta, Gamma and error functions.

UNIT – V

Special Functions:

Legendre's differential equation and Legendre's polynomials, Rodrigue's formula, Generating function for Legendre's polynomials $P_n(x)$, Recurrence relations for Legendre's polynomials $P_n(x)$, Orthogonal and Orthonormal functions, Orthogonal property of Legendre's polynomials $P_n(x)$, Bessel's differential equation and Bessel's functions, Derivatives and integrals of Bessel's functions, Recurrence relations for $J_n(x)$,Generating function for $J_n(x)$.

Suggested Reading:

1. R.K. Jain & S.R.K. lyengar, Advanced Engineering Mathematics, Narosa Publications, 4th Edition,2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, Khanna Publications, 43rd Edition,2014.
3. Dr.M.D.Raisinghania, Ordinary and Partial differential equations, S.CHAND, 17th Edition 2014.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley , 9th Edition, , 2012.

BS 202 PH

ENGINEERING PHYSICS-II
(Common to All Branches)

Instructions	**3 Hours/week**
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

OBJECTIVES: The aim of this course is to acquire the basic knowledge on elements of solid state physics. To understand the properties of semiconducting , superconducting ,dielectric and magnetic materials in their bulk form. To acquire the knowledge on latest material characterization techniques such as X-ray Diffractometry (XRD), Scanning Electron Microscopy (SEM), Atomic Force microscopy (AFM) and Raman Spectroscopy. Also get introduction to basics of thin films and nano materials.

OUTCOMES: At the end of the course the student will acquire the knowledge on the properties of the materials in their bulk and thin forms. Student will apply his knowledge of the materials in selecting the materials for various engineering applications.

UNIT- I (9 periods)

Crystallography: Crystal systems - Bravais lattices – Lattice planes and Miller Indices – Inter planar spacing - Bragg's law - Experimental determination of lattice constant by powder diffraction method. Crystal defects: Classification of defects - Concentration of Schottky defects in metals and ionic crystals - Concentration of Frankel defects.

Band Theory of Solids: Classical free electron theory (qualitative) – Energy band formation in solids - Kronig-Penney model (qualitative treatment) - Electron gas - Fermi energy and Fermi level in metals - Classification of solids into conductors, semiconductors and insulators.

UNIT- II (8 Periods)

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

Superconductivity: Introduction - General properties of super conductors - Meissner effect - Type I and Type II superconductors - BCS theory (qualitative) – High T_c superconductors (in brief) - Applications of superconductors : Josephson's Junction and SQUIDS.

UNIT- III (8 Periods)

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

Dielectric Materials: Dielectrics - Types of dielectric polarizations – Electronic polarization, Ionic, Orientational and Space-charge polarizations – Expression for Electronic polarization - Frequency and temperature dependence of dielectric polarizations - Determination of

dielectric constant by capacitance Bridge method - Ferro electricity - Barium titanate - Applications of Ferroelectrics.

UNIT-IV (8 Periods)

Techniques for characterization of materials: Principles of X-ray fluorescence – Raman Spectroscopy
- Atomic force microscopy - Electron microscopy (SEM).

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

UNIT-V (7 Periods)

Nanomaterials: Zero dimensional materials - Properties of materials at reduced size - Surface to volume ratio at nano scale - Quantum confinement - Preparation of nanomaterials: bottom–up methods (sol gel and CVD), Top-down methods (ball milling) - Elementary ideas of carbon nanotubes – Applications.

Suggested Reading:

1) C. Kittel - Introduction to Solid State Physics, Wiley Eastern Ltd. 5th Edition, 1976.
2) S.L. Gupta and V. Kumar - Solid State Physics, K. Nath & Co., 8th Edition, 1992.
3) A. Goswami - Thin Film Fundamentals, New Age International, 2007.
4) A.K Bhandhopadhya - Nano Materials, New Age International, Ist Edition, 2007.
5) M.S. Avadhanulu and P.G. Kshirasagar - Engg. Physics, S.Chand & Co., Ist Edition, 1992.
6) C.M. Srivastava and C. Srinivasan - Science of Engg. Materials, New Age International, 2002.

HS 204 EG

BUSINESS COMMUNICATION SKILLS AND PRESENTATION SKILLS

(Common to all branches**)**

Instructions	3 Hours/week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

The following are the objectives of the courses

- To enable the students to
  - communicate clearly, accurately and appropriately
  - learn different models of interpersonal communication
  - work in teams effectively and learn how to be effective in using time
  - comprehend the difference between technical and general writing
  - write reports, scientific papers, letters, Statement of Purpose, Resume
  - learn how to plan and prepare to face interviews effectively

UNIT – I

Business Communication: Importance of business communication; ABC of technical communication – Accuracy, Brevity, Clarity; Channels of communication: Downward communication, Upward communication, Diagonal communication, Horizontal communication; Organisational GDs

UNIT – II

Interpersonal Communication and Personality Development: Models of interpersonal development, Johari window, Knapp's model, styles of communication; Team work; Persuasion techniques; Mobile Etiquette, e-mail Etiquette; Time Management

UNIT – III

Technical Written Communication: Differences between Technical Writing and General Writing; Report Writing: Types of Reports, Structure/Format, Language Style, Writing Technical Reports; Writing Scientific Papers

UNIT – IV

Career Oriented Written Communication: Writing SOPs; Job Application: Language style and Format; Résumé writing: design and style; Cover Letter; Business Letters: Letters of enquiry and responses, Letters of complaint, Letters of adjustment, Sales letters; Agenda and minutes

of the meeting

UNIT – V

Interview Skills and Group Discussions: Interviews: Purpose, Planning, Preparation, Language and style, Sample interview questions and answers; Group discussions: Types of GDs, Features of good GDs, Preparing for a group discussion

Textbook prescribed:

E. Suresh Kumar, *Engineering English,* Orient Blackswan, 2014.

Books Recommended:

1. E. Suresh Kumar et al., *Communication Skills and Soft Skills.* Pearson, 2011.
2. E. Suresh Kumar et al., *English for Success.* Cambridge University Press India Private Ltd, 2010.
3. Sanjay Kumar and Pushp Lata. *Communication Skills. OUP, 2011.*
4. Kavita Tyagi and Padma Misra. *Professional Communication.* PHI, 2011.
5. Meenakshi Raman and Sangeeta Sharma. *Technical Communication: Principles and Practice. OUP, 2011.*

ES 205 CE

ENGINEERING MECHANICS-II

[Common to Civil Engineering and Mechanical Engineering]

Instructions	3 Hours/week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

- To understand the mass moment of inertia analysis for the different bodies.
- To know basic concepts of dynamic loads, their behavior, analysis and motion bodies
- To determine the work energy principles and impulse momentum theory

Outcomes:

- Analysis of virtual force systems and ability to calculate centroids and moments of inertia.
- Knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies.
- Describe the motion of a particle in terms of its position, velocity and acceleration in different frames of reference
- Knowledge of kinematic and kinetic analyses for particles and systems of particles.
- Apply work, energy, impulse and Solve the problems using equation of motions and analyze impact of elastic bodies on collision.

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

UNIT-I

Centre of Gravity and Mass Moment of Inertia: Centre of gravity and mass moment of inertia for solid and composite bodies. Radius of gyration

Virtual Work: Principle of virtual work and its application to simple systems.

UNIT-II

Kinematics: Rectilinear motion, curvilinear motion, Velocity and acceleration, Types of rigid body motion, and its analysis in a plane.

UNIT-III

Kinetics: Analysis as a particle and as a rigid body in Translation, Fixed axis rotation, Rolling bodies and Plane motion.

UNIT -IV

Work -Energy: Principles of work- energy, and its applications to bodies in Translation, Particle motion and connected systems. Fixed axis rotation and Plane motion.

UNIT-V

Impulse momentum: Linear impulse momentum, Conservation of momentum, Elastic impact and Plane motion.

Suggested Reading:

1. Ferdimand L. Singer. (1975). "Engineering mechanics", Harper & Collins,Singapore.
2. Timoshenko, S.P. and.Young, D.H (1983). Engineering Mechanics",Mcflraw-Hill International Edition.
3. Rajashekaran, S and G.Sankarasubramanyan , "Engineering Mechanics". Vikas Publications.
4. Junarkar, S.B. and Shah, H.J. (2001). "Applied Mechanics",Charotar Publishers.
5. Shames, I.H. (1987). "Engineering Mechanics", Prentice Hall of India.
6. Bhattacharyyya, B. (2015). “Engineering Mechanics.”Oxford Higher Education.

ES 252CE

ENGINEERING GRAPHICS-II

(**Civil Engineering)**

Instructions	3 Hours/week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives:

- To understand the Engineering drawing concepts of section of solids and development of their surfaces.
- To know basic concepts of isometric projections.
- To determine the orthographic projections for solid sections.
- To analyze and obtain the perspective views for different solid bodies.

UNIT-I

Sections of Solids: True shape of solids, sections of prisms, pyramids, cylinders and cones.
3D modeling: Poly, Orbit, Mesh, Array, Clip.

UNIT-II

Development of Surfaces: Basics concepts of developments of surfaces. Methods of development- parallel line development and redial line development. Development of prisms, pyramids, cylinders and cones

UNIT-III

Intersection of surfaces: Intersection of cylinder and cylinder and cone.

UNIT-IV

Isometric Projections: Isometric Scale, Isometric projections of prisms, pyramids, cylinders, cones and spheres, and combinations of two or three solids

UNIT- V

Perspective Views: Perspective views of straight lines, plane figure (triangle, square, pentagon, hexagon, circle), and simple solids (cylinder cone, regular prism, regular pyramid) using Visual Ray Method and Vanishing Point method.

Suggested Reading:

1.Bhatt, N.D. (1998). Elementary Engineering Drawing", Charotar Publisher.
2. Narayana, K.L. and Kannaiah, P. (2001). "Text book on Engineering Drawing" SciTech Publications.
3. French, T.E. et al. (1993). "Engineering Drawing and Graphic Technology McGraw-Hill International Editions.
4. Venugopal, K. (1998). "Engineering Drawing and Graphics plus AutoCAD New Age International (P) Ltd, New Delhi.
5. Siddique, N et al. (2004). "Engineering Drawing with a Primer.c AutoCAD" Prentice Hall of India Pvt., Ltd., New Delhi.

BS 252 CH

ENGINEERING CHEMISTRY LAB - II (FOR ALL BRANCHES EXCEPT BME)

Instructions	2Hours/week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

Outcomes:

- 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

	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			

INSTRUMENTAL ANALYSIS

CONDUCTOMETRY

1. Conductometric and acid-base strong acid vs strong base titration
2. Conductometric weak acid vs strong base titration
3. Conductometric mixture of acids vs strong base titration
4. Conductometric precipitation titration-barium chloride against sodium

sulphate POTENTIOMETRY

1. Potentiometric acid-base titration –strong acid vs strong base, using quinhydrone electrode.
2. Potentiometric redox titration-$KMnO_4$vs Fe^{+2}

pH Metry

1. pH metry strong acid vs strong base titration
2. pH metry weak acid vs strong base titration

COLORIMETRY

1. Verification of Beer's Law –using Potassium permanganate
2. Estimation of $KMnO_4$(Mn) in the given solution
3. Estimation of iron in

cement KINETICS

1. First order reaction-hydrolysis of methyl acetate
2. Second order reaction-potassium iodide and persulphate

Suggested Readings:

1. Senior practical Physical Chemistry, BD Khosla, A.Ghulati, VC.Garg., R.Chand and Co., New Delhi 10th ed. 2001.
2. Practical Physical Chemistry ,B.Vishwanathan, P.S Raghavan, Viva Books Private Limited.

ES 258 ME

ENGINEERING WORKSHOP -II
(Common to Civil & Mechanical)

Instructions	2Hours/week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

Objectives:

- To know the usage of smithy tools and its operations.
- To acquire the skills in welding and machining of metals.
- To familiarize with usage of plumbing tools for making pipe joints and PC parts assembly

Outcomes:

- To study and practice on tools and their operations of different trades.
- To practice on manufacturing of components using workshop trades including forging and welding
- To apply suitable tools for machining process including facing, turning &parting

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

LIST OF EXERCISES

SMITHY

1. Flattening Operation
2. Bending Operation
3. Upsetting Operation
4. Fullering Operation

WELDING

1. Demonstration of Arc and Gas Welding
2. Bead formation on a plate
3. Lap and Butt Joints
4. Brazing and Soldering

MACHINING

1. Plain and Step Turning Operations
2. Knurling Operation
3. Taper turning Operation
4. Thread Cutting Operation

PLUMBING

1. Making Single Joint with Coupling and Union.
2. Making 90^{o} Pipe Joint using Elbow/Bend
3. Making Tee and 4-way joint
4. Making pipe joint with two different diameters (3/4" x 1/2" Reducer)

PC ASSEBLY

1. Demo of Assembling PC components

Suggested Reading

1. K.C. John, "Mechanical Workshop" 2nd Edn., PHI, New Delhi, 2010.
2. Hajra Choudary, "Elements of Workshop Technology-Vol. 1, Asian Publishers, 6th Edn., 1993.
3. G.S. Sawhney, "Mechanical Experiments and Workshop Practice", I.K. International Publishing House, New Delhi, 2009

BS 251 PH

ENGINEERING PHYSICS LAB -II
(Common to All Branches)

Instructions	2Hours/week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

1. **Dielectric Constant:** To determine the dielectric constant and phase transition temperature of given material (PZT).

2. **B-H Curve:** *(a)* To draw graph between the magnetising field and the intensity of magnetisation of a ferromagnetic specimen and *(b)* To determine i) Coercivity ii) Retentivity and iii) Hysteresis loss of given specimen (soft iron) from the graph.

3. **P-N Junction Diode:** To draw the volt-ampere characteristics of the given P-N junction diode.

4. **Photo Cell:** To determine the planck's constant and the work function of the photometal.

5. **Thermister:** To draw the temperature characteristics of a thermistor and to evaluate the constants

6. **Solar Cell:** To draw I-V characteristics of a solar cell and to calculate the (a) Fill factor (b) Efficiency and (c) Series resistance

7. **Hall Effect:** To determine the (a) Hall coefficient (b) Carrier concentration and (c) Mobility of charge carriers of given semi conducting material.

8. **Thermo Electric Power:** To calculate (a) Thermoelectric power (b) Fermi Energy and (c) Carrier concentration of given ferrite sample.

9. **Four Probe Method:** To determine the conductivity of semiconductors.

Demonstration Experiments:

1. X – Ray Diffractometer
2. D.C. Conductivity
3. Preperation of Nano materils- Sol-gel method

ES 253 CS

COMPUTER SKILLS LAB

(Common to all branches)

Instruction	: 2 Hours /Week
Duration of University Examination	: 2 Hours
CIE	: 25 Marks
SEE	: 50 Marks
Credits	1

Course Objectives:

- To learn assembling and disassembling of PC Hardware
- To understand the installation of Operating systems
- To be able to acquire skills in Productivity tools

I: PC Hardware

1. Identify the peripherals of a computer. (Processor, Memory chips, Mother board, Disk drives, and Controller card such as AGP board, Network cards, Sound card, as well as Parallel and Serial ports etc.,)

2. Disassembling and Assembling PC in working condition. Load the Operating Systems with partitions for Windows and Linux, configure for Network.

II: Productivity Tools:

1. **Documentation Using MS-Word** - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, and Bookmarks.

2. **Presentation using MS-PowerPoint**: Creating presentation slides and Enhancing Slides with features like Organizational charts, Excel Charts, Word Art, Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object.

3. **MS Excel :** Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions- like sum, average, standard deviation, and charts.

4. **Internet** and **HTML:**
   a) Telnet/Secure Shell (Remote login to university computers)
   b) Electronic Mail (Communicating with email software)
   c) File Transfer Protocols (transferring files between networked computers)
   d) World Wide Web (Interface, Navigation, Search Tools)
   e) Publishing Web Pages (Using HTML editors to create personal web sites)
   f) **C**reate the web-page (With title, text, frames, hyperlinks to some sites, pictures, lists, tables, fonts and colors) without using any web authoring tools.

5. **Documentation Using LATEX:** Introduction to Linux Commands, Introduction to LateX, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar tool, Page Formatting, Single/Multi column, Pictures/Objects, Drawing, Hyperlinks, Header/Footer, and Tables.

Suggestion Reading:

1. Peter Norton, "*Introduction to Computers*" , 6th Edition, McGraw Hill Publishers,
2. Leslie Lamport**, "***Latex: A Document Preparation System",* 2nd Edition*,* Pearson Education India, 1994.
3. Stefan Kottwitz, "*LaTeX Beginner's Guide*"**,** Shroff/Packt Publishers, First Edition, 2012.

ES 253 CS

COMPUTER SKILLS LAB

(Common to all branches)

Instruction	: 2 Hours /Week
Duration of University Examination	: 2 Hours
CIE	: 25 Marks
SEE	: 50 Marks
Credits	1

Course Objectives:

- To learn assembling and disassembling of PC Hardware
- To understand the installation of Operating systems
- To be able to acquire skills in Productivity tools

I: PC Hardware

3. Identify the peripherals of a computer. (Processor, Memory chips, Mother board, Disk drives, and Controller card such as AGP board, Network cards, Sound card, as well as Parallel and Serial ports etc.,)

4. Disassembling and Assembling PC in working condition. Load the Operating Systems with partitions for Windows and Linux, configure for Network.

II: Productivity Tools:

6. **Documentation Using MS-Word** - Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, and Bookmarks.

7. **Presentation using MS-PowerPoint**: Creating presentation slides and Enhancing Slides with features like Organizational charts, Excel Charts, Word Art, Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object.

8. **MS Excel :** Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions- like sum, average, standard deviation, and charts.

9. Internet and **HTML:**

a) Telnet/Secure Shell (Remote login to university computers)
b) Electronic Mail (Communicating with email software)
c) File Transfer Protocols (transferring files between networked computers)
d) World Wide Web (Interface, Navigation, Search Tools)
e) Publishing Web Pages (Using HTML editors to create personal web sites)
f) **C**reate the web-page (With title, text, frames, hyperlinks to some sites, pictures, lists, tables, fonts and colors) without using any web authoring tools.

10. **Documentation Using LATEX:** Introduction to Linux Commands, Introduction to LateX, Creating & Editing Document, Formatting Document, Auto-text, Autocorrect, Spelling and Grammar tool, Page Formatting, Single/Multi column, Pictures/Objects, Drawing, Hyperlinks, Header/Footer, and Tables.

Suggestion Reading:

4. Peter Norton, "*Introduction to Computers*" , 6th Edition, McGraw Hill Publishers,
5. Leslie Lamport**, "***Latex: A Document Preparation System",* 2nd Edition*,* Pearson Education India, 1994.
6. Stefan Kottwitz, "*LaTeX Beginner's Guide*"**,** Shroff/Packt Publishers, First Edition, 2012.

HS 254 EG

COMMUNICATION SKILLS LABORATORY

(common to all branches**)**

Instructions	2Hours/week
Duration of University Examination	3 Hours
SEE	50 Marks
CIE	25 Marks
Credits	1

The following are the objectives of the course: To enable the students to

- learn the appropriate use of language
- learn to use the appropriate body language
- participate in group discussions and debates
- improve their public speaking skills
- improve their presentation and participation skills
- learn how interviews are conducted and faced

Outcomes:

- 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

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

Note: While teaching the following items, emphasis may be laid on intensive practice in the language lab. Lecturing may be avoided as far as possible.

1. **Role play**: Use of dialogues in a variety of situations and settings
2. **Presentation Skills**: Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions and answer session
3. **Public Speaking**: Planning, Preparation, Techniques of delivery, Handling stage fear/fright

4. **Group Discussion**: Initiating, continuing and concluding a GD, Giving feedback; Practising case studies and Topic based GDs
5. **Debate**: Differences between a debate and a group discussion, Essentials of a debate, Participating in a debate
6. **Interview Skills**: Facing interviews confidently, Use of suitable expressions during interviews; Mock interviews

Lab Manual Recommended:

E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD).* Revised edition, Cambridge University Press India Pvt. Ltd. 2014

Suggestion Reading:

1. T. Balasubramanian. *A Text book of English Phonetics for Indian Students.* Macmillan, 2008.
2. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.
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.

ES 210 ME

ELEMENTS OF MECHANICAL ENGINEERING

(Common to ECE & EEE)

Instructions	3 Hours/week
Duration of University Examination	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Objectives

- To understand basic concepts of thermodynamics.
- To understand applications of thermodynamics concepts.
- To understand the working principles of I.C. engines, Reciprocating compressors and Refrigeration
- To familiarize the design and working principles of drives transmission systems.
- To understand various manufacturing processes.

UNIT- I

Statements of 0^{th}, 1^{st} , 2^{nd} and 3^{rd} Laws of thermodynamics with their applications. Representation of thermodynamics processes on P-V and T-s plots. Ideal gas equation. Relations for internal energy and entropy changes, heat and work transfers for closed systems. Steady flow energy equation for an open systems-derivation and applications in turbines, compressors, nozzles and diffusers. Relations for enthalpy changes, heat and work transfers for open systems.

UNIT-II

Power Cycles: Concept of air standard cycles- Otto, Diesel , Joule cycles with applications. Representation of Cycles on P-V and T-s plots. Calculation of Cycle efficiencies.

IC Engines: Classification of IC Engines. Mechanical components of IC Engines. Working Principles of four stroke and two stroke cycle engines. Differences between petrol and diesel engines. Calculation of engine parameters -IP, BP, Specific fuel consumption, mechanical and thermal efficiencies.

UNIT-III

Working principles of reciprocating air compressors-single and double acting, single stage and two stage. Effect of clearance. Conditions for maximum efficiency. Isentropic and isothermal efficiencies.

Problems on work input, power required and efficiencies of single and two stage

compressors. Methods for improving efficiency –use of intercooler and aftercooler.

Refrigeration: Carnot and Reversed Carnot Cycles-representation on T-s ,P-V and P-h Plots. Working principle of vapour compression refrigeration system. COP calculation. Common refrigerants in use.

UNIT-IV

Belt drives: Velocity ratio, effect of slip, belt thickness and creep. Length of open and cross belts. Ratio of tensions, centrifugal tension and its effect on power transmission. **Gear drives**: Nomenclature and types of gears. Problems on simple , compound and epicyclic gear trains. **Governors**: Working of Watt, Porter and Hartnell governors. Effect and power of governor, Effect of friction. Stability of governor and isochronism. Balancing of several masses in one plane and in several planes.

UNIT- V

Production Techniques: Principles of Arc, Gas and Resistance welding, soldering and Brazing, Working mechanism of Lathe, milling and drilling machines by simple sketches. Working principle of NC machines. Basic principles of USM, EDM, LBM, EBM, ECM and Chemical machining and etching. Principles of sand casting, die casting and investment casting. Plastics and their moulding methods.

Suggested Reading

1. R.K. Rajput, "Thermal Engineering", Laxmi Publications, New Delhi, Eighth Edition, 2010.
2. P.K. Nag, " Basic and Applied Thermodynamics", Tata Mc-Graw Hill, Eigth Reprint, 2006
3. Thomas Bevan, "Theory of Machines", College Book Store (CBS) Publishers, 3rd Edn., 1986.
4. Hajra Choudary, "Elements of Workshop Technology-Vel. I and 2, Asian Publishers, 6th Edn., 1993.
5. P. N. Rao, "Manufacturing Technology", Vol. I &2, Tata McGraw- Hill, 2nd Edn., 2009