Bharati Vidyapeeth
(Deemed to be University)
College of Engineering, Pune
Department of Mechanical Engineering

Vision of the Bharati Vidyapeeth (Deemed to be University) College of Engineering is:

To be a World Class Institute for Social Transformation through Dynamic Education

Missions of the Bharati Vidyapeeth (Deemed to be University) College of Engineering are:

- *To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession & society.*
- *To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.*
- *To practice and promote professional ethics, transparency and accountability for social community, economic & environmental conditions.*

Goals of the Bharati Vidyapeeth (Deemed to be) University College of Engineering are:

- *Recruiting experienced faculty.*
- *Organizing faculty development programs.*
- *Identifying socio-economically relevant areas & emerging technologies.*
- *Constant review &up gradation of curricula.*
- *Up gradation of laboratories, library & communication facilities.*
- *Collaboration with industry and research & development organizations.*
- *Sharing of knowledge, infra-structure and resources.*
- *Training, extension, testing and consultancy services.*
- *Promoting interdisciplinary research.*

Vision of the Mechanical Engineering Department is:

To develop, high quality Mechanical Engineers through dynamic education to meet social and global challenges.

Mission Statements of the Mechanical Engineering Department are:

- *To provide extensive theoretical and practical knowledge to the students with well-equipped laboratories and ICT tools through motivated faculty members.*
- *To inculcate aptitude for research, innovation and entrepreneurial qualities in students.*
- *To acquaint students with ethical, social and professional responsibilities to adapt to the demands of working environment.*

Program Educational Objectives (PEOs) of the B. Tech. Mechanical are:

Graduates will be able,

- *To fulfill need of industry and society with theoretical and practical knowledge.*
- *To engage in research, innovation, lifelong learning and continued professional development.*
- *To fulfill professional ethics and social responsibilities.*

PROGRAM OUTCOMES

Engineering Graduates will be able to:

*1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.*

*2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.*

*3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.*

*4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.*

*5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.*

*6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.*

*7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.*

*8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.*

*9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.*

*10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.*

*11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.*

***12. Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.*

Statements of Programme Specific Outcomes (PSOs)

PSO1: Apply the knowledge of thermal, design, manufacturing engineering and computational sciences to solve Mechanical Engineering problems.

PSO2: Apply Mechanical Engineering principles for research, innovation and develop entrepreneurial skills.

PSO3: Apply concepts of mechanical engineering to asses' societal, environmental, health and safety issues with professional ethics.

B. TECH. MECHANICAL: COURSE STRUCTURE: CBCS: 2020

B. Tech. Mechanical Sem.-I

Course Code	Course	Teaching Scheme (Contact Hrs./Week)			Examination Scheme (Marks)						Total Credits			
					End Sem. Exam	Continuous Assessment				Total				
		L	P	T		IA	TW	OR	PR		TH	TW	OR/ PR	Total
C101	Engineering Mathematics-I	3	-	1	60	40	-	-	-	100	4	-	-	4
C102	Engineering Physics	3	2	-	60	40	25	-	-	125	3	1	-	4
C103	Fundamental of Electrical Engineering	3	2	-	60	40	25	-	-	125	3	1	-	4
C104	Engineering Graphics*	3	4	-	60	40	25	25	-	150	3	1	1	5
C105	Fundamentals of Mechanical Engineering	4	2	-	60	40	25	25	-	150	4	0.5	0.5	5
C106	Workshop Technology	-	2	-	-	-	50	-	-	50	-	1	-	1
C107	Open Course-I: Business Communication	2	-	-	50	-	-	-	-	50	2	-	-	2
	Total	**18**	**12**	**1**	**350**	**200**	**150**	**50**	**0**	**750**	**19**	**4.5**	**1.5**	**25**

*End Sem. Examination of 4 Hrs.

B. Tech. Mechanical Sem.-II

Course Code	Course	Teaching Scheme (Contact Hrs./Week)			Examination Scheme (Marks)						Total Credits			
					End Sem. Exam	Continuous Assessment				Total				
		L	P	T		IA	TW	OR	PR		TH	TW	OR/ PR	Total
C108	Engineering Mathematics-II	3	-	1	60	40	-	-	-	100	4	-	-	4
C109	Engineering Chemistry	3	2	-	60	40	25	-	-	125	3	1	-	4
C110	Fundamental of Electronics Engineering	4	2	-	60	40	25	-	--	125	4	1	-	5
C111	Engineering Mechanics	3	2	1	60	40	25	-	-	125	4	1	-	5
C112	Programming Skills-I	-	4	-	-	-	50	-	50	100	-	1	1	2
C113	Production Practice	-	2	-	-	-	25	-	--	25	-	1	-	1
C114	Computer Aided Machine Drawing	-	4	-	-	-	50	-	50	100	-	1	1	2
C115	Open Course –II: Soft Skills	2	-	-	50	-	-	-	-	50	2	-	-	2
	Total	**15**	**16**	**2**	**290**	**160**	**200**	**-**	**100**	**750**	**17**	**6**	**2**	**25**

B. TECH. FIRST YEAR SYLLABUS 2020

B. Tech. Mechanical and Production Sem.-I

ENGINEERING MATHEMATICS-I
Course Code (C101)

Designation of Course	**Engineering Mathematics-I**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory: 0 3 Hours/Week	End Semester Examination	60 Marks	Theory:03
Tutorial: 01Hours/Week	Internal Assessment	40 Marks	Tutorial:01
	Term Work/Oral	- Marks	
	Total	100 Marks	4

Course Prerequisites:	Student should have Basic Knowledge of Algebra
Course Outcomes:-	1. Solve the consistency of any type of systems. 2. Find the roots of equations using DeMoiver's theorem and to locate imaginary points using argand diagram. 3. Apply Leibnitz's rule to find n th derivative. 4. Test convergence and divergence of infinite series. 5. Compute total derivative. 6. Compute maxima and minima of any function of two variables.

Course Contents

Unit1	**Matrices**	**(8 Hrs.)**
Rank, Normal form, System of Linear Equations, Linear Dependence and Independence, Linear and Orthogonal Transformations. Eigen values, Eigen Vectors.		
Unit2	**Complex Numbers and Applications:**	**(8 Hrs.)**
Definition, Cartesian, Polar and Exponential Forms ,Argand's Diagram, De'Moivre's theorem and its application to find roots of algebraic equations., Hyperbolic Functions, Logarithm of Complex Numbers, Separation into Real and Imaginary parts, Application to problems in Engineering.		
Unit3	**Differential Calculus :**	**(8 Hrs.)**
Differential Calculus: Successive Differentiation, nth Derivatives of Standard Functions, Leibnitz's Theorem. **Expansion of Functions:** Taylor's Series and Maclaurin's Series.		
Unit4	**Differential Calculus and Infinite Series**	**(8 Hrs.)**
Differential Calculus: Indeterminate Forms, L' Hospital's Rule, Evaluation of Limits. **Infinite Series** : Infinite Sequences, Infinite Series, Alternating Series, Tests for Convergence, Absolute and Conditional Convergence, Power series, Range of Convergence.		
Unit5	**Partial Differentiation and Applications:**	**(8 Hrs.)**

Partial Derivatives, Euler's Theorem on Homogeneous Functions, Implicit functions, Total Derivatives, Change of Independent Variables. Errors and Approximations.		
Unit6	**Jacobian, Maxima and Minima**	**(8 Hrs.)**
Jacobian: Jacobians and their applications, Chain Rule, Functional Dependence. **Maxima and Minima:** Maxima and Minima of Functions of two variables, Lagrange's method of undetermined multipliers.		

Text Books:

1. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune), 7th Edition, 1988,Reprint 2010.
2. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi),42th Edition,2012.

Reference Books:

1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill),Edition ,2008.
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8th Edition, 1999, Reprint 2010.
3. Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning),Edition 2007.
4. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2nd ,Edition, 2002.

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

ENGINEERING PHYSICS

Course Code (C102)

Designation of Course	**Engineering Physics**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory: 03 Hours/ Week	End Semester Examination	60 Marks	Theory: 03 Practical: 01
Practical: 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	
	Oral/Practical Examination	-- Marks	
	Total	125 Marks	4

Course Prerequisites:-	Students are expected to have a basic understanding of physics and calculus.
Course Objective	After completing this course the students will able to apply knowledge of Engineering Physics to different branches of engineering for better conceptual clarity and exploring emerging fields of technology and research.
Course Outcomes:-	1. Interpret the basics of semiconductors and its uses to develop electronics devices such as diode. 2. Interpret the properties of lasers and use it to applications like fibre optics and holography. 3. Express knowledge of nanoscience to develop new electronic devices. 4. Interpret the magnetic properties of material. 5. Express the properties of new engineering materials such as shape memory alloys. 6. Analyze the problems associated with architectural acoustics and give their remedies and use ultrasonic as a tool in industry for Non Destructive Testing. Define the behavior of quantum particles in different potentials.

Course Contents

Unit 1	**Semiconductor Physics**	**(6 Hrs.)**
Free electron theory, Density of states, Bloch theorem (Statement only), Origin of band gap, Energy bands in solids, Effective mass of electron, Fermi-Dirac probability function and position of Fermi level in intrinsic semi-conductors (with derivation) and in extrinsic semi-conductors, Band structure of p-n junction diode under forward and reverse biasing, Conductivity in conductor and semi-conductor, Hall effect and Hall coefficient, Photovoltaic effect, Solar cell and its characteristics.		
Unit 2	**Lasers and Fibre Optics**	**(6 Hrs.)**
Principle of laser, Einstein's coefficients, Spontaneous and stimulated emission, Population inversion, Ruby laser, Helium-Neon laser, Semiconductor laser, Properties of lasers, Applications of lasers (Engineering/ industry, medicine, communication, Computers), Holography. Principle and structure of optical fibre, acceptance angle and acceptance cone, numerical aperture, Applications of optic fibre.		
Unit 3	**Nanoscience**	**(6 Hrs.)**
Introductions of nanoparticals, properties of nanoparticals (Optical, electrical, Magnetic, structural, mechanical), Wide band gap semiconductors, Quantum confinement effect, Quantum dots, CNT, Fullerene, synthesis of nanoparticals, synthesis of nanoparticals by physical-ball milling and chemical-co-precipitation, applications in the field of electronics, automobile and medicine.		

Unit 4	Magnetic Materials and Superconductors	(6 Hrs.)
Origin of magnetic moment , Bohr magneton, Domain theory, comparison of Dia, Para and Ferro magnetism, Hysteresis – soft and hard magnetic materials, antiferromagnetic materials, Ferrites and its applications. Superconductors, properties, Meissner effect, Type I and Type II superconductors, BCS theory of superconductivity (Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.		
Unit 5	**Advance Engineering Materials**	**(6 Hrs.)**
Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Synthesis by pulsed laser deposition and chemical vapour deposition, Applications, NLO materials. Birefringence, optical Kerr effect, Classification of Biomaterials and its applications		
Unit 6	**Acoustics and Ultrasonics**	**(6 Hrs.)**
Elementary acoustics, Reverberation and reverberation time, Sabine's formula, Pressure and Intensity level, different types of noise and their remedies, basic requirement for acoustically good hall, factors affecting the architectural acoustics and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating –Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C–scan displays, Medical applications - Sonogram		

Text Books/ Reference Books

1. Engineering Physics, M. N. Avadhanulu and P.G. Kshirsagar, Engineering Physics, S Chand Publication, 9th Edition, 2011.
2. Engineering Physics, R. K. Gaur and S. L. Gupta, Dhanpat Rai Publications.
3. Fundamental of Physics Extended, Halliday and Resnik, Wiley Publication, 10th Edition, 2013.
4. Concept of Modern Physics, Arthur Beizer, McGraw Hill Publication, 6th Edition, 2003.
5. Optics, Ajoy Ghatak, McGraw Hill Publication, 5th Edition, 2012.
6. Science of Engineering Materials, C.M. Srivastava and C. Srinivasan, Wiley Publication.
7. Solid State Physics, A.J. Dekker, Pan MacMillan Publication, 1969.

Term Work

Experiments Any eight experiments from the following:

1. Determination of band gap of semi-conductor.
2. Solar cell characteristics.
3. e/m by Thomson's method.
4. Uses of CRO for measurement of phase difference and Lissajos figures.
5. Hall effect and Hall coefficient.
6. Conductivity by four probe method.
7. Diode characteristics (Zener diode, Photo diode, LED, Ge/Si diode).
8. Plank's constant by photodiode.
9. Wavelength by diffraction grating.
10. Wavelength of LASER by diffraction grating.
11. Newton's rings.
12. Ultrasonic interferometer.
13. Sound intensity level measurement.
14. Wavelength of laser by diffraction.
15. Determination of refractive index for O-ray and E-ray.
16. Brewester's law.
17. Synthesis of ZnO nanoparticles by chemical method
18. Laser divergence angle
19. Determination of band gap of synthesized nanoparticles
20. Project based Learning
21. Project based Learning

Assignments:

At least ONE assignment on each unit

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

FUNDAMENTALS OF ELECTRICALENGINEERING

Course Code (C103)

Designation of Course	**Fundamentals of Electrical Engineering**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 03 Hours/ Week	End Semester Examination	60 Marks	Theory : 03 Practical : 01
Practical:- 02 Hours/ Week	Unit Test	40 Marks	
	Term Work / ~~Oral~~	25 Marks	
	Total	125 Marks	4

Course Pre-requisites: -	Students should have basic knowledge of Physics and Mathematics

Course Outcomes:

The students should be able to

1.	Understand and apply knowledge of Kirchoff's laws and network theorems to solve electrical networks
2.	Understand working principle and applications of AC Circuits, Switch gear and electrical measuring instruments
3.	Understand working principle, performance and applications of single phase & three phase Transformer
4.	Select& use AC motors, it's control techniques for various mechanical engineering applications
5.	Select & use DC motors, it's control techniques for various mechanical engineering applications
6.	Understand the working and performance analysis of Transmission and Distribution of power

Course Contents

Unit 1	**DC Circuit Analysis and Network Theorems:**	**(06 Hrs)**

Circuit Concepts: Concepts of network, Active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, R, L and C as linear elements, source transformation. Kirchhoff's laws; loop and nodal methods of analysis; star-delta transformation; Network Theorems: Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem (simple numerical problems).

Unit 2	**AC Circuits and Switch Gear, Electrical Measurement**	**(06 Hrs)**

Representation of sinusoidal waveforms, peak and RMS values, Phasor representation of AC quantities, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), Series and parallel resonance. Three phase balanced circuits, voltage and current relations in star and delta connections, Power measurement in three phase circuits. Electrical instruments such as wattmeter, energy meter, tong-tester, megger and power analyser. Introduction to LT Switchgear, NO and NC Contacts, Contactors, relay, timers, use in control panel, application in interlocking and protection, symbols.

Unit 3	**Transformers**	**(06 Hrs)**

Single Phase Transformer: Working principle, Construction, types, EMF equation, Transformer on no load and on load, vector diagram, exact and approximate equivalent circuit, O.C & S.C.test on transformer, regulation of transformer, losses &efficiency, condition for maximum efficiency, Allday efficiency, Efficiency curve, Sumpner's test, Auto transformer, Saving of conductor material, Parallel operation, Conditions, Parallel with equal and unequal voltage ratio.

3 Phase transformers: Construction, connections, Scott connection, V-V Connection, Instrument transformers, Current transformers and potential transformers.

Unit 4	**Induction Machines:**	**(06 Hrs)**

3 Phase induction motor: Construction, types, rotating magnetic field, principle of operation, slip, frequency of rotor current, rotor emf, rotor current, expression for torque, conditions for maximum torque, torque slip characteristics, starting torque in squirrel cage and slip ring motors, effect of change in supply voltage on torque, slip and speed , relation between full load torque and maximum torque, Power stages in induction motor, vector diagram and equivalent

circuit, circle diagram, construction and calculation, speed control of 3 phase motor, starting methods for 3 phase induction motor.

Single phase motor: Double revolving field theory, starting methods, no load and block rotor test, equivalent circuit, types of single-phase motor.

Servomotor: Servomotor, construction, types, working, characteristics, application in automation and robotics.

Unit 5	**DC Machines**	**(06 Hrs)**

DC Generator: Construction features, emf equation of dc generator, methods of excitation, losses condition for maximum efficiency, armature reaction, interpoles and compensating winding, commutation, methods of improving commutation, characteristics of separately excited and self excited dc generator.

DC Motor: Working principle, voltage equation, condition for maximum power, characteristics, operating characteristics of dc motor, torque developed, starting ,3 point and 4 point starter, speed control methods, Swinburn's and break test of dc shunt motor.

Unit 6	**Basic of Power transmission and distribution, safety measures**	**(06 Hrs)**

Classification of transmission lines, transmission line parameters, ABCD constants, Voltage regulation, Ferranti effect, efficiency of transmission line. 3-phase 3-wire and 3-phase 4-wire distribution system, feeders, distributors, main lines, comparison of various distribution systems, load power factor improvement techniques. Safety measures in electrical system, basic principles of earthing-types of earthing.

List of Experiments-

Term work shall consist of Minimum Eight Experiments.

Text Books/ Reference Books

Electrical Technology - Edward Huges (Pearson)
Basic Electrical Engineering - D. P. Kothari, J Nagarath (TMC)
Electrical power system technology - S. W. Fordo, D. R. Patric (Prentice Hall)
Principles of Electronics-Dr. H. M. Rai (SatyaPrakashan)
Electronic Devices and Circuit Theory- R. L. Boylestad and L. Nashelsky (PHI)
Electrical, Electronics Measurements and Instruments - (SatyaPrakashan)

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

ENGINEERING GRAPHICS

Course Code (C104)

Designation of Course	**ENGINEERING GRAPHICS**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory :- 03 Hours/ Week	End Semester Examination	60 Marks	03
Practical :- 04 Hours/ Week	Unit Test	40 Marks	
	Term Work	25 Marks	01
	Oral/~~Practical~~	25 Marks	01
	Total	150 Marks	05

Course Prerequisites:-	Knowledge of basic geometry
Course Outcomes:-	1. Different engineering curves and dimensioning. 2. Differentiate Ist angle and IIIrd angle projection Method in orthographic. 3. To interpret views of the object and to draw by using Isometric projection method. 4. Projection of Lines, its traces and planes. 5. Projection of different solids. 6. Development of lateral surfaces of solids.

Course Contents

Unit 1	**Lines and Dimensioning in Engineering Drawing and Engineering Curves**	**(06 Hrs.)**
Different types of lines used in drawing practice, Dimensioning – linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. **Ellipse by Arcs of Circle method, Concentric circle method. Involutes of a circle, Cycloid, Archimedean Spiral, Helix on cone & cylinder.** **Introduction to Auto CAD commands.**		
Unit 2	**Orthographic Projection**	**(06 Hrs.)**
Basic principles of orthographic projection (First and Third angle method). Orthographic projection of objects by first angle projection method only. Procedure for preparing scaled drawing, sectional views and types of cutting planes and their representation, hatching of sections. (Also using AutoCAD commands)		
Unit 3	**Isometric Projections**	**(06 Hrs.)**
Isometric view, Isometric scale to draw Isometric projection, Non-Isometric lines, and construction of Isometric view from given orthographic views and to construct Isometric view. **(Also using AutoCAD commands)**		
Unit 4	**Projections of Points, Lines and Planes**	**(06 Hrs.)**
Projections of points, projections of lines, lines inclined to one reference plane, Lines inclined to both reference planes. (Lines in First Quadrant Only) Traces of lines, Projections of Planes, Angle between two planes, Distance of a point from a given plane, Inclination of the plane with HP, VP. (Also using AutoCAD commands)		
Unit 5	**Projection of Solids**	**(06 Hrs.)**
Projection of prism, pyramid, cone and cylinder by rotation method. (Also using AutoCAD commands)		

Unit 6	Development of Lateral Surfaces (DLS) of Solids.	(06 Hrs.)
Introduction to development of lateral surfaces and its Industrial application, draw the development of lateral surfaces of cone, pyramid and prism. (Also using AutoCAD commands)		

Term work

Term work shall consist of half imperial size or A2 size (594 mm x 420 mm) sheets.
All sheets should complete in drawing hall manually and sheet no 2-7 also completed using AutoCAD with printout on A2 size papers.

Sheets

1. Types of lines, Dimensioning practice, free hand lettering, 1nd and 3rd angle methods symbol.
2. Engineering curves.
3. Orthographic Projections.
4. Isometric views.
5. Projections of Points and Lines and planes.
6. Projection of Solids.
7. Development of lateral surfaces.

Text Books/ Reference Books

1. "Elementary Engineering Drawing", N.D. Bhatt, Charotar Publishing house, Anand India,
2. "Text Book on Engineering Drawing", K.L.Narayana & P.Kannaiah, Scitech Publications, Chennai.
3. "Fundamentals of Engineering Drawing", Warren J. Luzzader, Prentice Hall of India, New Delhi ,
4. "Engineering Drawing and Graphics", Venugopal K., New Age International publishers.
5. M. B. Shah and B. C. Rana, "Engineering Drawing", 1st Ed, Pearson Education, 2005
6. P. S. Gill, "Engineering Drawing (Geometrical Drawing)", 10 Edition, S. K. Kataria and Sons, 2005
7. P. J. Shah, "Engineering Drawing", C. Jamnadas and Co., 1 Edition, 1988

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

FUNDAMENTALS OF MECHANICAL ENGINEERING

Course Code (C105)

Designation of Course	**Fundamentals of Mechanical Engineering**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory: 04
Practical:- 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	0.5
	Oral/~~Practical~~	25 Marks	0.5
	Total	150 Marks	05

Course Prerequisites:-	Students should have the basic knowledge of Physics at Higher Secondary School Certificate
Course Objective	To develop understanding about thermal, fluid, design and manufacturing aspects in mechanical engineering
Course Outcomes:-	1. Understand the first law of thermodynamics andits applications in flow and non-flow thermodynamic processes 2. Define and calculate fluid properties 3. Design and analyze mechanisms of machines 4. Analyze mechanical elements and compare their suitability for various applications 5. Illustrate metal working processes with sketches 6. Classify metals cutting machines and illustrate various operations

Course Contents

Unit 1	**Applications of first law of thermodynamics**	(8 Hrs.)
A] Flow and non-flow process First law of thermodynamics apply to non-flow process, steady flow energy equation and its application to different power producing and absorbing devices (boiler, turbine, condenser, nozzle, diffuser, pump, compressor) B] Power producing and absorbing devices Introduction to I.C. Engines, steam turbines, gas turbines, Introduction to centrifugal pumps and reciprocating pumps, reciprocating and rotary air compressors, refrigeration, vapour compression cycle, vapour absorption cycle, split air conditioning		
Unit 2	**Properties of Fluids**	(8 Hrs.)
Introduction, Definition of fluid, Development of fluid mechanics, mass density, specific weight, specific volume, specific gravity, equation of state, the perfect gas, viscosity, vapour pressure, compressibility, elasticity, surface tension and capillarity		
Unit 3	**Mechanism of machines**	(8 Hrs.)
Kinematic link, Kinematic pair, Kinematic chain, mechanism of machines, structure, Degree of freedom of planar mechanism, Inversions of four bar chain, Inversions of Single and double slider crank chain, Geneva mechanism, Ratchet and Paul mechanism		
Unit 4	**Introduction to machine elements**	(8 Hrs.)
Types of Belts and belt drives, Chain drive, rope drive, Types of gears, Types of gear trains, Types of Couplings, types of friction clutch, Power transmission shafts, axles, keys, types of Keys, Sliding Contact and Rolling Contact Bearing, Bush and ball bearings, Types of brakes.		

Unit 5	**Manufacturing Processes**	(8 Hrs.)
Introduction, Hot working, Cold working, Sheet metal forming, Sheet metal cutting, Forging, Open die forging, Closed die forging, Forging defects, Rolling, Ring Rolling, Cold Rolling, Rolling defects, Extrusion, Extrusion process, wire drawing, extrusion defects, deep drawing, casting & its applications, Metal joining processes- Welding-Metal Arc Welding, Concept of Soldering, Brazing and its applications.		
Unit 6	**Machine tools**	(8 Hrs.)
Lathe Machine– Centre Lathe, Operations Performed on Lathe Machine, Drilling Machine- types of drilling machines, Operations performed on drilling machines, Power saw (Block diagram & its Applications), Grinding Machine- Cylindrical Grinder, Surface Grinder.		

Term work shall consist of any Eight Experiments of the following list

1. Study of application of steady flow energy equation
2. Study and demonstration of two stroke and four stroke engines
3. Study and demonstration of pumps and compressor
4. Study and demonstration domestic refrigerator & window air-conditioner
5. Measurement of viscosity using Redwood viscometer
6. Study of power transmitting elements coupling, gears and bearings
7. Study and demonstration of different types of clutches
8. Assembly and working of 4-bar, 6-bar, 8- bar planner mechanisms
9. Finding relation between input angle and output angle for various link lengths
10. Study and demonstration of operations on Centre lathe
11. Study and demonstration of operations on drilling machines

Text Books/ Reference Books

1. Thermodynamics: an Engineering Approach by Yunus A. Cengel & Michael A. Boles, McGraw-Hill Publication, 8th Edition (2014).
2. Hydraulics and Fluid Mechanics Including Hydraulics Machines, Dr., P.N. Modi & Dr. S. M. Seth, Standard book house, 22nd Edition (2019).
3. Internal Combustion Engine, V. Ganeshan, Tata McGraw-Hill Publication, 4th Edition (2012).
4. Fluid Mechanics and Hydraulic Machines by R K Bansal, Laxmi Publications, 10th Edition (2018).
5. Heat and Mass Transfer by R K Rajput, S Chand Publication, 5th revised edition (2012).
6. Mechanisms and Machine Theory, Ambekar A.G., Prentice-Hall of India, Eastern Economy Edition (2007)
7. Theory of Machines, S.S. Ratan, Tata McGraw Hill, 4th Edition (2014).
8. A Textbook of Production engineering" P.C. Sharma, S. Chand Publication, New Delhi, 2nd edition, 8th Edition (2014).
9. A Textbook of Manufacturing Technology: Manufacturing Processes, R. K. Rajput, Laxmi Publications (P) Ltd, 2nd Edition 2015

Assignments:

At least ONE assignment on each unit

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

Workshop Technology
Course Code (C106)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: --2 Hrs./Week	TW : 50 Marks	01 Credits

Prerequisites:-	Basics of physics, chemistry, mathematics and measurements.
Course	To develop understanding about thermal, fluid, design and manufacturing aspects in mechanical engineering
Course Objective:-	• To develop a skill in dignity of labor, precision, safety at workplace, team working and development of right attitude. • To acquire skills in basic engineering practice • To identify the hand tools and instruments • To develop general machining skills in the students
Course Outcomes:-	Student Should be able to, 1) Understand the Measuring and Marking systems used in Carpentry Work. 2) Understand the Hot working Processes. 3) Understand the Techniques of Welding. 4) Understand the Machine tools, Mechanisms and Drilling operations.

Instruction and Demonstration: Instruction should be given for each of following shops which include importance of the shop in engineering, new materials available, use of each tool / equipment, methods of processing any special machines, power required etc.

Four Sections
Section 1 – Carpentry (Two Practical's on Pattern making Carpentry Batch Job)
Study of tools & operations and carpentry joints, Simple exercise using jack plane, Simple exercise on woodworking lathe.
Section 2 – Black Smithy and Tin Smithy (3 Practicals on Black Smithy and Tin Smithy-Batch Job)
Study of tools & operations, Simple exercises base on smithy operations such as upsetting, drawing down, punching, bending, fullering &swagin
Section 3 – Welding Processes. (Two Practical's on Welding batch Job)
Study of tools & operations of Gas welding & Arc welding, Simple butt and Lap welded joints, Oxy-acetylene flame cutting.
Section 4 – Machining Processes (Making Batch Job on Lathe Machine and Milling Grinding Process 4 practical)
Study of machine tools and operations, Demonstrations of basic machine tools like Lathe, Shaper, drilling machine with basic operations etc.

OPEN COURSE –I Business Communication

Course Code (C107)

Designation of Course	**Business Communication**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 2 Hours/ Week	End Semester Examination	50 Marks	Theory: 02 Tutorial: 00 Practical: 00
Tutorial : 00 Hours/ Week	Internal Assessment	00 Marks	
	Term Work	00 Marks	
	Oral/Practical Examination	00 Marks	
	Total	50 Marks	2

Course Prerequisites:-	Students should have knowledge of Basic English grammar Students should have basic information of sound system of English language Basics of written communication
Course Objective	The course objective of Business Communication is to help students understand the basic of English language through application of it in business. The units cover the aspects of functional grammar for inculcating the basics for business communication. It helps students to understand the process of communication in association with different components of communication. It also targets the understanding of different barriers that creep into communication process and different business documentation process.
Course Outcomes:-	Graduates will able to 01. To construct the error free sentences of English language and do implementation of it in the spoken and written business communication 02. Do applications of sounds of English language for correct pronunciation 03. To understand communication process and principles to do applications in business communication 04. Develop the ability to communicate effectively using suitable styles and techniques of communication 05. Build up the ability to study employment business communication skills and its proper implications 06. To construct effective business presentation and do effective implementation of it through activities

Course Contents

Unit 1	English grammar:	(4 Hrs.)
Forms of tense, articles, preposition, use of auxiliaries and modal auxiliaries, common errors, Vocabulary development through GRAPS-PT, types of sentences voice, direct indirect speech, degree of comparison		
Unit 2	Phonetics/study of sounds in English:	(4 Hrs.)
Introduction to phonetics, study of speech organs, study of phonetic script, transcriptions of words, articulation of different sound in English, reducing MTI, stress and intonation		
Unit 3	**Communication Skills**	(4 Hrs.)
Introduction, forms and function of communication process, non-verbal codes in communication, importance of LSRW in communication, Barriers to communication and overcoming them digital communication.		

Unit 4	**Mechanics of Written Communication**	(4 Hrs.)
Developing the mechanics of written communication: principles of effective writing, technical report writing; format, structure and its types, language development through literary text		
Unit 5	Honing employment communication:	(4 Hrs.)
Job application, building resume and CV, email writing, group discussion, interview skills, meeting formation, notice, agenda, minutes of meeting		
Unit 6	**Presentation skills:**	(4 Hrs.)
Designing effective presentation, understanding theme, developing content and layout of presentation, use of tone and language, technological tools for effective presentation, developing content for extempore, elocution and public speaking		

Reference Books:

1. Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition,
2. Spoken English- A manual of Speech and Phoonetics by R. K. Bansal, J. B. Harrison published by Orient Blackswan
3. Communication Skills by Sanjay Kumar, Pushp Lata, published by Oxford University press, second edition
4. Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press
5. Developing Communication Skills by Krishna Mohan, Meera Banerji published by Macmillan India Pvt Ltd

Recommended web-links for enhancing English language and business communication

1. http://www.bbc.co.uk/worldservice/learningenglish
2. http://www.englishlearner.com/tests/test.html
3. http://www.hodu.com/default.html
4. http://www.communicationskills.co.in/index.html

Assignments:

At least ONE assignment on each unit

ENGINEERING MATHEMATICS - II

Course Code (C108)

Designation of Course	**Engineering Mathematics - II**		
Teaching Scheme:	**Examination Scheme:**		**Credits**
Theory:- 03	End Semester Examination	60 Marks	Theory:03
Tutorial: 01 Hours/Week	Internal Assessment	40 Marks	Tutorial:01
	Term Work/ OR	- Marks	
	Total	100 Marks	04

Course Prerequisites:	Student must have basic knowledge of calculus.
Course Outcomes:	1. To develop an ability to solve differential equations of first order and first degree. 2. To develop an ability to form mathematical model of rectilinear motion, electric circuit, Fourier heat conduction, Newton's law of cooling. 3. To develop an ability to transform the Cartesian co-ordinates into spherical polar and cylindrical coordinate systems. 4. To develop an ability to represent periodic function as Fourier Series. 5. To develop an ability to evaluate definite integral by DUIS rules and to trace Cartesian and polar curves. 6. To develop an ability to apply methods to find area and volume by double and triple integration.

Course Contents

Unit 1	**Differential Equations (DE):**	**(8 Hrs.)**
Definition, Order and Degree of DE, Formation of DE. Solutions of Variable Separable DE, Exact DE, Linear DE and reducible to these types		
Unit 2	**Application of Differential Equations (DE):**	**(8 Hrs.)**
Applications of DE to Orthogonal Trajectories, Newton's Law of Cooling, Kirchoff's Law of Electrical Circuits, Motion under Gravity, Rectilinear Motion, One–Dimensional Conduction of Heat.		
Unit 3	**Fourier Series And Integral Calculus**	**(8 Hrs.)**
Fourier Series: Definition, Dirichlet's conditions, Fourier Series and Half Range Fourier Series, Harmonic Analysis. **Integral Calculus:** Differentiation Under the Integral Sign, Error functions		
Unit 4	**Integral Calculus And Curve Tracing**	**(8 Hrs.)**
Integral Calculus: Reduction formulae, Beta and Gamma functions **Curve Tracing:** Tracing of Curves, Cartesian, Polar. Rectification of Curves		
Unit 5	**Solid Geometry**	**(8 Hrs.)**
Solid Geometry: Cartesian, Spherical Polar and Cylindrical Coordinate Systems. Sphere, Cone and Cylinder		
Unit 6	**Multiple Integrals and their Applications**	**(8 Hrs.)**
Multiple Integrals and their Applications: Double and Triple integrations, Applications to Area, Volume, Mean and Root Mean Square Values.		

Text Books:

1. Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill),Edition ,2008.
2. Applied Mathematics (Volumes I and II) by P. N. Wartikar& J. N. Wartikar (Pune VidyarthiGrihaPrakashan, Pune), 7th Edition, 1988,Reprint2010.

Reference Books:

1. Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education), 2nd ,Edition, 2002.
2. Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.), 8th Edition, 1999,Reprint 2010.
3. Advanced Engineering Mathematics, Wylie C.R. & Barrett L.C. (McGraw-Hill, Inc.) , 6th Edition,1995 .
4. Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi),42th Edition ,2012.

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

ENGINEERING CHEMISTRY
Course Code (C109)

Designation of Course	**Engineering Chemistry**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 3 Hours/ Week	End Semester Examination	60 Marks	Theory: 03
Practical : 02 Hours/ Week	Internal Assessment	40 Marks	
	Term Work	25 Marks	Practical: 01
	Oral/Practical Examination	-- Marks	
	Total	125 Marks	4

Course Prerequisites:-	Student should have Basic Knowledge of Chemistry
Course Objective	1. To understand technology involved in analysis and improving quality of water as commodity. 2. To acquire the knowledge of electro-analytical techniques that facilitates rapid and precise understanding of materials. 3. To understand structure, properties and applications of speciality polymers and nano material. 4. To study conventional and alternative fuels with respect to their properties and applications. 5. To study spectroscopic techniques for chemical analysis. **6.** To understand corrosion mechanisms and preventive methods for corrosion control.
Course Outcomes:-	On completion of the course, learner will be able to– CO1: Select appropriate method of crystal analysis. CO2: Illustrate the knowledge of polymers, fabrication methods, conducting polymers in industrial fields. CO3: Illustrate the knowledge of engineering materials for various engineering applications. CO4: Analyze fuel with calorific value and apply combustion methods for use of alternative fuels. CO5: Explain corrosion and methods for prevention of corrosion. CO6: Apply the different methodologies for analysis of water and suggest suitable methods of treatment.

Course Contents

Unit 1	**Material Chemistry**	(06 Hrs.)
Crystallography: Unit cell, Law of crystallography, Weiss indices and Miller indices, Crystal defects(point and line defects), X-ray diffraction- Bragg's Law and numerical, Indexing of planes and directions, Imperfections in crystals, Density calculations, Volume density, Linear density, Atomic packing factor single crystal structure.		
Unit 2	**Study of Polymers, Composite and ceramics Materials**	(06 Hrs.)
A) Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers and Biopolymers (Introduction, examples and applications.) **B)Composite:** Introduction, Classification, constituents of composites, Fiber reinforced composites, unidirectional fiber reinforced composites, short fiber reinforced composites, particle reinforced composites, important types and failures of fiber reinforced composites, Advantages and applications of composites. **C) Ceramics:** Introduction, classification, properties, ceramics crystal, Mechanical behaviour of Ceramics.		
Unit 3	**Study of Non Ferrous Materials**	(06 Hrs.)
Introduction, Copper and it's alloy, Alpha and alpha beta brasses, Zinc Equivalent, Copper Nickel alloy, Bronzes, Aluminium and it's alloy, Dispersion strengthening, Nickel and it's alloy, Metals at High and Low Temperature, Bearing Materials etc		
Unit 4	**Fuels and Combustion**	(06 Hrs.)
Definition, classification, characteristics of a good fuel, units of heat (no conversions).		

Calorific value- Definition, Gross or Higher calorific value & Net or lower calorific value, Dulong's formula & numerical for calculations of Gross and Netcalorific values. Solid fuels- Analysis of coal- Proximate and Ultimate Analysis- numerical problems and significance. Liquid fuels- Petrol- Knocking, Octane number, Cetane number, Antiknocking agents, unleaded petrol, oxygenates (MTBE), catalytic converter. Combustion- Calculations for requirement of only oxygen and air (by weight and by volume only) for given solid & gaseous fuels.		
Unit 5	**Corrosion and Prevention**	(06 Hrs.)
Introduction, Types of corrosion, Oxide film growth laws, Action of hydrogen, Polarization, Stress corrosion, Season Cracking, Prevention of corrosion, Design of component, Modification of environment, Cathodic Protection, Deposition and coating, Ion Implantation, PVD, CVD, Powder coating etc.		
Unit 6	**Water Technology and Green Chemistry**	(06 Hrs.)
Water Technology -Impurities in water. Hardness of water and its determination by EDTA method, Alkalinity of water and its determination. Numerical. Ill effects of hard water in boiler. Boiler feed water treatment 1) Internal treatment -calgon, colloidal and phosphate conditioning, 2)External treatment A) Zeolite process and its numerical (B) Ion exchanger method. Desalination of brackish water/purification of water by reverse osmosis and electrodialysis. **Green Chemistry:** Definition, goals of green chemistry, efficiency parameters, need of green chemistry.		

Text Books/ Reference Books

1. Jain P.C & Jain Monica, Engineering Chemistry, Dhanpat Rai & Sons, Delhi, 1992.
2. Bhal & Tuli, Text book of Physical Chemistry (C1995), S. Chand & Company, New Delhi.
3. O. G. Palanna , Engineering Chemistry, Tata McGraw-Hill Publication, New Delhi.
4. S. S. Dara, A textbook of Engineering Chemistry, McGraw-Hill Publication, New Delhi.

Reference books:

1. Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
2. Shikha Agarwal, Engineering Chemistry- Fundamentals and applications, Cambridge Publishers - 2015.
3. WILEY, Engineering Chemistry, Wiley India, New Delhi 2014.
4. Atkins, Physical chemistry.

Assignments:

One assignment on each unit.

List of Experiments: (Perform any 08 Experiments)

1.To determine hardness of water by EDTA method
2. To determine strength of strong acid using pH meter
3. Titration of a mixture of weak acid and strong acid with strong base using conductometer
4. Preparation of polystyrene/phenol-formaldehyde/urea-formaldehyde resin
5. To determine molecular weight/radius of macromolecule polystyrene/ polyvinyl alcohol by viscosity measurement.
6. Preparation of biodiesel from oil.
7. Determination of Saponification value of an oil sample.
8. Estimation of percentage of Iron in Plain Carbon Steel by Volumetric Method
9. To determine Surface Tension of given liquid by Stalagmometer
10. Study of corrosion of metals in medium of different pH.
11. To set up Daniel cell
12. To determine pH of soil
13. To determine Acidity of soil
14. Study of Bomb calorimeter for determination of calorific value.

15. Determination of calorific value of gas fuel by using Boy's gas calorimeter.
16.Determination of percentage of Ca in given cement sample

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

FUNDAMENTALS OF ELECTRONICS ENGINEERING

Course Code (C110)

Designation of Course	**Fundamentals of Electronics Engineering**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 04 Hours/ Week	End Semester Examination	60 Marks	Theory : 04 Practical : 01
Practical:-02 Hours/ Week	Unit Test	40 Marks	
	Term Work / Oral	25 Marks	
	Total	125 Marks	05

Course Pre-requisites:-	Students should have the basic knowledge of Electrical Engineering.

Course Contents

Unit 1	**Electronic Devices and Linear ICs**	(08 Hrs)
Rectifiers: Half wave, Full wave and Bridge rectifiers - capacitor filter-wave forms-ripple factor regulation characteristics. Special semiconductor devices: : FET, SCR. LED, MOSFET, DIAC, TRIAC, relays , VI characteristics – applications		
Unit 2	**Digital Electronics**	(08 Hrs)
Number system – Binary, Decimal, Octal, Hela decimal, Digital Signal, Combinational and sequential logic circuits, clock signal, Boolean Algebra and Logic gates, Arithmetic Operations, Multiplexers, Demultiplexers, Encoders, Decoders, Flip-flop, Registers, Counters. Integrated circuits & logic families: – Logic levels, noise immunity, fan out, propagation delay, TTL logic family, CMOS logic family, comparison with TTL family		
Unit 3	**Signal Conditioning**	(08 Hrs)
Operational amplifiers, Inverting, non-inverting, voltage follower, summing, subtractor, Instrumentation, 555 timer-operating modes: monostable, astable multivibrator, Analog to Digital & Digital to Analog Convertors		
Unit 4	**Communication systems**	(08 Hrs)
Analog Communication & Digital communication: Block diagram of a basic communication system, Frequency spectrum, need for modulation, Methods of modulations- Principles of AM,FM, Pulse analog & pulse digital modulation, AM/FM transmitters & receivers, satellite communication – Radar system, data transmission and MODEM, Mobile communication systems: cellular concept, simple block diagram of GSM system		
Unit 5	**Transducers and Data Acquisition Systems**	(08 Hrs)
Basic requirement of transducers, classification of transducers, passive transducers: Resistive, capacitive, inductive, LVDT, potentiometric, strain gauge, thermistor, hall effect, proximity sensors. Active transducers: Piezoelectric, photoelectric & thermocouple. Static characteristics of transducer, selection of transducer. Block diagram of data acquisition systems and its applications.		
Unit 6	**Microprocessor & Microcontroller**	(08 Hrs)
Overview of generic microprocessor, architecture & functional block diagram, comparison of microprocessor & microcontroller. 8051 Architecture, ports, resisters, timers/counters. Serial communications, interrupts. Interfacing of relay, stepper motor, LCD Display, Keyboard, ADC.		

List of Experiments-

Term work shall consist of Minimum Eight **Experiments.**

Text Books/ Reference Books

1) K.P. Ramchandran, G.K. Vijyaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008
2) W.Bolton, Mechatronics - A Multidisciplinary approach, 4th Edition, Prentice Hall, 2009.
3) Dr. D.S.Kumar, Mechanical Measurement & Control, Metropolitan Book Co. Pvt.Ltd. New Delhi,2007
4) M.D. Singh and J.G.Joshi, Mechatronics, 3rd Edition, Prentice Hall, New Delhi, 2009.

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

ENGINEERING MECHANICS
Course Code (C111)

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours / Week	End Semester Examination: 60 Marks Continuous Assessment: 40 Marks	Theory: 04
Practical: 02 Hours / Week	Term Work: 25 Marks	Credit: 01
Tutorial: 01 Hour / Week (Mech., Prod.)		Total: 05

Course Pre-requisites: The students should have knowledge of	
1	Physics- Forces, Newton's law of motion, Concept of physical quantities, their units and conversion of units, Scalar and Vector
2	Mathematics- Algebra, Geometry, Concept of differentiation and integration
Course Objectives:	
	The student should be able to determine effect of forces and concept of equilibrium on rigid object to solve engineering problems.
Course Outcomes: The student will be able to	
1	calculate resultant and apply conditions of equilibrium.
2	calculate friction force and its effect.
3	analyze the truss
4	calculate centroid and moment of inertia.
5	evaluate kinematic effect of forces
6	evaluate kinetic effect of forces

Course Content:

UNIT - I	**Resultant and Equilibrium** Types and Resolution of forces, Moment and Couple, Free Body Diagram, Types of Supports, Classification and Resultant of a force system in a Plane - Analytical and Graphical approach.. Equilibrant, Conditions of Equilibrium, Equilibrium of a force system in a Plane, Force and Couple system about a point.	**(08 Hours)**
UNIT - II	**Friction** Coefficient of Static Friction, Impending motion of Blocks, Ladders and Belts.	**(08 Hours)**
UNIT - III	**Analysis of Truss** Analysis of Perfect Trusses - Method of Joint, Method of Section	**(08 Hours)**
UNIT - IV	**Centroid and Moment of Inertia** Centroid of line and plane areas, Moment of Inertia of plane areas, parallel and perpendicular axis theorem, radius of gyration, least moment of inertia.	**(08 Hours)**
UNIT - V	**Kinematics of a Particle** Cartesian components, Normal and Tangential components of motion, Relative motion, Dependent motion, Motion of a Projectile,	**(08 Hours)**
UNIT - VI	**Kinetics of a Particle** D'Alemberts Principle, Work-Energy Principle and Impulse-Momentum Principle, Coefficient of Restitution, Direct Central Impact.	**(08 Hours)**

Term Work:

Part- A	The term-work shall consist of minimum **Five** experiments from list below.	
	1) Study of equilibrium of concurrent force system in a plane	
	2) Determination of reactions of Simple and Compound beam.	
	3) Determination of coefficient of friction for Flat Belt.	

	4) Determination of coefficient of friction for Rope.	
	5) Determination of Centroid of line or plane elements.	
	6) Study of Curvilinear motion.	
	7) Determination of Coefficient of Restitution.	
Part- B	The term-work shall also consist of minimum **Five** graphical solutions of the problems on different topics.	

Text Books:
"Engineering Mechanics" (Statics and Dynamics)",Hibbeler R.C., McMillan Publication
"Vector Mechanics for Engineers-Vol.-I and Vol.-II (Statics and Dynamics)", Beer F.P. and Johnston E.R., Tata McGraw Hill Publication.
"Engineering Mechanics",Bhavikatti S.S. and Rajashekarappa K.G., New Age International (P) Ltd.
"Engineering Mechanics (Statics and Dynamics)",Tayal A.K., Umesh Publication
"Engineering Mechanics-I and II (Statics and Dynamics)", Mokashi V.S., Tata McGraw Hill Publication
Reference Books:
"Engineering Mechanics (Statics and Dynamics)", Shames I.H., Prentice Hall of India (P) Ltd.
"Engineering Mechanics (Statics and Dynamics)", Singer F.L., Harper and Row Publication
Engineering Mechanics (Statics and Dynamics)",Meriam J.L. and Kraige L.G., John Wiley and Sons Publication
"Engineering Mechanics (Statics and Dynamics)",Timoshenko S.P. and Young D.H., McGraw Hill Publication

Unit Tests

Unit Test-I	Unit-I,II, III
Unit Test-II	Unit- IV, V, VI

PROGRAMMING SKILLS- I

Course Code (C112)

Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory: - 0 Hour/ Week	End Semester Examination	-	--
Practical: -04 hours/Week	Unit Test	-	
	Term Work	50 Marks	1
	Practical	50 Marks	1
	Total	100 Marks	2

Course Prerequisites: -	Basic Mathematics
Course Objective: -	The goal of the course is that students should develop techniques for problem solving using a programming language.
Course Outcomes	Students should 1. understand and be able to write simple programs 2. to understand structured programming including conditionals and loops 3. write functions to perform specific tasks in a program 4. store data using pointers, functions, and operators 5. use the concept of arrays and strings to deal with big data 6. To understand how to structure complex data and how to systematically structure large programs

Course Contents

Unit 1	**Introduction to C++**	(02Hrs.)
Module 1	Introduction to C, C++; Object oriented programming; Programming Fundamentals; Data and Data Types	
Module 2	Declarations in C++; Operators in C++; Introduction to classes and objects and strings	
Unit 2	**Control Statements and Loops**	(02Hrs.)
Module 3	Relational and logical operators; If statements; Switch Statements	
Module 4	Loops in C++; For loop; While loop; Do while loop; Jump statement	
Unit 3	**Functions**	(02Hrs.)
Module 5	Functions basic formats; Recursion	
Module 6	Overloaded functions; Local, Global and Static Variables	
Unit 4	**Pointers**	(02Hrs.)
Module 7	Data Variables and memory; Address operator: &	
Module 8	Pointers; Functions, pointers and Indirection Operators	
Unit 5	**Arrays and Strings**	(02Hrs.)
Module 9	Arrays Fundamentals; Arrays and Functions; Character Arrays	
Module 10	Multidimensional Arrays; Multidimensional Arrays and Functions; Array filling from data files	
Unit 6	**Classes, Structure and Objects**	(02Hrs.)
Module 11	Objects and classes; Class members; Class Destructors	
Module 12	Array of objects; Overloaded operators and objects	

Term work

Term work shall consist programs (not limited to)listed below based on modules as described in syllabus.

Unit 1: Introduction to C++

Module 1	1. "Hello, World!" Program 2. Program to Print Number Entered by User 3. Program to Add Two Numbers 4. Program to Find Quotient and Remainder
Module 2	5. Program to Find Size of int, float, double and char in Your System 6. Program to Swap Two Numbers 7. Program to Find ASCII Value of a Character 8. Program to Multiply two Numbers
Unit 2: Control Statements and Loops	
Module 3	9. Program to Check Whether Number is Even or Odd 10. Program to Check Whether a character is Vowel or Consonant. 11. Program to Find Largest Number Among Three Numbers 12. Program to Find All Roots of a Quadratic Equation 13. Program to Calculate Sum of Natural Numbers 14. Program to Check Leap Year 15. Program to Find Factorial 16. Program to Generate Multiplication Table 17. Program to Display Fibonacci Series 18. Program to Find GCD 19. Program to Find LCM
Module 4	20. Program to Reverse a Number 21. Program to Calculate Power of a Number 22. Program to Check Whether a Number is Palindrome or Not 23. Program to Check Whether a Number is Prime or Not 24. Program to Display Prime Numbers Between Two Intervals 25. Program to Check Armstrong Number 26. Program to Display Armstrong Number Between Two Intervals 27. Program to Display Factors of a Number 28. Programs to Create Pyramid and Pattern 29. Program to Make a Simple Calculator to Add, Subtract, Multiply or Divide Using switch… case
Unit 3: Functions I	
Module 5	30. Program to Display Prime Numbers Between Two Intervals Using Functions 31. Program to Check Prime Number By Creating a Function 32. Program to Check Whether a Number can be Express as Sum of Two Prime Numbers 33. Program to Find Sum of Natural Numbers using Recursion
Module 6	34. Program to Calculate Factorial of a Number Using Recursion 35. Program to Find G.C.D Using Recursion 36. Program to Convert Binary Number to Decimal and vice-versa 37. Program to Convert Octal Number to Decimal and vice-versa 38. Program to Convert Binary Number to Octal and vice-versa 39. Program to Reverse a Sentence Using Recursion 40. Program to Calculate Power Using Recursion
Unit 4: Function II	
Module 7	41. Address in C++ 42. Program to demonstrate the working of pointer. 43. Program to display address of elements of an array using both array and pointers. 44. Program to display address of array elements using pointer notation. 45. Program to insert and display data entered by using pointer notation. 46. Program for Passing by reference using pointers

Module 8	47. Program to Swap Numbers Using Pointers In C++ 48. Program to Add Two Numbers Using Pointer in C++ 49. Program to Count vowels String Using Pointer in C++ 50. Program for Length of String Using Pointer In C++ 51. Program to Read, Print and Sum of Integer in an array using pointers in C++ 52. Program for Passing pointers to functions In C++ 53. Program for Area Of Circle Using Pointer In C++
Unit 5: Arrays	
Module 9	54. Program to Calculate Average of Numbers Using Arrays 55. Program to Find Largest Element of an Array 56. Program to Calculate Standard Deviation 57. Program to Add Two Matrix Using Multi-dimensional Arrays 58. Program to Multiply Two Matrix Using Multi-dimensional Arrays 59. Program to Find Transpose of a Matrix 60. Program to Multiply two Matrices by Passing Matrix to Function 61. Program to Access Elements of an Array Using Pointer
Module 10	62. Program to Swap Numbers in Cyclic Order Using Call by Reference 63. Program to Find the Frequency of Characters in a String 64. Program to Find the Number of Vowels, Consonants, Digits and White Spaces in a String 65. Program to Remove all Characters in a String Except Alphabets. 66. Program to Find the Length of a String 67. Program to Concatenate Two Strings 68. Program to Copy Strings 69. Program to Sort Elements in Lexicographical Order (Dictionary Order)
Unit 6: Classes and Objects	
Module 11	70. Program to Store Information of a Student in a Structure 71. Program to Add Two Distances (in inch-feet) System Using Structures 72. Program to Add Complex Numbers by Passing Structure to a Function 73. Program to Calculate Difference Between Two Time Period
Module 12	74. Program to Store and Display Information Using Structure 75. Increment ++ and Decrement -- Operator Overloading in C++ Programming 76. Program to Subtract Complex Number Using Operator Overloading

Text Books/ Reference Books

1. “C++ programming Today”, Barbara Johnston, Prentice Hall of India, New Delhi.
2. “C++ how to program”, Paul Deitel and Henry Deitel, Prentice Hall of India, New Delhi.
3. "Accelerated C++: Practical Programming by Example", Andrew Koenig and Barbara E. Moo, Addison-Wesley Publications
4. "C++: The Complete Reference", Herbert Schildt, McGraw Hill Publications.
5. "C++ Primer"; Barbara E. Moo, Josée Lajoie and Stanley B. Lippman; Addison-Wesley Professional
6. "Programming: Principles and Practice Using C++", Bjarne Stroustrup, Addison-Wesley Professional
7. "Let Us C++", Kanetkar Yashavant, BPB Publications

Production Practice
Course Code (C113)

TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS ALLOTTED:
Practical: --2 Hrs./Week	TW: 25 Marks	01 Credits

Pre-requisites: Basics of Manufacturing processes ,work shop tools , equipment's used in workshops.

Course Outcomes:

- Understand modern manufacturing operations, including their capabilities, limitations.
- Learn how to analyze products and be able to improve their manufacturability and make the cost effectively
- To acquire practical skills in the trades.
- To provides the knowledge of job materials in various shops.

Course Objectives

Student Should be able to,

1) Get the idea about Plastic Formation and sheet metal work
2) Understand the various machining operations on lathe
3) Understand the processes of casting.
4) Understand the techniques of TIG, MIG and spot Welding.

Four Sections

Section 1 – **Plastic Moulding And Pattern Making job**(Three Practical's For Individual Job Making)
Study of tools & operations like plastic moiding , Pattern making, Mould making with the use of a core.

Section 2– **Machining Processes** (4 Practicals For Individual Job Making On Lathe Machine)
Study of tools & operations, Simple exercises involving turning on lathe work, Make perfect male-female joint, Simple exercises involving drilling/tapping/threading.

Section 3 –Casting And Sand Molding.(Two Practical's Casting Formation as a Batch Job)
Study of tools & operations like Pattern making, Mould making with the use of a core. Various Casting processes, Sand casting, Die casting.

Section 4 – Arc,TIG, MIG And Resistance Welding Processes (Three Practical's For Individual Job Making)
Study of tools & operations of Arc welding, Simple butt and Lap welded joints, Oxy-acetylene flame cutting, TIG, MIG And Resistance Welding Processes.

COMPUTER AIDED MACHINE DRAWING

Course Code (C114)

Designation of Course	**Computer Aided Machine Drawing**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory: -00 Hours/ Week			Theory: 00
Practical: 04 Hours/ Week			
	Term Work	50 Marks	Term Work: 01
	Oral/Practical Examination	50 Marks	Practical: 01
	Total	100 Marks	2

Course Prerequisites	1. Knowledge of basic concept of Engineering Graphics. 2. Basic knowledge of Mechanical Engineering drawing. 3. Basic knowledge of Computer Hardware and AutoCAD Software.
Course Objective	1. Understand Indian standards for machine drawing. 2. Understand Fits and Tolerances in manufacturing drawing. 3. Visualize and prepare assembly drawing of a given object. 4. Prepare detailed drawing of any given physical object/machine element.
Course Outcomes	Able to understand- 1. Indian standards for machine drawing. 2. Conventional and geometrical Tolerances in manufacturing drawing. 3. Prepare assembly drawings of joints, couplings and machine elements. 4. Preparation of details and assembly drawings of Bearings. 5. Visualize and prepare detail drawing of a given object. 6. Prepare detailed drawing of any given physical object/machine element.

Course Contents

Unit 1	**Conventional Representation**	(02 Hrs.)
BIS Code of practice for Engineering Drawing: General principles of presentation, conventional representation of dimensioning and sectioning, break, threaded parts, gears, springs and common features, foundation bolts.		
Unit 2	**Geometric Dimensioning and Tolerancing (GD&T)**	(02 Hrs.)
Introduction Limits, Tolerances and Fits, Limit System, Tolerances, Fits, Tolerances of Form and Position Machining symbols, Surface roughness symbols, Welded joints, Dimensioning with tolerances indicating various types of fits.		
Unit 3	**Details and assembly drawings**	(02 Hrs.)
Types of assembly drawings, part drawings, drawings for catalogues and instruction manuals, patent drawings, drawing standards, Introduction to unit assembly drawing, steps involved in preparing assembly drawing from details and vice-versa, Preparation of details and assembly drawings: Clapper block, Single tool post, Lathe and Milling tail stock, jigs and fixtures, screw jack Cotter, Knuckle joint, Keys: keys-sunk, parallel woodruff, saddle, feather etc. Couplings: simple, muff, flanged Protected flange coupling, Oldham's coupling, Universal coupling.		
Unit 4	**Preparation of details and assembly drawings of Bearings**	(02 Hrs.)
Types of bearings and their applications, I.S. conventional representation of ball and roller bearing, Bushed bearing,		

Plummer block or Pedestal bearing, footstep bearing.		
Unit 5	**Preparation of details and assembly drawings of pulleys, Pipe joints**	(02 Hrs.)
Classification of Pulleys, pipe joints Pulleys: Flat belt, V-belt, rope belt, Fast and loose pulleys. Pipe joints: Flanged joints, Socket and spigot joint, Gland and stuffing box, expansion joint, Machine voce, Pipe vice.		
Unit 6	**Preparation of details and assembly drawings of Valves**	(02 Hrs.)
Types of Valves Preparation of details and assembly drawings: Blow off cock, Steam stop valve, Gate valve, Globe valve, Non return Valve.		

Text Books/ Reference Books

1. Machine Drawing by N.D. Bhatt.
2. A Textbook of Machine Drawing by K. C. John, PHI Learning Pvt. Delhi.
3. Machine Drawing by Kamat and Rao
4. Machine Drawing by M. B. Shah
5. A Text book of Machine Drawing by R. B. Gupta, Satyaprakashan, Tech. Publication
6. Machine Drawing by K.I.Narayana, P. Kannaiah, K.Venkata Reddy
7. Machine Drawing by Sidheshwar and Kanheya
8. Autodesk Inventor 2016 for Designers by ShamTickoo and CADCIM Technologies
9. Engineering Drawing by P J Shah
10. **Engineering Drawing by N D Bhatt**

Assessment:

Term work

A-2/A3 size Printouts/plots of the problems solved in practical class from the practical part of each topic.

(min 10 sheets)

Problems from practical parts of each topic should be solved using AutoCAD package.

End Semester Practical/Oral examination:

To be conducted by pair of Internal and External Examiner

1. Practical examination duration is **Two hours**, based on the Term work.
2. Questions provided for practical examination should contain minimum five and not more than ten parts.
3. Evaluation of practical examination to be done based on the performance of students work in laboratory.

***Oral examination should also be conducted to check the knowledge of conventional and CAD drawing.**

OPEN COURSE –II SOFT SKILLS

Course Code (C115)

Designation of Course	**Soft Skills**		
Teaching Scheme:	**Examination Scheme:**		**Credits Allotted**
Theory:- 2 Hours/ Week	End Semester Examination	50 Marks	Theory: 02 Tutorial: 00 Practical: 00
Tutorial : 00 Hours/ Week	Internal Assessment	00 Marks	
	Term Work	- Marks	
	Oral/Practical Examination	-- Marks	
	Total	50 Marks	2

Course Prerequisites:-	Students should have knowledge of basic soft skills Students should have basic information of self analysis techniques Basics of business manners
Course Objective	The course objective of Soft skills puts the following class teaching objectives, considering soft skills as a wheel rolling aspects in today's world, the focus is on honing the skills self awareness and self development. It also puts emphasis on developing the interpersonal skills. Honing the skills of time management and stress management among students through appropriate activities, this will help them in their business ventures. It also aims to develop the skills of conflict resolution, problem solving and inclusion ability at work place.
Course Outcomes:-	Graduates will able to **01.** To understand the concept of soft skills and its implication at workplace **02.** To analyse SWOT and TOWS techniques and its implementation in career development **03.** To develop team building and leadership skills by applying motivational factors **04.** To build up the time management mastery through Pareto Principles and time matrix **05.** To inculcate appropriate business ethics and etiquettes for effective professionalism **06.** To apply the negotiation, conflict resolution and problem solving skills at workplace

Course Contents

Unit 1	Introduction	(4 Hrs.)
Soft skills, meaning, need and importance, difference between soft skills and hard skills, life skills and personal skills, applying soft skills across culture		
Unit 2	Self awareness and self development:	(4Hrs.)
Self assessment, self appraisal through SWOT and TOWS, developing perception and attitude, personal goal setting and self management, Career planning and personal success factors		
Unit 3	Developing interpersonal skills:	(4Hrs.)
situational conversation, building team, team dynamics, developing leadership skills, difference between leader and manager, role and responsibilities of leader, different styles of leadership, Maslow's theory of motivation		

Unit 4	Time management:	(4Hrs.)
Time management matrix, apply Pareto principle (80/20) to the time management, handle the most common time wasters, maximizing personal effectiveness		
Unit 5	Business ethics and corporate etiquettes:	(4Hrs.)
Ethics- its definition, importance and code of ethics, workplace etiquettes and professionalism, communication etiquettes, telephonic etiquettes, meeting etiquettes		
Unit 6	**Problem solving, Diversity and inclusion:**	(4Hrs.)
Conflict resolution, negotiation and problem solving, handling different problems at workplace, Diversity and inclusion at workplace, LGBTQ+, its advantages and disadvantages		

Reference Books:

01. Soft Skills by Meenkashi Raman, published by Cengage publishers
02. Soft skills for Managers by Dr. T. Kalyana Chakravarthi and Dr. T. Latha Chakravarthi published by biztantra
03. Personality development and Soft Skills by Barun K. Mitra by Oxford University press
04. Soft Skills by Dr. K Alex published by Oxford University press
05. The Ace of Soft Skills: Attitude, Communication and Etiquettes for Success by Ramesh Gopalswamy, published by pearson education
06. Seven Habits of Highly effective People: Powerful lessons in personal life by Stephen Covey

Recommended web-links for enhancing English language and business communication

01 http://www.englishlearner.com/tests/test.html

02. http://www.youtube.com/playlist?list=PLY3DFj1jjj0URoyHOnxuau610EgzOtoHI

Assignments:

At least ONE assignment on each unit