DIPLOMA IN ENGINEERING

Duration: 36 Months (3 Years) Eligibility: 10th Pass

COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING SEMESTER Ist													
Course Details				**External Assessment**		**Internal Assessment**						**Credit Distribution**			**Allotted Credits**
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
2TDDE 101	Basic Science	Mathematics-I	100	50	17	20	07	30	15	2	1	0	3
2TDDE 102	Professional Core	Applied Mechanics	100	50	17	20	07	30	15	2	1	0	3
2TDDE 103	Basic Science	Physics	100	50	17	20	07	30	15	2	1	0	3
2TDDE 104	Mandatory Course	Environment engineering & safety	100	50	17	20	07	30	15	2	1	0	3
2TDDE 105	Humanities	Communication Skills-I	100	50	17	20	07	30	15	2	1	0	3
Practical Group				**Term End Practical Exam**				**Sessional**					
2TDDE 102	Professional Core	Applied Mechanics	50	25	12			25	12	-	-	1	1
2TDDE 103	Basic Science	Physics	50	25	12			25	12	-	-	1	1
2TDDE 105	Humanities	Communication Skills-I	50	25	12			25	12	-	-	1	1
Total			650							10	5	3	18

Minimum Passing Marks are equivalent to Grade D **L- Lectures T- Tutorials P- Practical**

Major- Term End Theory / Practical Exam

Minor- Pre University Test

Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

DIPLOMA IN ENGINEERING

Duration: 36 Months (3 Years) Eligibility: 10th Pass

COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING SEMESTER IInd													
Course Details				**External Assessment**		**Internal Assessment**					**Credit Distribution**		**Allotted Credits**
Course Code	**Course Type**	**Course Title**	**Total Marks**	**Major**		**Minor**		**Sessional *****		**L**	**T**	**P**	**Subject wise Distribution**
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
2TDDE 201	Basic Science	Mathematics-II	100	50	17	20	07	30	15	2	1	0	3
2TDDE 202	Professional Core	Engineering Graphics	100	50	17	20	07	30	15	2	1	0	3
2TDDE 203	Basic Science	Chemistry	100	50	17	20	07	30	15	2	1	0	3
2TDDE 204	Basic Science	Fundamentals Computer & IT	100	50	17	20	07	30	15	2	1	0	3
2TDDE 205	Humanities	Communication Skills - II	100	50	17	20	07	30	15	2	1	0	3
Practical Group				**Term End Practical Exam**				**Sessional**					
2TDDE 203	Basic Science	Chemistry	50	25	12			25	12			1	1
2TDDE 204	Engg. Science Course	Fundamental Computer & IT	50	25	12			25	12			1	1
2TDDE 206	Engg. Science Course	Workshop Practice	50	25	12			25	12			1	1
Total			650							10	5	3	18

Minimum Passing Marks are equivalent to Grade D

Major- Term End Theory / Practical Exam

Minor- Pre University Test

L- Lectures T- Tutorials P- Practical

DIPLOMA IN ENGINEERING

Duration: 36 Months (3 Years) Eligibility: 10th Pass

COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING SEMESTER IIIrd													
Course Details				**External Assessment**		**Internal Assessment**					**Credit Distribution**		**Allotted Credits**
Course Code	Course Type	Course Title	Total Marks	Major		Minor		Sessional ***		L	T	P	Subject wise Distribution
				Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
2TDME 301	Professional Core	Material technology	100	50	17	20	07	30	15	2	1	0	3
2TDME 302	Professional Core	Strength of material	100	50	17	20	07	30	15	2	1	0	3
2TDME 303	Professional Core	Basic electrical & electronics	100	50	17	20	07	30	15	2	1	0	3
2TDME 304	Professional Core	Manufacturing process	100	50	17	20	07	30	15	2	1	0	3
2TDME 305	Professional Core	Industrial engineering	100	50	17	20	07	30	15	2	1	0	3
Practical Group				**Term End Practical Exam**				**Sessional**					
2TDME 302	Professional Core	Strength of material	50	25	12			25	12			1	1
2TDME 303	Professional Core	Basic electrical & electronics	50	25	12			25	12			1	1
2TDME 304	Professional Core	Manufacturing process	50	25	12			25	12			1	1
Total			650							10	5	3	18

Minimum Passing Marks are equivalent to Grade D   **L- Lectures T- Tutorials P- Practical**

Major- Term End Theory / Practical Exam

Minor- Pre University Test

Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

DIPLOMA IN ENGINEERING

Duration: 36 Months (3 Years) Eligibility: 10th Pass

Course Details				External Assessment					Internal Assessment					Credit Distribution			Allotted Credits
COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING SEMESTER IVth																	
Course Code	Course Type	Course Title	Total Marks	Major			Minor			Sessional ***			L	T	P	Subject wise Distribution
				Max Marks	Min Marks		Max Marks	Min Marks		Max Marks	Min Marks					
Theory Group																
2TDME 401	Professional Core	Fluid mechanics & hydraulic machine	100	50	17		20	07		30	15		2	1	0	3
2TDME 402	Professional Core	Thermal engineering	100	50	17		20	07		30	15		2	1	0	3
2TDME 403	Professional Core	Theory of machine	100	50	17		20	07		30	15		2	1	0	3
2TDME 404	Professional Core	Machine tool technology	100	50	17		20	07		30	15		2	1	0	3
2TDME 405	Management Course	Entrepreneurship	100	50	17		20	07		30	15		2	1	0	3
Practical Group				Term End Practical Exam						Sessional						
2TDME 401	Professional Core	Fluid mechanics & hydraulic machine	50	25	12					25	12		-	-	1	1
2TDME 402	Professional Core	Thermal engineering	50	25	12					25	12		-	-	1	1
2TDME 403	Professional Core	Theory of machine	50	25	12					25	12		-	-	1	1
Grand Total			650										10	5	3	18

Minimum Passing Marks are equivalent to Grade D   **L- Lectures T- Tutorials P- Practical**
Major- Term End Theory / Practical Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

DIPLOMA IN ENGINEERING

Duration: 36 Months (3 Years) Eligibility: 10th Pass

Course Code	Course Type	Course Title	Total Marks	External Assessment Major Max Marks	Major Min Marks	Internal Assessment Minor Max Marks	Minor Min Marks	Sessional *** Max Marks	Sessional Min Marks	L	T	P	Allotted Credits Subject wise Distribution
COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING SEMESTER Vth													
Theory Group													
2TDME 501	Professional Core	Engineering measurement and maintenance practices	100	50	17	20	07	30	15	2	1	0	3
2TDME 502	Professional Core	Power plant engineering	100	50	17	20	07	30	15	2	1	0	3
2TDME 503	Professional Core	Internal combustion engine	100	50	17	20	07	30	15	2	1	0	3
2TDME 504	Professional Core	Mechanical drafting and Auto CAD	100	50	17	20	07	30	15	2	1	0	3
2TDME 505	Professional Core	Modern practices in manufacturing & management	100	50	17	20	07	30	15	2	1	0	3
Practical Group			Term End Practical Exam					Sessional					
2TDME 501	Professional Core	Engineering measurement and maintenance practices	50	25	12			25	12	-	-	1	1
2TDME 503	Professional Core	Internal combustion engine	50	25	12			25	12	-	-	1	1
2TDME 504	Professional Core	Mechanical drafting and Auto CAD	50	25	12			25	12	-	-	1	1
Grand Total			650							10	5	3	18

Minimum Passing Marks are equivalent to Grade D

L- Lectures T- Tutorials P- Practical

Major- Term End Theory / Practical Exam

Minor- Pre University Test

Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

DIPLOMA IN ENGINEERING
Duration: 36 Months (3 Years) Eligibility: 10th Pass

Course Details			Total Marks	External Assessment		Internal Assessment				Credit Distribution			Allotted Credits
COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING SEMESTER VIth													
				Major		Minor		Sessional ***		L	T	P	Subject wise Distribution
Course Code	Course Type	Course Title		Max Marks	Min Marks	Max Marks	Min Marks	Max Marks	Min Marks				
Theory Group													
2TDME 601	Professional Elective	Professional Elective-I	100	50	17	20	07	30	15	2	1	0	3
2TDME 602	Professional Core	Design of machine elements	100	50	17	20	07	30	15	2	1	0	3
2TDME 603	Professional Core	Refrigeration & Air conditioning	100	50	17	20	07	30	15	2	1	0	3
Practical Group				Term End Practical Exam				Sessional					
2TDME 601	Professional Elective	Professional Elective-I	50	25	12			25	12	-	-	**1**	1
2TDME 603	Professional Core	Refrigeration & Air conditioning	50	25	12			25	12	-	-	1	1
2TDME 604	Project Work	Project	200	100	50			100	50	-	-	4	4
2TDME 605	Professional Core	Professional activity	50					50	25	-	-	3	3
Grand Total			**650**							**6**	**3**	**9**	**18**

Minimum Passing Marks are equivalent to Grade D
Major- Term End Theory / Practical Exam
Minor- Pre University Test
Sessional weightage – Attendance 50%, Three Class Tests/ Lab Performance Assignment 50%

L- Lectures T- Tutorials P- Practical

Professional Elective-I (TDME-601)
2TDME-601 (A) Automobile Engg.
2TDME-601 (B) CAD/CAM

Mathematics-I

COURSE OBJECTIVE:

Mathematics forms backbone for all technologies and hence occupies an important place in the curriculum of polytechnic education. The subject is equally important for the future self-development of Polytechnic students. In designing the curriculum for foundation course, the admission level to Polytechnics has been considered as 10th Board examination and mathematical needs of Technical subject have been given due consideration.

Syllabus:

UNIT-I **Permutation:** Meaning of factorial n**,** Permutation of 'n' dissimilar thing taken 'r' at a time

Combination: Combination of n dissimilar things taken 'r' at a time

Binomial Theorem: Statement of the theorem for positive integer, General Term, Middle term, Constant term

UNIT-II **Partial Fractions:** Define a proper-improper fraction**,** Break a fraction into partial fraction whose denominator contains Linear, Repeated linear and Non repeated quadratic factors.

UNIT-III **Determinant:** Concept & principles of determinants **,** Properties of determinant **,** Simple examples.
Complex Numbers: Algebra of Complex Numbers **,** Polar form

UNIT-IV

Trigonometry : Allied angles, trigonometrical ratios of sum and difference of angles, (only statement),sum and difference of trigonometric ratios (c-d formula),multiple angles (only double angle and half angle),properties of triangle (without proof)

UNIT-V **Matrix:** Definition of matrix, types of matrix, row, column, square, unit, upper and lower triangular, symmetric & skew symmetric, singular and nonsingular matrices,

Adjoint *Adjoint* of a matrix, inverse of a matrix.

COURSE OUTCOME:

Through this syllabus the diploma student will learn the basic concepts of counting principle through permutation and combination , expansion of a binomial function , breaking up a complex fraction into simpler partial fractions, trigonometric ratio and concept of matrix

TEXT BOOKS:

Engineering Mathematics	Iyenger , SRK.,	Narosa Publshing, New Delhi
Engineering Mathematics I	Agarwal D.C	Meerut:Shree Sai Prakashan

Basic Engineering Mathematics	Dass H. K.	Delhi S. Chand Group
Higher Engineering Mathematics	B.S. Grewal	Delhi, Khanna Publishing

REFERENCE BOOKS:

Calculus	Loomis	Addison Wesley
Applied Mathematics	Abhimanyu singh	Anne books
Engineering Mathematics	Dr. G Balaji	Balaji Publishers

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Applied Mechanics

COURSE OBJECTIVE:

1. Ability to apply knowledge of mathematics, science, and engineering.

2. Solve for the resultants of any force systems.

3. Determine equivalent force systems.

4. Determine the internal forces in plane frames, simple span trusses and beams.

5. Solve the mechanics problems associated with friction forces.

Syllabus:

UNIT-I **COMPOSITION AND RESOLUTION OF FORCES**

Definition, Effect, characteristics of force, System of Forces, Principle of Transmissibility of Forces, Concept of Resultant Force, Law of Parallelogram of Forces, Triangle of Forces, Polygon of Forces, Determination of Resultant of two or more concurrent forces (analytically and graphically).

PARALLEL FORCES AND COUPLES

Classification of Parallel Forces, Methods of finding resultant Force of parallel forces- analytically graphically, Position of resultant force of parallel forces, Definition, Classification and characteristics of a force Couple, moment of couple.

UNIT-II **MOMENTS AND THEIR APPLICATIONS**

Definition, Types and law of moment, Varignon's Principle of moment and its applications, Lever and its Applications, Types of supports and determination of support reactions of a simply supported beam subjected to point load and uniformly distributed load (UDL).

EQUILIBRIUM OF FORCES

Equilibrium of a system of concurrent forces, Conditions and types of Equilibrium, Lami's Theorem and its applications.

UNIT-III **CENTRE OF GRAVITY**

Difference between Centroid and Center of Gravity (CG), Centroid of standard plane figures and CG of simple solid bodies, Method of finding out Centroid of composite plane laminas and cut sections, Method of finding out CG of Composite solid bodies.

FRICTION

Concept and types of friction, Limiting Friction, coefficient of friction, angle of friction, angle of repose, Laws of friction (Static and Kinetic), Analysis of equilibrium of Bodies resting on Horizontal and inclined Plane, Utility / Nuisance value of friction.

UNIT-IV **SIMPLE LIFTING MECHINES**

Concept of lifting Machines, Definition of Mechanical Advantage, Velocity

Ratio and Efficiency of Machines and their relation, Reversibility of Machines and condition for self locking machine, Law of Machines, Maximum mechanical advantage and maximum efficiency of machine, Friction in machine (In terms of Load and effort), Calculation of M. A, V.R. and efficiency of following machines

- Simple wheel and axle
- Differential wheel and axle
- Single purchase crab
- Double purchase crab
- Simple screw jack
- Different System of simple pulley blocks

MOTION OF A PARTICLE

Definition of speed, velocity, acceleration, uniform velocity, uniform acceleration and variable acceleration, Motion under constant acceleration/ retardation (equations of motion), Motion under force of gravity, Concept of relative velocity, Definition of projectile, velocity of projection , angle of projection, time of light, maximum height, horizontal range and their determination, Definition of angular velocity, angular acceleration and angular displacement, Relation between linear and angular velocity of a particle moving in a circular path, Motion of rotation under constant angular acceleration.

UNIT-V   **LAWS OF MOTION**

Newton's Laws of motion and their applications.

WORK, POWER AND ENERGY
Definition unit and graphical representation of work, Definition and unit of power and types of engine power and efficiency of an engine, Definition and concept of Impulse, Definition, unit and types of energies, Total energy of a body falling under gravity.

List of Experiments:

1.   Verification of laws of parallelogram of forces.
2.   Verification of laws of polygon of forces
3.   Verification of laws of moments
4.   Determination of forces in the members of Jib Crane
5.   Determination of Centroid ofplane lamina by graphical method
6.   Determination of coefficient of friction for surfaces of different materials on horizontal plane
7.   Determination of coefficient of friction for surfaces of different materials on an inclined plane
8.   Determination of mechanicaladvantage, velocity ration and efficiency of the following lifting machines
9.   Measurement of B.H.P. of an engine using roap break dynamometer

COURSE OUTCOME:

At the end of the course, the student will be able to:
1. Determine the resultant force and moment for a given system of forces

2. Analyze planar and spatial systems to determine the forces in members of trusses, frames and problems related to friction

3. Calculate the motion characteristics of a body subjected to a given force system.

4. Determine the deformation of a shaft and understand the relationship between different material constants.

TEXT BOOKS:

Applied Mechanics	R.S. Khurmi	S.C. Chand & Co. , New Delhi
Applied Mechanics	I.B. Prasad	Khanna Publishers, New Delhi
Applied Mechanics	R.S. Jog	Anand Publishers, Gwalior
Applied Mechanics	A.R. Page	Deepak Prakashan, Gwalior

REFERENCE BOOKS:

Applied mechanics	R K Rajput	S Chand publication
Engineering Mechanics	R K Bansal	Pearson
Applied mechanics	Henry Taylor Bovey	Nabu

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Physics

COURSE OBJECTIVE:

1. The development of various diploma engineering topics is primarily based on the fundamental principles. The different principles of physics have a wide range of applications in all the branches of engineering. A reasonably good level of knowledge of physics, therefore, forms sound base for engineering students. Physics can be considered as a basic tool in the hands of an engineer through which he can pure his studies and research work in technical field. The foundation level of the subject acquired by the student is kept in mind for selection of the topics. To create interest in the students more stress is given on the applications, in engineering field

Syllabus:

UNIT- I **UNITS & Measurement, Motion**

Fundamental and derived units, Scalar and vector, Basic requirements to represent vector Symbols, abbreviation, and proculation Linear measurement by vernier calipers, screw gauge and spherometer Angular measurement by angular vernier Motion and its type Linear motion ,Circular motion ,Angular velocity and relation with linear velocity ,Centripetal acceleration, Centripetal and Centrifugal forces Rotatory motion Axis of rotation Moment of Inertia, Radius of gyration   Kinetic energy of rotation Numerical problems and solution on the topic

UNIT- II **Molecular Phenomenon Solids, Liquids And Properties Of Matter**

Postulates Of Molecular Kinetic Brownian motion Kinetic and Potential energy of Kinetic theory of gases Postulates Calculation of pressure by Kinetic theory Prove of different gases law by Kinetic theory, Elasticity: Meaning, definition, stress, stain, Hook's law and elastic limit Surface Tension: Meaning, definition, molecular forces, cohesive and adhesive forces, Surface energy, capillary rise and capillary rise method. Viscosity : Meaning, definition, stream line and turbulent flow, critical velocity, Stock's law. Numerical problems and solution on the topic.

UNIT- III **Heat Heating Effect Of Current And Thermoelectricity**

Heat and temperature, concept of heat as molecular motion Transmission of heat, study state and variable state. Concept of heat capacity, specific heat and latent heat. Calorimeter and its uses Thermodynamics Relation between heat and work Mechanical equivalent of heat First law of thermodynamics and its application, Second law of thermodynamics and its application ,Carnot cycle Numerical problems and solution on the topic., Heating effect of electric current: Joule's law, work energy and power in electric circuit, calculation of electric energy. Thermo electricity See back effect and thermoelectric power, Neutral temperature, temperature of inversion and relation between them Thermo electric thermometer and thermo couples. Numerical problems and solution

UNIT- IV   **Sound Optics And Optical Instruments**

Reduction of sound waves(Longitudinal and transverse waves)Progressive and stationary waves Basic knowledge of refraction , reflection, interference and diffraction. Ultrasonic, Audible range, Production of ultrasonic, properties an due Refraction, critical angle and total internal reflection, refraction through lenses and problems Power of lenses Spherical and chromatic aberrations Simple and compound microscope, telescope and derivation for their magnifying power Numerical problems and solution on the topic.

UNIT- V   **Electrostatics and Electromagnetic Induction Modern Physics,**

               Basic Electronics

Coulomb's law, Electric field intensity, potential. Capacity, principle of capacitor, types of capacitor, combination of capacitors Electromagnetic Induction: Faraday's law, Lenz's law Self and mutual inductance Transformer and electric motor, Induction coil Photoelectric effect, threshold frequency, Einstein- equation, Photo electric cells Radioactivity : decay constant, Half life, mean life Properties of nucleus, nuclear mass, mass defect Production of x-rays, properties and its uses Thermal emission, semiconductors, Types of semiconductors Explanation of conductor, semiconductor and insulators on the basis of band theory P-N junction, diode as rectifier

List of Experiments:

1. Refractive index of prism (I-D) curve
2. Refractive index of prism (spectrometer)
3. Focal length of a convex lens by u-v method
4. Focal length of a convex lens by displacement method
5. Verification of Ohm's law
6. To find out unknown resistance by meter brid
7. To find out internal radius of hollow tube by vernier calipers.
8. To find out volume of given cylinder by screw gauge.
9. Surface tension by Capillary rise method. Coefficient of viscosity
10. Coefficient of Thermal conductivity by searl's method.
11. Verification of Newton's cooling law.

COURSE OUTCOME:

1. The course content should be taught and implemented with the aim to develop different types of skills leading to the achievement of the following competencies *Select proper measuring instrument on the basis of range, least count & precision required for measurement.
2. Analyze properties of material & their use for the selection of material mostly applicable for engineering users.
3. Identify good & bad conductors of heat and proper temperature scale for temperature measurement Identify.
4. Analyze, discriminate and interpret logical sequence of field problems with the study of physics.
5. Analyze variation of sound intensity with respect to distance and follow the principles used in the physical properties, its measurement and selections.

TEXT BOOKS:

Applied Physics Vol. 1 & 2	Saxena and Prabhakar	S Chand
Physics	Halliday And Resnic R	Wiley
Engineering Physics	Gaur And Gupta	Dhanpat rai

REFERENCE BOOKS:

Engineering Physics	B K Pandey	Cengage
Applied Physics	P K Diwan	Wiley

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Environmental Engineering & Safety

COURSE OBJECTIVE:

1.　　To improve the quality of life of the local community through management and conservation of natural resources.
2.　　To ensure that the natural environment is used wisely
as well as judiciously. The natural resources are continuously available for the benefit and enjoyment of future generations.
1.　　Todecrease vulnerability and improve adaptation capacity among poor local communities associated with Climate Change.

Syllabus:

UNIT-I　　**Introduction to Environment**

The Biosphere, biotic and abiotic, An aquatic ecosystem, Types of pollution Impact of hum a being on environment, Impact of environment on human being, Basic approach to improve environmental qualities, Roll of an environmental engineer

UNIT-II　　**Air Pollution Sources and Effects**

Standard definition of air pollution**,** Composition of natural air**,** Names of air pollutants**,** Classification of air pollutants, primary and secondary pollutants**,** Classification of source of air pollutants on different bases**,** Definition of different types of aerosols, Effect of air pollution on: human health, material properties, vegetation, Major toxic metals and their effects**,** Major environmental phenomenon e.g., acid rain, global warming, green house effect, ozone layer depletion, Air quality standards**,** Brief description of air pollution laws.

UNIT-III　　**Meteorological Aspects of Air Pollutant Dispersion**

Meteorological parameters influencing air pollution, Environmental laps rate, temperature inversion, atmospheric stability and adiabatic loss rate, Turbulence, topographical effects, Plume behavior, looping, coning, fanning fumigation, lofting , trapping.

Air Pollution Control Methods and Equipments

Natural purification processes of air, Artificial purification methods of air, Brief description of following control equipments along with sketch e.g, gravitation settling chamber, cyclone, scrubber, bag house filter, electrostatic precipitator, Brief description of following processes for the control of gaseous pollutants e. g., absorption, adsorption, condensation, combustion etc.

UNIT-IV　　**Water Pollution Sources and Classification**

Water resources, Uses of water, Classification of water, Origin, composition and characteristics of domestic waste water as well as industrial waste water, Biochemical oxygen demand, Water pollution laws and standards, Uses of waste water, Classification of waste water, Chemical oxygen demand

Waste water treatment method

basic processes of water treatment, Meaning of primary, secondary and tertiary treatment, Flow chart of a simple effluent treatment plant, Theory of industrial waste treatment, Volume reduction, neutralization and proportion

UNIT-V   Solid Waste Management

Sources and classification of solid waste, Public health aspects, Disposal methods - open dumping, sanitary, land fill, Incineration, compositing, Potential methods of disposal, Recovery and recycling of paper, glass, metal and plastic

Noise Pollution and Control

Sources of noise pollution, Units of Noise pollution measurement, Allowable limits for different areas, Problems of noise pollution and measures to control it, Noise pollution control devices brief discussion

Safety Practices

Responsibility of employees and employers regarding health and safety,

Fire hazards prevention and precautions, Industrial hazards prevention and protection, Protection from air and noise pollution

COURSE OUTCOME:

1. After successful completion of this course students will able to
2. Enhance the use of recycled material for construction work and optimize the use of conventional energy sources.
3. Take care of issues related to Conservation & Hazard Management while working as chemical engineer.
4. Assess the effects of pollution on resources.
5. Justify need of renewable energy for sustainable development.
6. Identifyconcept of waste management and methods of recycling.
7. Prepare list of use of do's and don'ts applicable during disasters.

TEXT BOOKS:

Environmental pollution control Engineering	C. S. Rao	PHI
Air pollution and control	Seth	S Chand
Air pollution	M.NRao	TMH

REFERENCE BOOKS:

A Textbook of environmental studies	Dr D K Asthana	S Chand
Fundamentals of air pollution engineering	Richard C. Flagan John H. Seinfeld	Prentice Hall

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Communication Skill-I

COURSE OBJECTIVE:

    1.   The main aim of communicating is to pass information so that other people may know about what you are talking off. This can be through facts or even feelings.

Syllabus:

UNIT- 1   Sentences –simple compound ,complex Articles –usage of 'A' , 'AN', 'THE' Preposition—position of prepositions ,place Relations Time Relations

    Tenses – past perfect ,present perfect progressive ,past perfect Progressive, simple present and present progressive

UNIT- II   Modals , Antonyms ,synonyms ,one word substitution ,jumbled sentences, Idioms and phrases ,correction of sentences with words likely to be confused word formation like prefix and suffix

UNIT- III   Comprehension of unseen passage short answer type questions to test understanding of the passage

UNIT- IV   Précis –writing -Introductory Remarks, Method of procedure, Summing up

UNIT- V   Essay-writing -- Introductory Remarks, Characteristics of a good Essay, Classifications of Essays, Method of collecting materials

COURSE OUTCOME:

    1.   Through this syllabus the diploma students will learn the basic concept of English. Student should gain the ability to read understand, analyze, intercept and extrapolate from the complex texts that are at the heart of the diver's traditions of the English language.

TEXT BOOKS:

English Conversation Practice	Grant Taylor	TMH
Communication Skills	Somaiya	M/S Somaiya Publication, Bombay
English Grammar, Usage, and Composition	Tickoo & Subramanian,	S. Chand

REFERENCE BOOKS:

Communication for Engineers	P. Prasad	Kataria and sons publications, New Delhi
Effective Business Communication	M.V. Rodriques	Concept Pub. Co., New Delhi
Essentials of Business Communication	Dr. Rajendra Pal & J.S. Korlahalli	S.Chand & Sons, New Delhi.

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Mathematics-II

COURSE OBJECTIVE:

    1.   The main of teaching mathematics is to provide students with an adequate knowledge on the subject to serve as a tool in the learning of various engineering subjects and to solve technical problems encountered during the course of study. It can also serve as a foundation for their future work involving computation.

Syllabus:

UNIT-I   CO-ORDINATE GEOMETRY

Co-ordinate System: Cartesian and Polar, Distance, Division, .Area of a triangle, Locus of a point and its equation, Slope of St. Line: Angle between two Straight lines, Parallel and perpendicular Straight lines. Standard and general equation of Straight line. Point of intersection of two straight lines .

UNIT-II   STATISTICS

Measures of Central tendency (Mean, Mode, Median),Measures of Dispersion (Mean deviation, standard deviation)

UNIT-III   DIFFERENTIAL CALCULUS

Define constant, variable, function, Value of the function, Concept of limit of a function, Definition and concept of differential coefficient as a limit, Standard results, Derivatives of sum, difference, product, quotient of two functions, Differential co-efficient of function of a function, Differential co-efficient of implicit function, Logarithmic Differentiation, Differential coefficient of Parametric function.

UNIT-IV   INTEGRAL CALCULUS

Definition as a inverse process of differentiation, Standard Results (including inverse function), Methods of Integration: Substitution, Integration by parts, Breaking up into partial fraction, Concept of Definite Integral

UNIT-V   VECTOR ALGEBRA

Concept of Vector and Scalar Quantities, Different types of vectors.
Addition and subtraction of vectors, Components of a vector
Multiplication of two vectors: Scalar Product, Vector Product, Applications (Work done, power & reactive power)

COURSE OUTCOME:

    1.   Here in this syllabus student will learn some concept of co-ordinate geometry , some part of statistics viz. mean , median , mode , deviation etc. , and of course a brand new concept of differential calculus and integral calculus which play an important role in technical subjects then concept of vector number , how they are added subtracted and multiplied etc.

TEXT BOOKS:

Higher Engineering Mathematics	B.S. Grewal	Khanna publisher
Mathematical Statistics	Ray and Sharma	Ram Prasad publication
Differential Calculus	Gorakh Prasad	Pothishala publication

REFERENCE BOOKS:

Mathematics for Polytechnics	Navjyoti dutta	T.T.T.I. Bhopal
Engineering Mathematics	Dr. S.K. Chouksey	Khanna publisher
Integral Calculus	Gorakh Prasad	TMH

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Engineering Graphics

COURSE OBJECTIVE:

1. To familiarize with the construction of geometrical figures.
2. To familiarize with the projection of 1D, 2D and 3D elements .
3. To familiarize with the sectioning of solids and development of surfaces.
4. To familiarize with the Preparation and interpretation of building drawing

Syllabus:

UNIT-I   Introduction to Drawing Instruments: Introduction of drawing instruments, materials and their uses, Applications of mini-drafter, Applications of compass and divider, Applications of French curves and spline**,** Pencils grades and their uses

Designation and sizes of drawing sheet and drawing board, Planning and Layout of Drawing Sheet: Planning of drawing sheet as per I. S.: 696-1972 (SP 46: 1988)
 This should include: Margin, Title Block, Zoning, Revision panel, Folding marks, Numbering of sheet.

UNIT-II   CONVENTIONAL REPRESENTATION:

Conventional representation of the following as per   BIS practice

COMMON   ENGINEERING   MATERIALS   ELECTRICAL INSTALLATIONS AND FITTINGS
Main switches, (lighting and power), socket outlets (3 pin 5AMP, 3pini5 AMP), bell, buzzer, loud speaker, Aerial, ceiling fan, exhaust fan, Bracket fan, fan regulator, battery and earth point.

ELECTRONICS COMPONENTS

Diode: Zener, varactor, Scotty, step recovery, light emitting diode (LED), PNP and NPN transistors, resistance, capacitor, Inductors (fixed and variable both), IC (8pin and 14pin) SCR, TRIAC, DIAC, UJT, FET, MOSFET, LOGIC GATES

SANITARY FITTINGS

showerhead, wall lavatory basin, comer Lavatory basin, urinal stall, kitchen sink, Indian type WC,Water closets (Asian pan, urissapan, Anglo-Indian, European)

BUILDING

Single and double swing doors and windows.

MECHANICAL COMPONENTS

Internal and external threads, slotted head, Square end and flat, radial arms and ribs, serrated shaft, splined shaft, Chain wheel, bearing, straight and diamond knurling,

Compression and tension spring, leaf spring (with and without eye), Spur and helical gear

UNIT-III   LINES, LETTERING AND DIMENSIONING:

Introduction of type of lines and their applications, Single stroke vertical, inclined letters (capital and lowercase) And numerals,

Dimensioning: Elements of dimensioning- dimension line, extension line, arrowhead and leader line, Dimensioning system - Aligned and unidirectional, Dimensioning of Arcs and Circles, Angular Dimensioning, Dimension of counter sunk and counter bore.

METRICAL CONSTRUCTIONS AND ENGINEERING CURVES: Divide a line into any number of equal parts by parallel line method bisecting of line and angle.

Construction of triangles and polygons Introduction of conic sections (curves), Construction of Ellipse by Eccentricity and Concentric circles methods, Construction of Parabola by Eccentricity and Rectangle methods Construction of Hyperbola by Eccentricity method Construction of Cycloid, Construction of Involutes of circle and polygon, Construction of Archimedean Spiral of any number of convolutions

UNIT-IV

SCALES:

Introduction of scales and their applications, Concept of reducing, enlarging and full size scale, Classification of scales - plain, diagonal, Vernier, Scale of chord and comparative scales, Definition of R.F, Construction of plain and diagonal scales

ORY OF PROJECTION AND PROJECTION OF POINTS, LINES AND PLANES

Definition of various term associated with theory of projection-

Planes of projection, Quadrants, first & third angle projection method, Projection of points in all the four quadrants.

Projection of lines-

Parallel to HP and VP both.

1. Perpendicular to one plane and parallel to other.

2. Inclined to one plane and parallel to other.

3. Knowledge of projection of line inclined to both the planes

Projection of planes -

1. Perpendicular to HP and VP both

2. Perpendicular to one plane and parallel to other

3. Inclined to one plane and perpendicular to other.

4. Knowledge of projection of plane inclined to both the planes

PROJECTIONS OF SOLIDS:

Projection of cylinder, cone, prism and pyramid. Under the following conditions:

1. Axis parallel to HP and VP

2. Axis perpendicular to HP and parallel to VP

3. Axis perpendicular to VP and parallel to HP

4. Axis inclined to HP and parallel to VP.

5. Axis inclined to VP and parallel to HP.

6. Axis inclined to both HP and VP

UNIT-V   SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES:

Section of cone, cylinder, prism and pyramid (Solid resting on its base in the HP i.e. the Axis perpendicular to HP and parallel to VP) in the following cases:

1. Section plane parallel to HP and perpendicular to VP

2. Section plane parallel to VP and perpendicular to HP.

3. Section plane inclined to HP and perpendicular to VP.

4. Section plane inclined to VP and perpendicular to HP.

Drawing True shape of section.

Introduction to development of lateral surface of solids-

Cone, Cylinder, Prism and Pyramids (Simple and truncated), Under the condition - solid resting on its base in the HP and axis, Perpendicular to HP and parallel to VP Development of funnel and elbow

1. INTERSECTION OF SURFACES

    Intersection of following cases -

    Cylinder to cylinder and Prism to prism(With their axis intersecting and perpendicular to each other.)

2. ORTHOGRAPHIC PROJECTIONS & FREE HAND SKETCHING:

    Principles of orthographic projections, Identification of necessary views and superfluous view, Selection of front view, Preparation of necessary

orthographic views of simple objects

From given pictorial views

- Dimensioning of orthographic views as per standard practice.

- Free hand sketches of simple objects (Using Pencil, Eraser & Paper only)

3.   ISOMETRIC VIEWS

- Concept of isometric projection and isometric view (Isometric Drawing)

- Construction of isometric scale

- Construction of isometric view of polygon and circle

- Construction of isometric view of cone, cylinder, prism and pyramids

- Construction of isometric view of simple objects

From given orthographic views

COURSE OUTCOME:

1.   Introduction toengineering design and its place in society
2.   Exposure to the visual aspects of engineering design
3.   Exposure to engineering graphics standards
4.   Exposure to solid modelling
5.   Exposure to creating working drawings
6.   Ability to draw projections and analysing multiple views of object.

TEXT BOOKS:

Engineering Drawing	N.D. Bhatt	Pearson
Engineering Drawing	R.K. Dhawan	S.Chand
Engineering Drawing	P. S.Gill	S.Chand

REFERENCE BOOKS:

First Year Engineering Drawing	Ac.Parkinson	TMH
Engineering Drawing	Dhananjay	TMH

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Chemistry

COURSE OBJECTIVE:

1.   The objective of the Chemistry in polytechnique courses is to acquaintthe students with the basic phenomenon/ concepts of chemistry, the student face during course of their studying the industry. The student withthe knowledgeof t h e b a s i c c h e m i s t r y w i l l u n d e r s t a n d a n d explain s c i e n t i f i c a l l y the v a r i o u s chemistry related problems in the industry/engineering field. The student will able to understand the new developments and break through sufficient lying engineering and technology.

2.   To appreciate the need and importance of chemistry for industrial and domestic use.

3.   To gain the knowledge on existing and future upcoming materials used in device fabrication.

4.   To impart basic knowledge related to material selection and the techniques for material analysis.

5.   To impart knowledge of green chemical technology and its applications.

6.   Demonstrate knowledge of science behind common impurities in water and methods to treat them.

7.   Knowledge of methods to determine the calorific value of fuels.

8.   Apply the science for understanding corrosion and its prevention.

Syllabus:

UNIT-I   **ATOMIC STRUCTURE AND RADIO ACTIVITY**
Discovery of electron, proton ,neutron and nucleus. Ruther ford's and Bohr's model of an atom. Bohr Burry scheme of filling the electrons in various orbits. Idea of s,p,d,f orbital .Alfa, Gamma and Beta rays, theory of radio activity, Group displacement law, half life period, numerical problems on half life period, fission and fusion.

SURFACE CHEMISTRY AND ITS APPLICATION

True solution, colloidal solution and suspension, lyophobic and lyophillic colloids, optical and electrical properties of colloids, coagulation, coagulants, idea about gels and emulsions.

ELECTROCHEMISTRY

Electrolysis, Faraday's laws of electrolysis, Numerical problems on Faradays Law, electroplating of copper and nickel.

UNIT-II   **COLLIGATIVE PRPOPERTIES**
Osmosis & osmatic pressure, Relative vapour pressure and Routls law. Internal energy (enthalpy) Entrophy, Entrophy fusion free energy, Effect of change in temperature catalysis.

CHEMICAL BONDING AND CATALYSIS

(A) Bonding: Nature of bonds- Electro valent, Co-valent, co-ordinate and hydrogen bond.

(B) Catalysis: Types, theory characteristic, positive, negative, auto and induced catalyst. Catalytic Promoter, and catalytic inhibitors. Industrial Application of catalysis.

WATER:

Sources of water, types of water, hardness of water, its causes, types and removal, Boiler feed water, harmful - effects of hard water in boiler. Municipal water supply. Numerical on soda lime process. Determination of hardness of water by O. Hener's, EDTA and soap solution method.

UNIT-III   METALS AND ALLOYS:

Physical and chemical properties of metals, copper, iron, aluminum, tin, nickel. General principal of metallurgy, minerals/ ores, ore dressing, roasting ,smelting, bassemerisation, fluxes, purification. Explanation of alloying purposes, methods of alloying, composition and uses of alloy like brass, bronze, duralium, German silver, gun metal, solder, stainless steel, casting and bearing alloy.

IONIZATION, PH VALUE CORROSION AND PROTECTION:
Arhenius theory of ionization, factors affecting ionization. pH meaning (numerical), Buffer solutions and Buffer actions, choice of indication (acidimetry and alkalimetry). Explanation of corrosion, types of corrosion, factors effecting corrosion, corrosion control (protection against corrosion), metal and organic coating for corrosion control.

GLASS, CEMENT AND REFRACTORY:
Glass: Basic raw materials for glass, composition and manufacture of glass, varieties of glass and annealing of glass,.

Cement : Constituting compounds in cement, Composition of Portland Cement, its manufacture, setting and hardening of cement.

Refractories : Meaning, characteristics , use of common refractory materials.

UNIT-IV   HIGH POLYMERS, RUBBER AND INSULATORS:

Polymerization and condensation, classification of plastics, Compounding and Moulding constituents of plastics. Preparation Properties and uses of PVC, polyethene, polystyrene, polyamides, polyesters , Bakelite. Synthetic fibers - nylon, rayon, decron, and polyesters.

Definition characteristics , classification and properties of insulators. Glass, wool and thermo cole Idea about rubber and vulcanization.

LUBRICANTS, PAINTS AND VARNISHES:

Lubricants: Meaning , type and theory of lubricants, properties of a good lubricants, Flash and fire point and cloud point, emulsification number, viscosity. Paints and Varnishes : Meaning, ingredients and characteristics of good paints and varnishes, their engineering applications.

UNIT-V   FUELS, FIRE EXTINGUISHERS AND EXPLOSIVES:

Classification of fuel, gross and net calorific value, Determination of a solid fuel by bomb calorimeter, octane and octane number. Proximate analysis of fuel, its utility, crude petroleum, products of fractional distillation .

Fire extinguishers - Description and use.

Explosives - Meaning, types, characteristic and use of explosives. Name Dynamite, lead azide, T.N.T., Picric acid, R.D.X.

POLLUTION AND CONTROL:
Introduction and chemical toxicology, air and water pollution, control of air and water pollution. Harmful effect of different gases like carbon mono-oxide, carbon dioxide, sulphur dioxide, nitric oxide, nitrous and lead.

LIST OF EXPERIMENTS:

1.   To identify one Anion and Cation in a given sample.
2.   Determination of flesh point and fire point of a given sample of oil by Abel's apparatus.
3.   Determination of viscosity by Red Wood Viscometer no. 1and no. 2.
4.   RedoximetryTitration :

1.   Percentage of Iron in given sample of alloy.
2.   Determination of strength of ferrous ammonium sulphate.
3.   Determination of strength of anhydrous ferrous sulphate and ferrous sulphate.
     Determination of hardness of water by :
1.   EDTA Method and Soap Solution Method
1.   Determination of solid content in the given sample of water.
2.   Determination of percentage of moisture in the given sample of coal by proximate analysis.

COURSE OUTCOME:

After the completion of the course, the learner will be able to:
1.   Analyze the need, design and perform a set of experiments.
2.   Differentiate hard and soft water, solve the related numerical problems on water purification and its significance in industry and daily life.
3.   Apply the principles of green chemistry in designing alternative reaction methodologies to minimize hazards and environmental degradation.
4.   Understand the causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.
5.   Explain the properties, separation techniques ofnatural gas and crude oil along with potential applications and role of petrochemicals in national economy.
6.   Equipped with basic knowledge of polymers and its application.

TEXT BOOKS:

Physical Chemistry	Bahl and Tuli	TMH
Inorganic Chemistry	Satyaprakash	S Chand
Engineering Chemistry	Rao	Pearson

REFERENCE BOOKS:

Applied Chemistry	H.N. Sahni	Deepak Prakash
Polymer Chemistry	O.P. Mishra	Khanna publisher
Applied Chemistry	Shrivastava & Singhal	Pbs Publication, Bhopal.

Fundamentals Computer & IT

COURSE OBJECTIVES:

1. Learn basic principles of using Windows operation system.
2. Learn and practice basickeyboarding and mouse use.
3. Be able to access the Internet, Worldwide Web, as well as use Internet directories and search engines, and locate www addresses.
4. Be able to find and evaluate information on the Web (learn how to be critical and evaluate what is valid and reliable).
5. Learn basic computer and keyboarding related vocabulary in English.
6. Learn the basics of e-mail, such as sending, forwarding and receiving mail,
attaching documents, creating mailboxes, filters, and address books.
7. Learn basic word processing skills with Microsoft Word, such as text input and formatting, editing, cut, copy and paste, spell check, margin and tab controls, keyboard shortcuts, printing, as well as how to include some graphics such as pictures and charts.
8. In general, develop an intuitive sense of how computers work and how they can be used to make your academic work more efficient.

Syllabus:

UNIT- I   **Computer Organization, Evolution And Generation Of Computer Systems:**

Block Diagram of computer system: Central Processing Unit, Memory unit ,ALU, Control unit Input & Output devices. Input Device Categorizing input hardware :Key Board, Card readers, Scanning Devices ,Bar Code Readers, OCR, OMR, MICR, Pointing Device, Mouse and its types ,light pen Touch Devices, Web camera ,microphone Joystick, Digitizing tablet. Output Device printers, Dot matrix, Printers, Plotters, and Monitors: CRT, TFT, Plasma, LCD Projector, DLP Projector, Speaker. Computer System Characteristics and capabilities Memory Capabilities, Repeatability Types of Computers & its Application Analog, Digital & Hybrid, General & Special Purpose Computer, Application of computer system Computer Generations & Classification of Computer Systems Minis, Mainframes & Super Computer Evolution of micro Comparative study w.r.t. speed, data bus, controllers, memory, peripheral interface of PC to Pentium computer systems.

Decimal, Binary, Octal, Hexadecimal number

UNIT- II   **Number System, Codes & Data Representation, Storage Devices**

Systems Inter-Conversion from decimal to binary, octal, hexadecimal, conversion of binary number System to decimal, hexadecimal. Codes used for information exchange between computers–ASCII, Unicode, Data representation- Bit, Nibble, Byte, Kilo Byte, Mega Byte, Giga Byte, Tera Byte, Peta Byte etc Storage Fundamentals, Primary & Secondary Storage.

RAM, dynamic and static ROM, PROM, EPROM, EEPROM, ape storage Devices, Characteristics & limitations, Floppy &theirtypes. Direct access Storage– Hard Disk, Disk Cartridges, Mass Storage Device Optical Disk , CD Rom, DVD, flash drive, ZIP drive

UNIT- III   Computer Software's & Language

System Software V/s Application Software. Types of System Software, Operating System, Loader, Linker, Language Processor, Assembler, Compiler and Interpreter, Device Driver. CLASSIFICATION AND CHARACTERISTICS OF LANGUAGES Machine language, Assembly language, High-level language, Generations of Computer Language Application Software: working with MSOFFICE components, creating editing, formatting and printing documents using MSWORD, Data analysis and charting with MSEXCEL, Creating and presenting slide show using MS POWERPOINT

UNIT- IV   Concept of Operating System, System security

Introduction, Functions of operating system, Types –batch, single user, multiuser, multiprogramming, multitasking, multi threading, real-time , embedded, Network, Distributed CLI(Command Line Interface) and GUI modes of O.S. Booting Process, BIOS, POST, Boot Strap Loader Introduction to viruses, worms, Trojans, Anti Viruses scanning & Removal of Viruses ,safety measures- Firewall, updates, Patches

UNIT- V   Internet Applications:

Introduction to internet, different services of internet- www, E-Mail, Chat (Textual/Voice), website access and information search, Browsers And Search Engines

LIST OF EXPERIMENTS:

1 .Study the uses of input and output device

2. Study the uses of storage devices

3. Backup of data on tape, floppy & hard disk, CD, DVD and in PEN drive

4. Use of windows media player, recording, editing playing sound and video files

5. PRACTICE ON WINDOWS 2000/ XP/Vista
Starting Windows, Exploring the desktop, Arranging windows, my Creating Shortcuts, Practice on moving and Practice on Windows Explorer File organization: creating, copying, moving, renaming and deleting and Practice on Windows Accessories Creating editing, formatting, previewing and printing documents using Shutting down windows.

6. PRACTICE ON MICROSOFT EXCEL
Creating editing, formatting, saving, previewing and printing worksheet.
Use of formula and functions.
Split windows and freeze pans.
Create, edit, modify, print worksheet/charts.
Import & Export D
Pivot table- create, modify
Sorting & Filter data
Header, footer, Watermark.
7. PRACTICE ON POWERPOINT
Create, edit, insert, move, slides.
Open and save presentation.
Insert Object, picture, Diagram, chart, Table, Movie & Sound,
Slide design, layout, background.

slide show, setup, action button, animation scheme, custom animation,

COURSE OUTCOMES:

1. Demonstrate a basic understanding of computer hardware and software.
2. Demonstrate problem-solving skills.
3. Apply logical skills to programming in a variety of languages.
4. Utilize web technologies.
5. Demonstrate basic understanding of network principles.
6. Working effectively in teams.
7. Apply the skills that are the focus of this program to business scenarios.

TEXT BOOKS:

A First Course in Computers	S . Jaiswal	Golgotha Publication
Computers Today	Suresh K. Basandra	Galgotia Publication
Understanding windows	Chapman	BPB Publication

REFERENCE BOOKS:

the Complete Guide to Microsoft Office Professional,	Ron Mansfield	Sybex /BPB Asian Edition
Inside IBM PC.	Norton Peter	TMH
Multimedia Making it work	Tay Vaughan	Tata McGrawHill

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Workshop Practices

COURSE OBJECTIVE:

1. Workshop Practice is the backbone of the real industrial environment which helps to develop and enhance relevant technical hand skills required by the technicians working in the various engineering industries and workshops.
2. To familiarize with the basics of tools and Equipments used in fitting, carpentry, foundry, welding andsmithy
3. To familiarize with theproductionof simple models in the above trades.

Syllabus:

UNIT- I   Carpentry Shop

1.1 Introduction to various   types of wood such as Deodar, Kail, Partal, Teak, Mango, Sheesham, etc. (Demonstration and their identification).

1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.

   Job, I Marking, sawing, planning and chiseling & their practice

1.3 Introduction to various types of wooden joints, their relative advantages, and uses.

   Job II Preparation of Half lap joint

   Job III Preparation of Cross-lap Joint

UNIT- II   Fitting Shop

2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. (e.g. Steel, Brass, Copper, Aluminium etc.). Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.

2.2 Description and demonstration of various types of workbenches. holding devices and files. Precautions while filling.

2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

 Job I Marking of job, use of marking tools and measuring instruments.

 Job II Filing a dimensioned rectangular or Square piece of an accuracy of ± 0.5mm

Job III Filing practice (Production of flat surfaces) Checking by a straight edge.
 Job IV Making a cutout from a square piece of MS Flat using a Hand hacksaw.

2.4 Care and maintenance of measuring tools like calipers, steel rule, try square,

vernier calipers, micrometer, height gauge, and combination set. Handling of measuring instruments, checking of zero error, finding of least count.

UNIT- III   Welding Shop

3.1 Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, Electrode holder, electrodes

3.2 Electric arc welding, (ac. and dc.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc.

Job I   Practice of striking arc while using an electric arc welding set.

Job II Welding practice on electric arc welding for making uniform and Straight weld beads

3.3 Various types of joints and end Preparation.

Job III Preparation of butt joint by electric arc welding.

Job IV   Preparation of lap joint by electric arc welding.

Job V   Preparation of Tee joint by electric arc welding.

UNIT- IV   Smithy Shop

4.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in Smithy shop. Safety measures to be observed in the smithy shop.

4.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.

4.3 Demonstration and description of tongs, fullers, swages etc.

Job I To forge an L-Hook.

Job II To forge a chisel

Job III To prepare a cube from an M.S. round by forging method.

UNIT- V   Foundry Shop

5.1 Use of foundry tools and other equipment for the Preparation of molding sand mixture.

5.2 Preparation of green sand molds kept ready for pouring in the following case:

Job, I Using two molding boxes (hand cut molds).

Job II Using patterns (Single piece pattern and Split pattern).

Job III Preparation of one casting (Wax, Aluminum or cast-iron Demonstration only)

COURSE OUTCOME:

On completion of this course, students will be able to

1. Make half lap joint and dovetail joint in carpentry.
1. Make welded lap joint, butt joint and T-joint.
1. Prepare sand mould for cube, conical bush, pipes and V pulley.
2. Prepare sand mould for cube, conical bush.
3. Make parts like square box in foundry.

Text Books:

● "A first course on workshop practice – Theory, Practice and Work Book"	.S K Hazara Choudhary, Gopal.T.V, Kumar.T, and Murali.G,	Suma Publications, Chennai, 2005

Reference Books:

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi

Material Technology

COURSE OBJECTIVE:

The course introduces several advanced concepts and topics in the rapidly evolving field of material science. Students are expected to develop comprehension of the subject and to gain scientific understanding regarding the choice and manipulation of materials for engineering applications.

Syllabus:

UNIT-I **Requirement of Engineering materials, mechanical properties and their testing:** Introduction to engineering materials, classification of engineering materials and their properties. Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.

Structure of Solid materials: Classification amorphous and crystalline states, unit cells and crystal structure (B.C.C., F.C.C. and H.C.P) allotropy. Crystal imperfection and their effects on properties

UNIT-II **Equilibrium Phase Diagrams and Phase Transformation Equilibrium of phase Diagrams:**
Plotting of equilibrium diagrams, interpretation, phase rule and lever rule and its application Phase transformations - Eutectic Eutectoid, Peritectic and Peritectoid.

Iron- Carbon Equlibrium System : The complete iron carbon diagram and its interpretation. The solidification and cooling of various carbon steels, structures produced, correlation of mechanical properties with carbon content.

UNIT-III **Heat Treatment of Steels:**
Objective of heat treatment, thermal processes- annealing, normalizing, hardening and tempering. Hardening process : Surface hardening, flame hardening, case hardening methods, their scope, limitations and advantages, quenching mediums and their effect on hardness, Hardening defects due to improper quenching, hardenability, Jominy end quench test and interpretation of its results. T.T.T. curves interpretation and use, Isothermal heat treatment processes -martempering, austempering, spherodising and patenting.

Ferrous Metals and Alloys : Classification, types of cast irons their properties and uses, alloy cast-irons, various alloying elements used, their effects on properties and uses. Classification, composition and uses of plain carbon steels, effect of impurities, Alloy steels -various alloying elements, their effects on properties and uses. Alloy steel classification.Tool Steel : Typical compositions, requirements of tool steels, high speed steel, high carbon steel. Standardization of steels. Designation of steals as per B.I.S. codes.

UNIT-IV **Non- Ferrous Metals and Alloys:**
Copper : Its Properties and uses Cooper Bases Alloys : Brasses, their classification, composition, properties and uses, designation of copper alloys as per B.I.S. aluminum its properties and uses.

Aluminum Alloys : Their composition, Classification, properties and uses.

Designation of Al- alloys as per B.I.S, Zinc, Nickel and lead their alloys properties and

uses Bearing alloys - their composition and field of application.

Non- Metallic Materials : introduction to Ceramic Refractory, Rubbers Insulators and Lubricants.

UNIT-V   **Plastics:**
characteristics, classification, commonly used thermo¬setting and thermoplastic - their properties and uses. Ingredients for processing plastics.
Plastic processing methods different methods.

Powder Metallurgy: Introduction and application. Description of process, manufacture and blending of metal powder compacting and sintering.

Modern Trends in Materials Engineering: New materials like FRP, Composites, synthetic fibers, synthetic wood. Super conductors.

COURSE OUTCOMES:

1.   To acquire basic understanding of advanced materials, their functions and properties for technological applications.
2.   To emphasize the significance of materials selection in the design process
3.   To get familiarize with the new concepts of Nano Science and Technology

TEXT BOOKS:

A Text Book of Material Science And Metallurgy	O.P. Khanna.	Dhanpat rai publication
Material Science And Process	S. K. Hazia Choudhry.	TMH
Materials Science	B.S. Narang	Pub. CBS pub. & Distributions New Delhi

REFERENCE BOOKS:

Engineering physical Matallurgy	Prof. Y Lakhtin	MIR Publishers mascow.
Mechanical Metallurgy	Dieter	Tata Mcgrawhill
Introduction to Material Science And Engineering	K.M. Ralls, T.H. Courtney, John Wuff	Wiley Eastern New Delhi

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Strength of Materials

Course Objective:

To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

Syllabus:

UNIT-I   **Simple Stress and Strains:**
Introduction types of loads and deformation, types of stresses and strain. Hooke's law, stress strain diagram for ferrous and non ferrous materials modulus of elasticity. rigidity and bulk modules of materials Stress in bars of varying cross sections, composite sections and compound sections Thermal stresses and strains, thermal stresses in composite sections. Poisson's ratio, volumetric strain, relation between different modulus, strain energy, resilience, proof resilience, modules of resilience suddenly applied loads and impact loads.

UNIT-II   **Mechanical properties and their testing:**

Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, torsion test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.

 S.F. and B.M. Diagrams : Definition, types of loading types of beams, shear force and bending moment sign conventions S.F. and B.M. diagrams for cantilever simply supported and overhanging beams with point or concentrated loads uniformly distributed loads and combination of point and U.D.L. Point of contra flexure, numerical problems.

Principal Planes and Principal Stresses : Stresses on inclined plane subjected to direct shear or combination of stresses in two mutually perpendicular planes. Principal planes and principal stresses, analytical and graphical methods.

UNIT-III   **Bending Stresses in Beams:**

Theory of simple bending as assumptions made in simple bending theory position of neutral axis, surface moment or resistance. Modules of section of symmetrical sections such as rectangular, circular and I sections, bending stresses in symmetrical sections. Simple problems. Reinforced concrete beams, beam of uniform strength.

Shear Stresses in Beams: Introduction shear stress equation, assumptions made, distribution of shear stresses over various sections, such as rectangular, circular and I L & T sections, Simple numerical problems.

Deflection of Beams: Introduction Strength and stiffness of beam curvature of bent beam, Derivation of equation for slope and deflection of beam in case of cantilever and simply supported beam loaded with point loads U.D.L. and combination. Simple numerical problems. Importance of deflection and practical applications.

UNIT-IV   **Torsion of Shaft:**

Definition of torsion relation between stress, strain and angle of twist assumptions made strength of solid and hollow circular shaft, polar moment of inertia. Calculation of shaft diameter on the basis of strength and stiffness for the given horse power transmitted torsional rigidity. Maximum torque comparison of solid and hollow shaft size of a shaft

for a given torque.

UNIT-V   Columns and struts:

Definitions crippling load different end conditions, slenderness ratio, equivalent length, Euler's theory Rankine's formulae, radius of gyration, Rankine constant for different materials Limitations of Rankine formula simple problem B.I.S. code for columns.

Stresses in Frames: Definition of frame, perfect, deficient and redundant frame. Assumptions made in finding stress in method of sections and graphical method Bows notation, solution of problems using three methods.

Thin Cylinders and Spheres: Hoop stress longitudinal stress on inclined plane subject subjected to direct, shell, volume strain change in value, cylindrical vessels subjected to internal pressure, simple numerical problems.

COURSE OUTCOMES:

1.   Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
2.   Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

LIST OF EXPERIMENTS

1.   Analysis and demonstration of Universal Testing Machine & its attachments
2.   Tension Test on mild steel, Aluminium & compression test on cast iron on Universal Testing Machine.
3.   Direct Shear Test of mild steel on Universal Testing Machine.
4.   Brinell Hardness Test on Mild Steel.
5.   Rockwell hardness Test on Hardened Steel.
6.   Izod & Charpy - Impact tests of a standard specimen
7.   Torsion Test on Mild steel bar.
8.   Drawing sheet on shear force & bending Moment diagrams for a given loading (At least four problems.).
9.   Estimation of principal stresses and maximum shear strain for a given combined loading by analytical & Mohr's circle method. (At least two problems.).

TEXT BOOKS:

Strength of Materials	Sadhu Singh	Khanna Pub.
Advanced Mechanics of Materials	Kamal K and Ghai RC	Khanna Pub
strength of materials;	Negi	TMH

REFERENCE BOOKS:

Mechanics of Materials	Beer FP, Johnson ER, Dewolf JT	TMH
Strength of materials	Rattan	TMH
Strength of Materials	Nash William	TMH

Basic Electrical and Electronics

Course Objective:

1.   T o explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
2.   To explain the fundamentals of semiconductor and applications.
3.   To explain the principles of digital electronics

Syllabus:

UNIT-I   **Fundamentals Of Electrical Engineering:**
Concept of electric current, potential and potential difference (Voltage), Sources of D.C. and A.C. Electric energy, Methods of voltage generation and standard voltages used in generation transmission and distribution, Electrical Power, energy and their units.

UNIT-II   **D.C. Circuits:**
Ohm's Law, Concept of resistance, conductance, resistivity, conductivity and their units. Effect of temp. on resistance. Temperature coefficient of resistance (Definition only), Connections of resistances. Series, Parallel connections and their combinations. (Simple Numericals), Kirchoffs Voltage Law, Kirchoffs Current Law (Simple Numerical)

A.C. Circuits:

Generation of single phase and three phase sinusoidal voltage. Vector representation. Concept of Cycle, Frequency, time period, amplitude, phase and phase difference.

Define instantaneous value, average value, RMS value and peak value of sinusoidal electrical quantities. Derive relationship between them . Form factor and peak factor (Definition only).

Current voltage and power in pure resistive, inductive and capacitive circuit.

Concept of Reactance , impedance and power factor in R.L., R. C. and RLC Series circuit. (Simple Numericals).

Causes and effect of poor power factor. Methods of improving power factor.

3 phase AC supply- three phase three wire and three phase four wire system. Relationship between VL and VPH, IL and IPH and three phase power in star and delta connected load.(Simple Numerical)

UNIT-III   **D.C. Machines:**
Review of concept of Electromagnetism and related laws (Faraday's Law, Lenz's Law, Cork Screw Rule, Fleming's Left Hand & Right Hand Rule.)

Construction of D.C. Machines, its main parts and their functions. Classification of D.C. Machines.

D.C. Generator : Principle , EMF equation(Derivation and simple numerical), Types of D.C. Generator (No Numerical), Applications of DC generator.

D.C. Motor : Working Principle of DC motor, Types of DC motor, significance of back emf, Torque equation(No Numerical).

Characteristics of D.C. Series and Shunt Motor. Applications of D.C. Motor.

D.C. Motor starter - 3 point starter. Efficiency (No numerical)

A.C. Machines:

Single Phase Transformer : Construction, working principle.

EMF Equation (Derivation with simple numerical), Turn ratio, Step up and step down transformers and their application, Losses , efficiency and regulation (No derivation).

Three Phase Induction Motor : Construction, types , principle of operation. Concept of Slip (Simple Numerical), Applications, Starters: DOL and Star Delta.

Single Phase Induction Motor : Methods of making a single phase motor self start. Types of single phase induction motor- capacitor start, capacitor run and shaded pole and their applications.

Synchronous Machines : Synchronous motor- construction, principle of operation, comparision with three phase induction motor.

Synchronous generator (alternator) - Construction, principle of operation, speed and frequency, synchronous speed.

UNIT-IV **Measuring Instruments And Transducers:**
Classification of Measuring Instruments, absolute and secondary instruments. Indicating, Integrating and Recording instruments, their examples.

Elementary idea about working principles and construction of MI and MC type Ammeter and voltmeter. Electrodynamometer type watt meter. Induction type energy meter , electronic energy meter. Application of Megger and earth tester.Multimeter, CRO, its block diagram and applications.

Transducers - Definition, primary and secondary transducers, active and passive transducers, variable parameter R,L,C type transducers.

General idea about strain gauge, LVDT, Thermocouple, Peizo Electric and Photoelectric Transducers.

Electric Wiring:

Types of Wiring and their Applications, Size of conductor , S.W. gauge. Accessories like switches, fuses, holders, sockets and MCB's, Staircase Wiring , Fluorescent tube light wiring .

UNIT-V **Electronic Devices And Circuits:**
Semiconductor PN Junction Diode, Zener Diode, PNP and NPN transistor , UJT, FET, MOSFET and SCR. Their layer diagram, symbol, V-I characteristics and applications.

Electronic Circuits : Concept of biasing of diode and transistor.

Single Phase Half wave and Full wave rectifier(I/O waveform), Concept of ripple, filter circuit (shunt capacitor and series inductor) . Transistor as an amplifier, concept of gain, Zener regulator, regulated power supply (Block diagram only).

Electric Safety: Electric shock and its prevention, effect of electrical current on human body, shock treatment, need of earthling.

COURSE OUTCOMES:

1.   Ability to identify the electrical components explain the characteristics of   electrical machines.

2.   Ability to identify electronics components and use of them to design circuits.

LIST OF EXPERIMENTS:

1. Verification of Kirchoffs Law
2. To Measure Voltage Current and power insingle phase AC circuit.
3. To calculate Impedance, power and power factor by measuring voltage across each element and current to the circuit for a given RLC series
4. circuit.
5. Study of different parts of DC machine .
6. Study of three point starter for DC motor.
7. To determine transformation ratio of a given single phase transformer.
8. Study and operation of DOL and Star Delta Starter.
9. To measure slip for a given three phase induction motor.
10. To measure insulation resistance by Megger.
11. To measure earth resistance by earth tester.
12. To measure linear displacement by LVDT.
13. To make connection for stair case wiring.
14. To make connection for fluorescent tube light circuit.
15. Testing of various electronic components using multimeter and CRO.
16. To draw V-I characteristics of Zener diode.
17. To observe input and output wave form of full wave / half wave rectifier on CRO. To observe amplified output of a given amplifier.

TEXT BOOKS:

Fundamental of Electrical Engineering and Electronics	B.L. Thareja	CHAND Publication
Basic Electrical Engineering	V.K. Mehta	S. CHAND Publication
Basic Electrical Engineering	V. N. Mittle	TMH

REFERENCE BOOKS:

Electrical Machines Vol I & II	S.K.Bhattacharya,	TTTI, Chandigarh
Principles of Electrical Engg. and Electronics	V.K. Mehta	S. CHAND Publication
Electrical Measurement	J.B. Gupta	Dhanpat Rai & Sons

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Manufacturing Process

COURSE OBJECTIVE:

To make the students aware of different manufacturing processes like casting, metal forming, metal cutting and gear manufacturing.

Syllabus:

UNIT-I   **Introduction to Manufacturing Processes:**

Definition, classification of basic manufacturing processes i,e, mechanical working, casting, metal joining processes, metal cutting process, press working . Examples of each of the above listed manufacturing processes, factors which influence selection of manufacturing process for a particular application.

UNIT-II   **Metal Casting:**

Introduction, advantages and limitations of casting as productionprocess.

Pattern Making: Definition of pattern, types of patterns and their details, materials, allowances, tools required, colour code for patterns.

Moulding : Definition, moulding methods and types of moulds, moulding materials, moulding sand and its composition, sand properties, testing parameters of sand, and their effects, sand preparations, sand conditioning, characteristics and defects of moulds. Function of runners, risers and gate. Cores and core making, core boxes. Cleaning of casting, Special casting methods, need for special casting methods, die casting, centrifugal casting, investment (lost wax) casting, casting defects, causes and analysis, area of application of casting process.

Furnaces : Cupola ,crucible, pit and electric arc furnaces, induction furnace , their salient features, safety aspects.

UNIT-III   **Press Working:**

Introduction of press working of metals, principle of press working description of a simple press working unit, press working operations : punching, shearing, drawing, bending, slitting, knurling, notching, trimming, piercing etc.

Double action press, description and its field of application, die and punch, types of dies, specifications of a press, safety precautions to be observed while working on a press.

UNIT-IV   **Mechanical Working:**

Introduction - hot and cold working Principle of recrystalization.

Metal Rolling : Principle of metal rolling , basic components of a simple rolling process equipment. Types of deformation during rolling. roller material, selection and desirable properties, principles of thread rolling- description with sketches, manufacture of seamless tubes by rolling. types of rolling mill. Rolling defects Metal Drawing : Basic Principle of drawing of metals, differentiate between the drawing and deep drawing of metals, principle of wire drawing and example.

Extrusion: Definition, Classify the methods of extrusion, their limitations, advantage and disadvantage. Tube extrusion, impact extrusion, application of extrusion processes. Extrusion defects.

Forging : Types of forging, Die forging, differentiate between the cold die and hot die forging , advantage of forming by forging, common defects and their reasons.

Limitations of forging, press forging, drop forging, upset forging, die material, applications of forging processes in engineering.

UNIT-V   **Metal Joining:** Introduction, Classification of metal joining processes

Welding: classification, Plastic, fusion and forge welding, Weldability of metals, metallurgy of welding

Resistance welding: Spot, seam, butt, projection, percussion techniques.

Gas welding and gas cutting: Principle of operation and technique, gas cutting.

Arc Welding : Carbon arc, TIG, MIG, Submerged arc , Atomic hydrogen, Eletro-slag, Plasma arc welding processes, Electrodes- types and selection , flux and their uses. Special welding techniques- Welding of different metals. Defects in welds, testing and inspection. Accident prevention in gas and arc welding Equipments & tools used in metal arc welding, specification and functions. Soldering, Brazing and Adhesive bonding

COURSE OUTCOMES:

1. Concepts of casting Technology.
2. Mechanical working of metals.
3. Concepts of welding process
4. Concept of forging methods

LIST OF EXPERIMENT

1. Making a split/solid pattern from wood. Making a core box.

2. Tempering of sand, practice of green and dry sand making.

3. Practice of core making and baking

4. Practice of open mould in a two boxes, using split pattern and solid pattern, Locating the core

5. Demonstration of metal melting in pit furnace& casting process.

6. Simple forming practice (Making a square bar out of a given round bar, making of a chisel and bolt)

7. Practice of upsetting of a round on power hammer.

8. Practice of sheet cutting with the help of straight and bent snips. Making small rectangular prism and cylinder

1. Practice of piercing, notching and circle cutting with the help of Metal master machine.

2. Practice of piercing, notching and circle cutting with the help of Metal master machine.

3. Practice of edge preparation for welding.

4. Demonstration and practice of bead laying (Welding) on a Flat pieces

5. Practice of Welding of corner, edge and Tee joint

6. Welding ' V' butt joint.

7. Practice of joining wires and rods of different size on spot welding machine.

8. Practice of making gas flames with nozzles and making simple joints.

TEXT BOOKS:

Producting Engineering	Kalpakjian	PEARSON
Workshop Technology	Raghuvanshi	Dhanpat Rai
Workshop Technology:, Vol I	Hajra Choudhary	Katson publication

REFERENCE BOOKS:

Shop Theory	Anderson and Tetro	Mc Graw Hills
Manufacturing Process & systems	Philip F Ostwald	Wiley
Manufacturing Processes	JP Kaushish	PHI Learning

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Industrial Engineering

COURSE OBJECTIVE:

To gain an understanding and appreciation of the principles and applications relevant to the plannir
design, and operations of manufacturing/service firms.
To gain some ability to recognize situations in a production system environment that suggests
the use of certain quantitative methods to assist in decision making on operations management
and strategy.

Syllabus:

UNIT-I Introduction: Definition of industry and industrial engineering, scope and role of industrial engineering fields of applications. Productivity: Production and productivity, production systems and their impact on productivity, its significance and benefits of higher productivity. Long term and short term factors affecting productivity, productivity cycle. Work Study: Introduction, its relation with productivity aims, objectives and application of work study, basic procedure and techniques of work study . Human factors in work study. Role of manager, supervisor and workers. Working conditions, environment of industry affecting work study.   Method   Study: Definition objectives, basic procedures of methods study. Recording techniques, operation process chart, flow process chart, machine chart, flow diagrams, string diagrams, two hand process charts, questioning technique procedure to develop, install and maintain new methods.

UNIT-II Principles of Motion Economy: Meaning, basic rules design of efficient work place-layout, classification of human body movements and their preferred order. Material Handling and Plant Layout : Importance and its effects on productivity, requirements of good material handling system, classification and selection of material handling equipment. Requirements of good layout. Effect of bad layout, Factors affecting plant layout, types of layout, advantages and limitations of each type of layout selection of layout, factors affecting the plant location   Micro Motion Study: Definition and objectives, techniques of micromotion study, therbligs and their symbols, use of therbligs, SIMO chart and its application. Work Measurement: Definition, Basic procedure and technique to work measurement. Stop watch time study, types of stop watch study, factors considered in selecting a job for time study, qualified and representative workers, procedure of stop watch time study, job element and their need of identification, general rules for breakdown of job into elements, work cycle, methods of time measurement, performance rating, its meaning, standard rating, rating of operators, conditions for operators variation at work place rating scales, rating factors, calculation of basic time. Allowances- purpose, types. Calculation of standard time synthesis method- meaning, data, complication, advantages and limitations.

UNIT-III PMTS- Definition principle and use, calculation of standard time. MIM - Meaning, tables and use. Application of MIM analysis for LH-RH charts, calculation of standard time. Work/ Activity Sampling: Definition, statistical basics, determination of number of observation for given accuracy, sources of error, application and calculation of standard time. MOST Technique for work measurement: Definition of terms, concept of the MOST, Basic MOST sequence models, Time Units, Parameter Indexing, Method Accuracy and Sensitivity, Levels of Work Measurement, Compatibility of MOST systems, Application of MOST. Job Evaluation, Wages and Incentives: Definition, need and scope of job evaluation. Job evaluation systems and their comparative merits and demerits and limitations. Wage: Definition, wage components, wage fixation, real, minimum and fair wage. Financial and non- financial incentives and their examples. Wage plans- Halsey, Taylor, differential plan, Gantt task and bonus

plan, 100 % premium plan.

UNIT-IV Statistical Quality Control: Definition of quality and total quality, three stages of quality, quality control and SQC, difference between inspection and quality control, concept of variability, natural variation, its importance to quality control, classification of quality, characteristics, basic tools of SQC and their application, frequency distribution, measures of central tendency and dispersion, their need and calculations. Normal Curve : Definition, characteristics, calculation of area under normal curve and its application, statistical tolerance their calculation and application. Process capability meaning calculation and use. Control Charts for Variables: Statistical basic for control Charts for variables, construction of X and R Charts- their interpretation, use of X and R chart in establishment of process capability. Control Charts for Attributes: Limitation of X and R charts, Meaning and use of attributes, their advantages, Calculation, construction, interpretation and application of p- chart, c- chart, ph-chart. Need of calculating the revised values of mean, and control limits and their calculation.

UNIT-V Acceptance Sampling: Meaning different techniques procedure involved sampling inspection meaning and comparison with 100 % inspection. Factors affecting sampling and their effects. Single and double sampling plans, use of IS codes. O.C. Curves: Meaning, terms used, their definition, construction and use of O.C. curves. Selection of sampling plans. Reliability: Definition quality control and reliability factors affecting reliability of product. Measures to ensure reliability of product, effect of product reliability marketing. M.T.B.F and M.T.T.F. Definition programme for reliability. Maintainability and availabili   ty.

COURSE OUTCOMES:

1.   Upon completion of this course, the students can ableto use the optimization techniques for use engineering and Business problems
2.   Understand the concepts of operations research modelling approaches.

TEXT BOOKS:

Introduction To Industrial Engineering	Philip Hicks	McGraw Hills
Work Study	M.D. Schmid & Subrammaniam	TMH
Industrial Engineering & Management	O. P. Khanna	Khanna publisher

REFERENCE BOOKS:

Motion and Time Study	Ralph M. Barnes	John Willey New York.
Wage Administration	D.K. Roy.	N.P.C. Publication
MOST Work Measurement Systems	Kjell B. Zandin, Marcel Dekkar	Inc. New York

Fluid Mechanics and Hydraulic Machines

COURSE OBJECTIVE:

1. The applications of the conservation laws to flow through pipes and hydraulic machines are studied.
2. To understand the importance of dimensional analysis.
3. To understand the importance of various types of flow in pumps and turbines.

Syllabus:

UNIT-I Fundamentals of Fluid Flow : Definition of fluid, ideal and practical, compressible and incompressible fluids, fluid properties- density, specific weight, specific gravity, dynamic and kinetic viscosity, types of flow- laminar and turbulent, steady and unsteady, uniform and non-uniform. Continuity equation, Simple numerical problems on continuity equation.

UNIT-II Pressure and Its Measurement: Concept of pressure, intensity of pressure, Pascal's law, pressure head, gauge pressure, vacuum pressure, absolute pressure, manometers- Piezometer, U-tube manometer inclined manometer, differential manometer, inverted U- tube manometer Pressure gauges, Bourdon tube pressure gauge. Simple numerical problems on differential manometers.
Basic Equation of Fluid Flow: Various form of energies applicable to fluid flow, potential energy, kinetic energy, pressure energy, total energy of fluid flow, Concept of datum pressure, velocity and total head of a fluid particle in motion. General steady flow energy equation, Bernaulli's theorem, assumptions made in deriving Bernaulli's theorem and derivation of Bernaulli's theorem, practical applications of Bernaulli's equation: venturimeter, orifice- meter, pitot tube, flow nozzle- Their construction, working and limitation. Simple problems on venturimeter, orifice meter, pitot tube.

UNIT-III Flow Through Orifices and Mouth Pieces and flow measurement: Definition and types of orifices, Vena contracta, coefficient of contraction., velocity, discharge and resistance . Torricell's theorem experimental determination of Cc, Cv and Cd. Head loss due to sudden enlargement, contraction and obstruction in pipe. Mouth pieces, Time of emptying vessel by orifice (cylindrical, conical) Flow from one vessel to another large orifices. Flow measurement by Rota meter, Volume flow meter

UNIT-IV Flow Through Pipes : Laminar and turbulent flow, Raynold's number, differentiation of laminar and turbulent flow on the basis of Reynold's number, loss of head due to friction in pipes, Darcy's formula and Chezy's equation. Hydraulic gradient and total energy line. Flow through long pipes, pipes in series and parallel simple problems based on above formulae water hammer and its effect surge tank.
Impact of Jets : Impact of Jet on flat and curved plates stationary and moving, work done by Pelton wheel, velocity triangle, simple numerical problems on axial, radial flow.

UNIT-V Water Turbines: Meaning Classification Impulse and reaction turbine, Comparison description and working of Pelton, Francis and Kaplan turbines, Fanlaws specific speed & Selection of turbines.
Water Pumps: Centrifugal and reciprocating- principle construction, working classification and layout. Comparison of centrifugal and reciprocating pumps. Specific speed, selection of pumps. Use of air vessels in reciprocating pump, indicator diagram, horse power calculation in case of reciprocating pump. Horse power calculation in case

of centrifugal pump. Operating characteristics.

Hydel Power Station : Schematic diagram, function of various elements, advantage over other power stations.

COURSE OUTCOMES:

Upon completion of this course,
1. The students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
2. Can critically analyse the performance of pumps and turbines.

LIST OF EXPERIMENTS:

1. To measure the pressure of water in pipe by (a) Piezometer (b) different types of monometers.
2. To verify Bernaulli's equation.
3. To determine discharge through a given venturimeter.
4. To determine discharge through a given orifice meter.
5. To determine discharge through a Pitot tube.
6. To determine Cc, Cv and Cd for different types of orifices and mouth pieces.
7. To determine loss of head due to : (a) Sudden enlargement. (b) Friction in pipes.
8. To determine discharge through different types of notches.
9. Study of Pelton wheel, Francis turbine, and Kaplan turbines.
10. To determine performance characteristics.
11. Study of reciprocating pump.
12. To determine h.p. of reciprocating pump.
13. Study of centrifugal pump.
14. To determine operating characteristics of centrifugal pump.

TEXT BOOKS:

Fluid Mechanics	Cengal	Mc Graw Hills
Fluid Mechanics & hydraulic Machines	Modi & Seth	S.Chand
Fluid Mechanics	K L Kumar	TMH

REFERENCE BOOKS:

Fluid Mechanics	White	Mc Graw Hills
Fluid Mechanics	R Mohanty	PHI
Fluid Mechanics	Streeter VL, Wylie EB, Bedford KW	Mc Graw Hills
Fluid Mechanics Volume II	CS Jog	CAMBRIDGE IISc Series

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Thermal Engineering

COURSE OBJECTIVE:

1. Know various sources of energy & their applications.
2. Apply fundamental concepts of thermodynamics to thermodynamic systems.
3. Understand various laws of thermodynamics.
4. Applyvarious gas laws & ideal gas processes to various thermodynamic systems.
5. Calculate properties of two phase system by using steam tables/ Mollier charts.
6. Explain construction & working of boilers, mountings & accessories.
7. Understand the working of I. C. Engines and its components.
8. Understand the working of steam turbine and use of nozzles and condensers.

Syllabus:

UNIT-I   Dimensions and systems of units: Basic and Derived units for common engineering variables and properties like mass, length, time, temperature, area, volume, velocity, acceleration, force, pressure, work, heat, energy, power etc.

Sources of energy: Brief description of energy sources Classification of energy sources, Renewable, Non-Renewable, Fossil fuels, including CNG, LPG; Solar Energy- Its nature, merits and demerits, potential; Flat plate and concentrating collectors & their application. Solar Water Heater, Solar Air Heater, Photovoltaic Cell, Solar Distillation; Wind, Tidal, Geothermal, Biogas, Biomass, Bio-diesel, Hydraulic, Nuclear, Fuel cell - list of fuel cells

Basic Concepts of thermodynamics: Definition and importance of thermodynamics, thermodynamic system open, closed and Isolated system, boundary and surrounding forms of energy. Point and path functions, properties of system intensive and extensive properties thermodynamic state, thermodynamic process, cycles thermodynamic definition of work, heat and thermodynamic equilibrium, Zeroth law of thermodynamics, Quasi-static process, work done during Quasi Static process.

UNIT-II   Energy and its calculation, relationship between heat transfer, work transfer and change in internal energy. Differentiation between shaft work, flow work and displacement work; Steady flow energy equation and its application to various units such as boiler, nozzle, turbine compressor enthalpy.

Second Law of Thermodynamics: Limitation of first law. Statements of second law Kelvin, Planck and Clausius statements, Concept of heat pump, refrigerator and heat engine thermal efficiency. Parameters affecting thermal efficiency, means of increasing efficiency, COP. Equivalence and irreversible processes. Factors which make a process irreversible. Reversible cycle. Carnot cycle its efficiency and limitation ; Carnot theorem Clausius Inequality, concept of entropy, Principle of increase of entropy, determination of increase of entropy, principle of increase of entropy, determination of increase of entropy, Statement of third law of thermodynamics.

First Law of Thermodynamics: Concept of heat reservoir, heat source and heat sink, Statement of first law, Mathematical representation, applications of first law to open and closed system. Concept of internal

UNIT-III   Ideal Gases and Gas Processes: Definition of an ideal gas, gas law, characteristics gas equation, specific and universal gas constants specific heat constant pressure and specific heat, constant volume. Ideal gas processes- isobaric isothermal, isentropic, polytropic and throttling process as applied to open and closed systems. Representation of these

processes on P-V, T-S and H-S diagrams. Computation of change in enthalpy, entropy and internal energy. Net heat transfer and work done.

Thermodynamic Cycles: Air Standard cycles- definition and purpose standard efficiency, Carnot, Otto Diesel dual and Brayton cycles, their representation on P.V. & T.S. Diagrams. Derivation of air Standard efficiency and their comparison and limitation of each cycle. Vapour power cycle - Carnot cycle its limitation, Rankine cycle modified Rankine cycle- their representation on P.V.T.S. and H.S. Planes, derivation of expression for thermal efficiency.

UNIT-IV   Two Phase System: Pure substance phase, phase changes steam as a two phase system steam formation and its representation on temp- enthalpy plane. Properties changes, representation of wet dry and saturated and superheated steam on P.V., T.S. and H.S. planes. Dryness fraction of steam, methods of determination of dryness fraction separation and throttling calorimeter. Use of steam tables and Mollier's diagram . Determination of change in properties such as entropy enthalpy internal energy and work and heat transfer in the following processes- isobaric, isochoric, isothermal, isentropic, polytropic, throttling, and representation of various processes on P.V. and H.S. planes.

Steam Generators: Definition, classification, working of Babcock and Wilcox Boiler and Lancashire, Boiler Mountings and accessories.
Steam Nozzle, Condensers and Turbines: Steam nozzle and its use, Condenser-Classification, construction and working of surface condenser, Classification, working principle of steam turbines, difference between impulse and reaction turbine, compounding of steam turbine, velocity diagram (introductory and its use) Governing of steam turbine.

UNIT-V   Internal Combustion Engines: Introduction, classification I.C. Engine Components and their function, working of two stroke and four- stroke cycle engines and their comparison. Indicator diagram, Calculation of IHP, BHP thermal efficiency, Mechanical efficiency and relative efficiency, Governing, Cooling and lubrication of I.C. Engines.

Heat Transfer: Modes of heat transfer; Conduction convection and Radiation. Fourier's law of heat conduction, temperature gradient, expression for determination of heat transfer across a flat plate, thermal conductivity and thermal resistance. Newton's law for heat transfer by convection, free and forced convection. Heat transfer by radiation Stefan-Boltzmann Law of thermal radiation.

Define the terms- absorptivity, reflectivity and transmissivity; black body, emissive power, grey body.

Heat exchanger; Shell and tube, Plate type and their applications.

COURSE OUTCOMES:

Upon completion of this course,

1.   The students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.

2.   Apply mathematicalfundamentals to study the properties of steam, gas and gas mixtures.

LIST OF EXPERIMENT:

1. Study and trial on solar water heating system.
2. Report on visit to wind power generation plant / biogas plant / hydraulic power plant.
3. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
4. Study or Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories..
5. Study of separating and throttling calorimeter.
6. Study of steam turbine.
7. Study of different types of I.C. engines (four stroke and two stroke C.I. and S.I.)
8. Study of various systems of I.C. engines.
   1. Fuel supply system
   2. Cooling system
   3. Ignition system
   4. Government system.
   5. Lubrication system
9. Study of
   1. Fuel pump
   2. Fuel injector
   3. Carburetor.
10. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.
11. Numerical on vapour processes and ideal gas processes (minimum two problems on each)
12. Two phase systems equilibrium diagram on p-v , T-s, h-s plane
13. Study of flow of heat in natural environment at least 10 cases and relation to second law of thermodynamics

TEXT BOOKS:

Engineering Thermodynamics	P.K.Nag	TMH
Engineering Thermodynamics	Ratha Krishanan	PHI India Pvt. Ltd.
Thermal Engineering	R.K Rajput	Khanna publication
Thermal Engineering	R Yadav	

REFERENCE BOOKS:

Thermodynamics	Cengel Y	TMH
Engineering Thermodynamics	Omkar Singh	New Age International
Engineering Thermodynamics	M. Achuthan	PHI India.
Thermodynamics	Arora CP	TMH

Theory of Machines

COURSE OBJECTIVE:

1.   To understand the basic components and layout of linkages in the assembly of a system /machine.

2.   To understand the principles inanalyzing the assembly with respect to the displacement, velocity and acceleration at any point in a link of a mechanism.

Syllabus:

UNIT-I   **Simple Mechanism:**

Introduction of theory of machines, definitions- statics, dynamics, kinematics, kinetics, kinematic pair, kinematic chain, mechanism, machine inversions, relation between number of links, number of joints and number of pairs, Four bar chain and its inversion, Slider crank chain and its inversions.

Velocity and Acceleration of Points and Links : Angular and linear velocity, relative and absolute velocity, velocity in links. Instantaneous centre, locating instantaneous centre of rotation, velocity determination of four bar mechanism by relative velocity method, Acceleration of link centripetal and tangential, total relative and absolute acceleration. Velocity and acceleration diagrams for four bar and other mechanisms. Klein's construction for single slider crank mechanism. Analytical method of calculating the velocity and acceleration of piston in a reciprocating engine mechanism.

UNIT-II   **Dynamic force analysis, Crank Effort Diagrams and Flywheel:**

Dynamics of reciprocating engine mechanism. Inertia force due to reciprocating mass, piston effort crank effort, turning moment on crank shaft, Analytical and graphical methods of construction of turning moment diagrams for steam and I.C. engines. Fluctuation of energy and speed. Coefficient of fluctuation of energy and speed. Flywheel and its function . Calculation of moment of inertia. weight of flywheel for steam and I.C. engines.

Brakes and Dynamometers: Brakes - need, types, braking force, braking torque. band brakes, block brakes, internally expanded brakes, dynamometer- meaning, need and types . Simple numerical calculation on above items

UNIT-III   **Power Transmission:**

Drives : meaning, Classification, belt, chain, rope and gear drives. Flat and ' V ' belt, ratio of tensions . Slip length of belt calculation for open and cross belt drive. H.P. transmitted. Effect of centrifugal force, centrifugal tension, total tension maximum stress in belt. Maximum Power transmitted. Velocity for maximum H.P. condition. V-Belt drives, advantages and disadvantages of V-Belt drives. Rope Drives : Types, ratio of tensions, Designation of ropes as per B.I.S.

Chain Drive : Classification, designation of chain drives as per B.I.S.

Governors : Functional difference with flywheel. Classification : Watt, porter, proell and hartnell- their contruction and working. Sensitivity, stability, power and effort, hunting phenomenon and isochorisom of governor.

UNIT-IV   **Cams and Followers:**

Need, Classification. motion of follower Displacement, velocity and acceleration diagrams uniform velocity, uniform acceleration and retardation. Simple harmonic motion. Cam profile for radial. offset knife edged follower.

Balancing of Machine Parts: Concept Static and dynamic balancing of rotating parts.

Simple numerical problems on static balancing of several masses in single plane graphical and analytical method.

UNIT-V   **Vibrations:**
Introduction elements of vibration. System classification and explanation of the types of vibration according to the actuating force on the body like undamped vibration. Free damped vibration and forced damped vibration. Classification and explanation of the types of vibration according to the number of degrees of critical speed of shaft.

Gear and Gear Train: Introduction , classification of gears , gear terminology , law of gearing ,velocity of sliding , forms of teeth - cycloid profile teeth , involutes profile teeth, path of contact, arc of contact. Interference in involutes gear , minimum no of teeth in gear and pinion classification of gear train . Function of idler. Calculation of velocity ratio, train value of gear train- simple, compound epicyclic and reverted gear train, motor car gear box.

COURSE OUTCOMES:

Upon completion of this course,
1.   The students can able to apply fundamentals of mechanism for the design of new mechanisms andanalyse them for optimum design.
2.   Students should be able to draw the profile of cams and its analysis

List of Experiments:

1. Study of inversions of four bar chain mechanism
2. Study of inversions of single slider crank chain mechanism (a) crank slotted lever mechanism
(b) Whitworth quick return motion mechanism
3. Dynamic force analysis of single cylinder four stroke engine.
4. Study of flywheel
5. Study of governor
6. Study of different cam and follower
7. Study of different gear trains
8. Study of power transmission methods
9. Study of different types of break and dynamometer
10. Study of types of vibration and their measurement methods
11. Study of dynamic balancing procedure of rotating parts

TEXT BOOKS:

Theory of machines	Rattan SS	TMH
Mechanism and Machine Theory	Ambekar AG	PHI
Theory of machines	R.S khurmi	Khanna publication
Theory of Mechanism and Machines	Sharma CS; Purohit K	PHI

REFERENCE BOOKS:

Theory of Machines	Thomas Bevan	CBS PUB Delhi.
Mechanism and Machine Theory	Rao JS and Dukkipati	New Age Delhi
Theory of Machines	Dr. Jagdish Lai	Metropolitan Book Co; Delhi
Theory of Mechanisms & Machines	Ghosh A, Mallik, AK	Affiliated East West Press, Delhi

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(Board of Studies)　　　**(Academic Council)**　　　**Seal**

Machine Tool Technology

COURSE OBJECTIVE:

Upon completion, students should be able to explain operator safety, machine protection, data input, program preparation, and program storage.

Syllabus:

UNIT-I **INTRODUCTION**:

Concept of machine tool technology, needs, area of use etc.

Metal Cutting Theory:

Stages in cutting, factors affecting cutting, types of chips, built up edge (BUE) formation conditions and effect upon surface finish, definition of cutting force, feed force, radial force with the help of merchant circle diagram. Power requirement for each type of force. Tool geometry and influence of tool angles, desirable properties of cutting tool materials and their influences on the choice of tool material.

Primary and secondary function of cutting fluids and properties of cutting fluids commonly used, types of cutting fluids. Cutting variables, tool wear and tool life. Taylor's tool life equation and cutting speed calculation. Economy of metal cutting.

UNIT-II **Lathe:**

Basic difference between centre, turret and Capston lathes, constructional details and specification. working principles and features of mechanical hydraulic and electrical copying system, rate of production, skill requirement, accuracy and cost of production. Working principles and types of automatic lathes, work holding and tool holding and tooling used for Capston and turret lathes, operation planning and tool layout for internal, external threading.

Shaper, Drilling & Boring Machine. Shaper:

Construction, operation. application, Types of Drilling Machines, construction, operation and application, Horizontal and vertical boring machines constructional features, Jig boring machine, its construction, operation and application.

Milling Machines:

Define milling, Classification of milling machines, Principles, parts and their functions, types of table movement in universal milling machine, specifications of milling M/C. Conventional and climb milling, different milling operations and their application, milling cutters and tool angles, specification and cutter materials, use of arbor, collets and adopters machine attachments, methods of mounting the cutter, work holding devices, dividing heads. Direct, simple and differential indexing, selection of cutters, speed feed, procedure for setting up operations and inspections, maintenance of milling.

UNIT-III **Grinding Machines and Finishing Processes:**
Definition of grinding and cutting action in grinding, types of abrasive materials and their properties, binding materials, grinding wheel classification and standard marking system, conditions for selection of grinding wheels. Balancing of grinding wheels, glazing and loading, methods of dressing and tracing, Principles of working of grinding machines, types of grinding process, functions of tool and work holding devices, feed arrangement, table drive in surface and cylindrical grinders.

Types of lubricants and coolants used in grinding, grinding defects, their remedy and safety practices.

Definition of honing, lapping, super finishing methods, equipments involved, Materials used, tolerances obtained and limitations, applications of honing and lapping processes.

UNIT-IV **Special Purpose Machines:**
Difference between forming and generation of gears, principle of gear shaping, hobbing and shaving, rate of production accuracy and limitations. Thread production : thread rolling and thread milling. Broaching Machines : Definition of Broaching, types of broaches, broaching machines, advantages and limitations.

Jigs and Fixtures:
Functions of Jigs and fixtures, 3-2-1 principle of location, Design criteria for simple jigs and fixtures.

UNIT-5 **Machine Tool Drives:**
Requirements of machine tools, elements of machine tools and their purpose Drive Systems: Stepped and step less drives, advantages and limitations of the gear box drives, function of feed box, types of feed gear boxes, working and advantages. Principle of straight line motion, multihandle, single lever and pre-selective control system.

Plastic Moulding:
Types of plastic, Compression moulding, Transfer moulding , Injection moulding, Blow moulding, Vacuum forming, Extrusion.

COURSE OUTCOMES:

1. Understand ASA and ORS systems of tool geometry and their inter-relations.
2. Develop relations for chip reduction coefficient, shear angle, shear strain, forces, power, specific energy and temperature in orthogonal cutting.
3. Select cutting fluids, tool materials and coatings to control tool wear and temperature.

TEXT BOOKS:

Manufacturing Processes & Systems	Phillip F. Ostwald & Jairo Minoz	John Willey & Sons
Production Technology	Jain Gupta,	Khanna Publishers, New Delhi
Manufacturing Processes	Begeman Amstead,.	(Wiley.)
Manufacturing Processes	Rusinoff	Tata McGraw Hill Publishing Co. Ltd.

REFERENCE BOOKS:

Workshop Technology Vol. I , II and III	W.A.J. Chapman	ELBS
Advanced Manufacturing Technology	Kalpakjain	Addison Wesley

Entrepreneurship

COURSE OBJECTIVE:

To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Syllabus:

UNIT-I **Introduction to Enterpreneurship**
Definition of Entrepreneur / Entrepreneur, Difference between Entrepreneurship / Entrepreneurship, Need for Entrepreneurship, qualities of successful entrepreneur, Myths about Entrepreneurship, Classification of entrepreneurs on the basis of different criteria, Reasons for the failure of entrepreneurs

UNIT-II **Industries and Business Organizations**
Concept of Industry or Enterprise
- Classification of Industries
(a) On the basis of capital investment
   a. Tiny (Micro) Industry
   b. Small Scale
   c. Medium Scale
   d. Large Scale
(b) Others
   a. Rural Industry
   b. Cottage Industry
(c) Forms of Business Organization
(d) Proprietorship
   a. Board & Co-operative
   b. Partnership
   c. Public Ltd.
   d. Private Ltd.
   e. IT Sector
   f. Government Co-operative / Undertakings
(e) Tiny small scale Industry
   a. Definition
   b. Its significance in National Development.
   c. Govt. policies for SSI promotions
   d. Sector / Product for SSI.

UNIT-III **Institutional Assistance**
(a) Types of Institutional assistance
   -Infra - structural assistance
   -Technical Assistance
   -Financial assistance
   - Marketing Assistance
(b) Information / guidance & Training
   - SISI   - ASK
   - MPCON   - CSIR
   - CED- MA   - NRDC
(c) Infrastructure
   - D/C   - AVN/AKVN
(e) Finance
   - SIDBI   - KVIB   MPFC

- NABARD   - MPWDC   NSIC
                                    -M.P.A.V.V.N.
     (d)   Marketing
                                    - MP- AGRO
                                    - NSIC
                                    - PM.LUN
                                    - EXPORT COPPORATION
                                    - KVIP
                                    - MPHSVN
                                    -MPLDC
     (e)   Quality Control
                                    - BIS   - FPO   - MPLUN   F.D.A.
                                    - AG. MKT. Board

INCENTIVES / CONCESSION / FACITLITIES AVAILABLE
- Seed money
- Incentive / subsidies
- Others (Phones, Lands etc)

UNIT-IV **Planning of an Industrial Unit (SSI)**

Pre- Planning Stage- Scanning the environment, Market survey, Seeking information,

product / project selection

Implementation Stage - PPR Preparation, DIC registration, Arrangement of Land, Arrangement of Power, Obtaining NOC / Licenses from various departments, DPR Preparation, Seeking financial assistance, Commercial Production

Post Implementation stage - Permanent registration from D.I.C., Availing Subsidies, Diversification / Modification, Setting up of marketing channel / Distribution.

UNIT-V **Achievement Motivation**

Historical perspective- Concept of achievement motivation, Significance of achievement motivation, Development of achievement motivation
Financial Management of an Industrial Unit (SSI)

Tools of financial analysis, Ratio analysis, Fund Flow / Cash flow analysis, Working capital and concepts, Financial accounting

COURSE OUTCOMES:

Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

Project Work/Assignment:

1. To prepare chart to showing various factors affecting entrepreneurship.
2. To collect details related to various schemes run by the Govt. for Self-employment and Entrepreneurship.
3. To identify and select a project and conduct Market-Survey thereof.
4. To collect various formats used in industries & departments/institutions working in the field of entrepreneurship.
5. Visit few small scale industries situated in city, nearby industrial area.
6. Discuss the problems related to SSI (Small Scale Industries) with an entrepreneur.
7. Collect information about market rates quality and quantity of goods for their choice.
8. Develop logical and analytical approach to purchase the raw material / finished goods
9. To prepare case study of successful entrepreneurs.
10. Preparation of Project report for the industry/ Business they are willing to start.

TEX

Entrepreneurial Development Vol. I,II,III	Vasant Desai	Himalaya Publication
Information systems	Steven Alter	Pearson
The new era of management	Daft R	Cengage

REFERENCE BOOKS:

Fundamental of Entrepreneurship	Mohanty SK	PHI
Marketing management	K. Jain	TMH
Management: Principles .Processes and Practices	Bhatt Anil, Arya kumar	Oxford higher edu.

Chairperson
(Board of Studies)

Dean
(Academic Council)

(Registrar)
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Engineering measurements and maintenance practices

COURSE OBJECTIVE:

Introduce students to the use of various electrical/electronic instruments, their construction, applications, principles of operation, standards and units of measurements. Make the student able for rating instrument devices including dynamic range, resolution, accuracy and precision. Provide students with opportunities to develop basic skills in the design of electronic equipment.

Syllabus:

UNIT-I **Inspection:**

Meaning and application of inspection, daily life examples of inspection, concept of inspection as applied in industries. Effect of absence of inspection in an industry. Classification of inspection, function, meaning and advantages of each concept of inspection applied to metrology. Definition & meaning of precision. accuracy and error, need of precision measurement in industry, relationship between cost and accuracy, Interchangeability and selective assembly.

General Measurement Concept:

Limits, fits and tolerances, selection of fit, calculation of fundamental deviation, tolerance and limits, selection of limits, tolerances and allowances.

Linear Measurement:

Standards of length, classification and use of slip gauges, wringing process , precautions to be observed while using slip gauges, classification of linear measuring instrument, direct and indirect, construction and working of vernier callipers, micrometers, vernier height gauge, dial vernier and dial height gauge, finding least count, precautions. Dial gauge-types, construction, principle, accuracy and precautions, comparators - principle, types, working and field of application of Mechanical, electrical, optical and pneumatic comparators.

UNIT-II **Angular Measurement:**

Need of angular measurement , various instruments used. Methods of measurement and field of application of protractor, angle gauges, Sine bars, spirit levels, clinometers and angle dekkor.

Straightness, Flatness, Squareness and Roundness Testing:

General concept straight edge method, light gap and feeler gauge method, wedge method, use of V- Block and dial indicator for checking roundness.

Surface Roughness:

Definition of primary and secondary texture , CLA value, R.M.S value, Types of surface measuring instrument, Working principle of Tomlinson mechanical surface finish recorder

UNIT-III **Screw Thread Measurement:**

Types of screw threads, threads nomenclatures, errors in screw thread, equipment required for measuring pitch, effective diameter and angle- procedure, advantages, limitation and precautions of each method.

Limit Gauges:

Definition of gauge and gauging, necessity of gauging in industrial practice, types

according to use (shop inspection and reference gauge), limit gauges for specific use - screw pitch gauge, template feeler gauge, working tolerance of gauges, maximum and minimum metal conditions to tolerance. Selection and specification as per IS 2251, 3455, 3484 Wear allowances and its selection for design, Taylor's principle for design of ' Go ' and ' No Go' gauges . Calculation of gauge dimensions form formula given in IS 3455 and selection of parameters necessary for calculation.

Transducers:
Meaning, function, primary and secondary transducers. Classification- mechanical electrical, active, passive. Comparison of electrical and mechanical transducers, Working principle and application of resistance type, inductance type, capacitance type and piezo electric type.

UNIT-IV   **Temperature Measurement:**
Principle on which temperature measuring devices work- example of each type. Comparison of resistance thermometer and thermister. Thermocouple- Principle, material, and working. Working principle of optical and radiation pyrometers.

Introduction to Plant Maintenance:
Introduction to maintenance, its need and scope, functions of the maintenance department. Different maintenance practices, procedure of corrective or break down maintenance, scheduled maintenance, preventive maintenance and predictive maintenance, methods of keeping records for condition of equipment, maintenance and replacement of parts, standard data for maintenance form, time standards (time to complete the maintenance job).

Fault Tracing:
Trouble Shooting and Remedies, Sequence of activities in fault finding, methods and procedures of repair, various measures to prevent repetition of similar faults. Various remedial actions.

UNIT-V   **Maintenance Cost:**
Definition, classification, Kelvin graph, procedures for obtaining cost data, maintenance cost control.

Wear and Its Effect:
Definition of wear and types of wear, causes of wear, effects of wear on performance, wear reduction and component replacement.

Lubrication and Lubricating Systems:
Need, properties of lubricant, selection criteria, principle of lubrication, centralized and decentralized lubrication systems, boundary, layer and hydrodynamic lubrication, use of greas

COURSE OUTCOMES:

After completing the course, student will be able to CO1 - Identify electronics/ electrical instruments, their use, peculiar errors associated with the instruments and how to minimize such errors. CO2 - Understand working principles in the measurement of field quantities. CO3 - Explain the industrial and laboratory applications of such instruments. CO4 - Service and maintain such instruments in case of damage or misusees and oil. Methods of preserving lubricants, handling of lubricants.

List of Experiments:

1. Study of application of various types of instruction.
2. Study of different type of fits with their practical application.
3. Study of Indian standards IS: 919 recomanded for limit and fits.
4. Demonstration of selective assembly.
5. Demonstration of concept of interchangeability using different objects.
6. Measurement of diameter, length, thickness etc. Using different calipers and steel rule.
7. Measurement of various parameters of different objects using vernier caliper & Micro-meter .
8. Measurement of various parameters of different objects using combination set.
9. Build up gauage blocks to produce different dimensions.
10. Measure different angles using vernier protractor .
11. Measure of unknown angle with the help of a sine bar and a slip gauge set.
12. Measure different angles using angle gauges.
13. Check for flatness, and parallelism of an object using a dial indicator and surface plate.
14. Check for roundness of an object using a dial indicator and aV-block.
15. Examine the surface texture of the machined surface by a microscope.
16. Examine the surface roughness of a machined surface using Tomlinson surface meter .
17. Use of plug and ring gauges for checking holes and shafts.
18. Demonstration and explanation of different types of transducers.
19. Study of different types of pyrometers.
20. Visit of large/ medium/small scale industries for colleting the information regarding various measurement techniques and instruments .
21. Maintance practice on lathe and shaper m/cs .

TEXT BOOKS:

Engineering Metrology.	R.K. Jain	Khanna Pub. Delhi
Engineering Metrology	I.C. Gupta	DANPAT RAI & SONS
Instruments for Measurement Control	W.G. Holzbock	Rainold Pub. Co-operation

REFERENCE BOOKS:

Inspection & Gauging	Kennedy	The Industrial Press, 93, Wortinstreet, New york
Engineering Metrology	K.J. Hume.	Macdonald & Co. Ltd. London
Instruments for Measurement Control	W.G. Holzbock	Rainold Pub. Co-operation

Power Plant Engineering

COURSE OBJECTIVE:

1.   Basic knowledge of Different types of Power Plants, site selection criteria of each one of them.

2.   Understanding of Thermal Power Plant Operation, turbine governing, different types of high pressure boilers including supercritical and supercharged boilers, Fluidized bed combustion systems.

3.   Design of chimney in thermal power plants, knowledge of cooling tower operation, numerical on surface condenser design.

4.   Basic knowledge of Different types of Nuclear power plants including Pressurized water reactor, Boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor.

5.   Understanding of Power Plant Economics, Energy Storage including compressed air energy and pumped hydro etc.

6.   Discussing environmental and safety aspects of power plant operation.

Syllabus:

UNIT-I   Steam Power Plant: Energy conversion in a thermal power station. Limitations on conversion of heat into work, direct conversion devices, central power station, industrial power station, captive power station, advantages. Classification of power station on the basis of prime-movers.
Elements of steam power plant, function of each element- generating unit, prime mover, auxiliary equipment and turbo generator. Revision & Improvement of thermal efficiency of Rankine cycle by lowering exhaust pressure, increasing boiler pressure and superheating of steam. Simple problems on Rankine efficiency. Reheat cycle: Representation on T-S and H-S planes, flow diagram and advantages. Simple regenerative cycle: flow diagram, representation on T-S and H-S planes, bleeding and feed water heating and pumping. Steam Generators: Classification according to working pressure Accessories - Super heater, economizer, pre-heater and draft equipment, superheat control methods, pulverized fuel- necessity, storing system. High pressure boiler in modern steam power plant need, features and functions of Velox, Benson, Lamaunt, Leoffler high pressure boiler.

UNIT-II   Steam Primemover: Steam nozzle-Types, velocity of steam at outlet, weight of discharge, area of cross- section at throat and outlet, critical pressure ratio, nozzle efficiency, concept of primemover, steam turbine- Revision of steam turbine in terms of principle of working, methods of compounding and governing, losses in steam turbines, lubrication system of steam turbines.
Condensing Unit: Steam Condenser, functions, type-jet and surface. Limitations and advantages, elements of condensing unit-cooling towers.

Steam Power Station Control and Safety: Effect of load variation on shaft speed, steam admission, valve opening, steam flow rate, steam pressure and combustion control system.

Necessity of controlling factors in load variation, control system (area system, centralized control system) functions of annunciator panel system, basic elements of control system, controls and instruments located in a modern central station. Control

room, records and their purpose, log sheets or log book.

UNIT-III   Nuclear Power Stations: Nuclear reactions : fission, fusion, mass defect, binding energy, chain reaction, types of nuclear materials - fissile materials, fertile materials, process of conversion of fertile materials, breeding moderation.
Nuclear reactor - Function- elements of a nuclear reactor- Reacted core, moderator, thermal - Shielding reflector, reactor vessel, fuel, coolant flow, control roads, biological shielding coolants (Caseansnon-boiling liquid, boiling liquid)

Fluids - Helium, Co2 , O2 under pressure, pressurised water (Ordinary, heavy) liquid metals (Li, Si, Pb, Na) and their alloys, boiling water.

Operation - Fast reactors, thermal reactor, breeding reactor. Nuclear fuel - Heterogeneous, Homogeneous.

UNIT-IV   Moderator: Water moderator, heavy water moderator, graphite moderator and Berylling moderator.
Health hazards in nuclear power station- Unit of radiation safe and dangerous zones of radiations, safety precautions in a nuclear power station- Medical requirements. **Entry** requirements: In contamination zones, precaution during changing of fuel. Nuclear waste disposal.
Diesel Power Plants: Advantages and disadvantages as a primemover for power generation, essential components of diesel power plant and function. Cooling and lubrication system, fuel injection system- Basic requirements, fuel injection system - common rail system, individual pump system, distribution system, data recording, performance.

UNIT-V   Gas Turbine Powers Plants: Advantages of gas turbines over I.C. Engine as prime movers, Brayton or Joule cycle, schematic diagrams for open and closed cycles, representation of cycle on P.V. and T.S. diagram. Thermal efficiency in terms of terminal temperature and pressure, effect of pressure ratio on thermal efficiency, advantages and disadvantages of open and closed cycle gas turbines, important components of a gas turbine power plant, methods of improving thermal efficiency, essential auxiliaries and controls of a gas turbine power plant, fuels for gas turbines.

Hydro Electric Plants: Types, Comparison of low, medium and high heat plants, elements of hydro power plants, governing of turbines, performance of water turbines, site selection.

COURSE OUTCOMES:

After taking this course the students should be able to
1. Select the suitability of site for a power plant.
2. Calculate performance of thermal power plant.
3. Propose ash handling, coal handling method in a thermal power plant.
4. Explain working principle of different types of nuclear power plant.
5. Calculate load factor, capacity factor, average load and peak load on a power plant.
6. Indicate safety aspects of power plants.

TEXT BOOKS:

Cost Control	G. R. Sharma	National Productivity Council
Mechanical Estimating And Costing	T.R. Banga and & S. C. Sharma	Khanna Pub
Power Plant Engineering	T. Morse	TMH

REFERENCE BOOKS:

Mechanical Estimation And Costing	R.L. Shrimali & P.C. Jain	Jain Pub. House
Mechanical Estimation And Costing.	Resource Persons of Hill Publishing Co,	Madars Tata McGraw Hill
Process Engineering For Manufacturing	Eary and Johnson	Prentice Hall

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Internal Combustion Engine

Course Objective:

The main objective of the course is to give the students an introduction to reciprocating internal combustion engines with emphasis on marine and stationary applications. The focus is on explaining engine performance in terms of power, energy utilization and exhaust emissions, its relation to internal processes like combustion and gas exchange, and varying engine operating conditions.

Syllabus:

UNIT-1

Internal Combustion Engine:
S.I. and C.I. engines of two and four stroke cycles, real cycle analysis of SI and CI engines, determination of engine dimensions, speed, fuel consumption, output, mean effective pressure, efficiency, factors effecting volumetric efficiency, heat balance, performance characteristics of SI and CI engines, cylinder arrangement, firing order, power balance for multi-cylinder engines, valve timing.

UNIT –II

Combustion in S.I. Engines:
Flame development and propagation, ignition lag, effect of air density, temperature, engine speed, turbulence and ignition timings, physical and chemical aspects of detonation, effect of engine and fuel variables on knocking tendency, knock rating of volatile fuels, octane number, H.U.C.R., action of dopes, pre-ignition, its causes and remedy, salient features of various type combustion chambers, valve timing and firing order.

UNIT - III

Combustion in C.I. Engines:
Times base indicator diagrams and their study, various stages of combustion, delay period, diesel knock, octane number, knock inhibitors, salient features of various types of combustion chambers, fuel, ignition, cooling, exhaust and lubrication systems; Simple problems on fuel injection, various types of engines, their classification and salient features. Rotary I. C. engines, their principles of working.

UNIT - IV

I.C. Engine System:
Fuels, ignition systems, cooling, exhaust/scavenging and lubrication system. Fuel metering in SI engine: Fuel injection in SI engine (MPFI & TBI), Theory of carburetion, simple problems on carburetion. Fuel metering in CI engines: Fuel injection in CI engine and simple problems, various types of engines, their classification and salient features.

Fuels:

Conventional fuels and alternate fuels, engine exhaust emission, carbon monoxide, un-burnt hydro carbon, oxides of nitrogen, smoke, density, measurement and control, hydrogen as alternate fuel.

UNIT V

Supercharging:

Effect of attitude on mixture strength and output of S.I. engines, low and high pressure super charging, exhaust, gas turbo-charging, supercharging of two stroke engines.

COURSE OUTCOMES:

The introduction to internal combustion engines is based on explaining processes and performance by application of first principles in thermodynamics, chemistry, heat transfer, fluid flow, and mechanical dynamics. This approach provides a basis for analysing and understanding the complex interactions between subsystems and processes inside the

TEXT BOOKS:

Internal combustion Engines	J.B. Heywood	Wiley
Internal Combustion Engines	DomKundwar	Dhanpat Rai Publications
Internal Combustion Engines Theory & Practice;	Taylor GF	MIT Press

REFERENCE BOOKS:

Internal Combusion engines	Ganeshan V	TMH
A Course in IC engines	Mathur M L & Sharma RP	DhanpatRai
Automotive Engines theory and servicing	Halderman JD and Mitchell CD	Pearson

Chair (Boar To enable the students to prepare a detailed assembly drawing for machine components.

1. Understand Indian standards for machine drawing.

2. Understand Fits and Tolerances in technical drawing.

3. Prepare assembly drawing of joints, couplings and machine elements.

4. Design and prepare Jigs and fixtures for given components

Syllabus:

UNIT-I **Projection and multi view Representation:**

Projection orthographic projection. First and third angle projection, superfluous view, choice of views, auxillary views- views -full and partial, conversion of pictorial views in to orthographic views, conventional representation as per IS: 696.

Sectional Views : Full section, half section, partial or broken section, revolved section, removed section, offset section. Sectioning conventions, section lines. Hatching procedure for different materials as per IS code 686 1972. Sectional views of assembled parts. Choosing from IC engine parts, couplings, clutches, brackets, bearing etc. (Use 1st and 3rd angle projections both)

UNIT-II **Dimensioning Tolerance, Machining And Welding Symbols:**

Types of dimensions (size and location) dimensioning terms and notations. (use of I.S.Code 696 &2709) general rules for dimensioning and practical hints on dimensioning systems of dimensioning. Dimension of cylinder holes arcs of circle narrow space, angles, counter sunk hole, screw threads taper etc. Application of tolerances. (Use I.S. Code 696) Machining marks, finish marks, countersinking, counter boring spot facing, figures and notes for same. Representation of characteristics machining (circularity, Angularity etc .) (Ref IS 969) Representation of welded joints, welding symbols, tolerance of forms and positions. Procedure of drawing fits, limits, size, tolerance, clearance etc.

UNIT-III **Production Drawing:**

Detailed drawing, assembly drawing, scale, finish tolerances, notes etc. Title block, tool list, gauge list. Preparation of production drawing for pattern shop. Forging shop, machine shop, preparation of assembly drawing from detailed drawing. exploded views, sectional pictorial views, assembly drawing of nut and bolt, plummer block, flange coupling, stepped pulleys, foot-step bearing, Universal coupling, connecting rod, piston of I.C. engines, cotter joint, Knuckle joint. Preparation of detailed drawing from assembly drawings and assembled pictorial views, Interpretation of production drawing.

Introduction to Auto CAD: Coordinate system. Draw command- line ,arc, circle rectangle, polygon, point, ellipse, hatch, table. Modify commands-erase, copy, offset, array, trim, extend, break, join, chamfer, fillet, move, rotate, scale, stretch, lengthen. Dimensioning

Tray settings: snap, grid, ortho, polar, osnap
Format commands: line type, point style, units, layers, drawing limit, dimension style

UNIT-IV   **Application of Auto CAD:**

Practice of assembly drawings using Auto CAD

Presentation: Block, creating layout, insert layout ,ploting/printing

Pipe Drafting : Various symbols used in pipe line work as per IS code of Practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fitting typical pipe bends, pipe supports and accessories.

Gear Drawing : Gear terminology such as pitch, pitch circle diameter module, addendum, root circle diameter, hole depth, blank diameter etc. construction of cycloidal, involute teeth profiles, pinion and rack mashing, spur gear mashing.

UNIT-V   **Graph and Charts:**

Introduction, Classification of chart, graphs and diagrams, quantitative and qualitative charts and graphs, Drawing and curve titles, legends notes etc. procedure for making a graphical representation in ink. Logarithmic graphs, semi logarithmic graphs, bar charts area (Percentage) charts, pie chart, alignment charts (Nomo graphs) Forms and construction, construction of functional scale, parallel scale charts for equations of the form [f (t) +f(u) +f (v), (f (t) x f (u) = f (v)] three scale alignment chart, graphical construction of a Z- chart, four variable relationship parallel scale alignment chart.

COURSE OUTCOMES:

1.   Understand Indian standards for machine drawing.
2.   Understand Fits and Tolerances in technical drawing.
3.   Prepare assembly drawing of joints, couplings and machine elements.
4.   Design and prepare Jigs and fixtures for given components

Suggested Terms –Work:

1.   Projection and multi views representation
2.   Sectional views
3.   Dimensioning, tolerance, machining and welding symbols
4.   Production drawing
5.   Pipe drafting
6.   Gear Drawing
7.   Graphs and charts
8.   Computer graphics

TEXT BOOKS:

Fundamentals of Engineering Drawing	Warren J. Luzadder	Prentice-Hall
Mechanical Drawing	Giesecke, Mic- hell Specer, Hill	Collier Macmillan Internal Edition
Mechanical Drawing	R.K.Dhawan	S.Chand

REFERENCE BOOKS:

Inside AUTO CAD	Daniel Raker and Harbest Rice	BPB Publisher
Computer Graphics and CAD Fundamentals	Noel M Morries	Wheeler
Mechanical Drawing	N.D.Bhatt	S. Chand

Modern practices in manufacturing and management

COURSE OBJECTIVE:

1.   To improving quality, reducing costs, speeding throughput and increasing production flexibility help companies compete more effectively and meet their customers' price, quality and delivery requirements.

2.   Management model that aims to improve the performance of an organization by clearly definingobjectives that are agreed to by both managementand employees.

Syllabus:

UNIT-I   Unconventional Machining Methods: Limitations of conventional machining. Working Principle, operating parameters and application of unconventional machining. Electro Chemical Machining, Chemical Machining, Electric Discharge Machining, Electron beam Machining, Ultra Sonic Machining, Abrasive Jet Machining, LASER Beam Machining, Plasma Arc Machining.
Coating & Deposition processes: plating & related processes, physical vapor deposition, chemical vapor deposition, Organic Coating.

Rapid Prototyping: Need, Fundamentals, Technologies and applications.

Manufacturing Automation: Introduction to Numerical control, Computer Numerical control, Direct Numerical Control, CNC Millings M/c, CNC Turning M/c, Turn mill centers, flexible manufacturing system, Preliminary idea of robotics. Introduction to G and M code as used in part programming. Use of Canned cycles. Simulation of parts, drawing generated through CAD, its modeling and transfer.

UNIT-II   Flexible Manufacturing systems: Elements, Limitations, Feature & Characteristics, New development. Robotics: Introduction to robotics, concept, and application, A4 level automation
Total Quality Management (TQM)-Evolution, definition, preparation stages in TQM implementation, Integrated TQM model, costumer satisfaction, Employee involvement. Continuous Process Improvement, 5s, Kaizen, and KANBAN, Supplier Partnership, Performance Measures. Just in Time systems (JIT) - Introduction, application and advantages

UNIT-III   Total Productive Maintenance (TPM)- Introduction, Plan, New Philosophy Improvement needs, Six Major losses Life cycle costing, work groups.
Introduction to Quality Standards:

ISO 9000- Introduction History, Indian Equivalence, System requirements for ISO 9001, 9002,9 003, steps for installation, How to apply. QS 9000 Quality Management systems.

ISO 14001- Introduction, Environment Management system, Background, vocabulary and Application.

UNIT-IV   OHSAS 18001- Occupational Health and Safety Assessment Series Introduction, scope, related terms, structure and operating features.
TS 16949 - Quality system certificate consisting following standard.

a.   APQP - Advance product quality planning.

b.   FMEA - Failure mode and effect analysis.

c.   MSA - Measurement system analysis.

UNIT-V   Lean manufacturing : System design for Lean manufacturing adopting.
Why Why analysis (5W 1 H) : Use of Why Why analysis to know the actual cause of

failures and problems.

Six Sigma systems: Basics of Six Sigma, competitive advantage of implementing six sigma systems. Briefs of what, why and how six sigma works to initiate and sustain greater productivity, profitability and customer satisfaction rates.

COURSE OUTCOME:

1. Explain the difference between industrial and engineering design with reference to familiar products; and for specific products explain whether it is the product's form or its function that enhances its value in the marketplace

2. Understand the conceptof a product design specification (PDS), and be able to indicate some to the factors which should be included in producing one

3. Management is a client-centric approach to service delivery which focuses on the results a client is trying to achieve rather than focusing only on the services available. A collaborative approach is encouraged which allows agencies to utilize the expertise of individuals within the agency and outside of it. Traditional approaches have meant that clients have not received the righthelp at the right.

TEXT BOOKS:

Fundamentals of Manufacturing processes	G. K. Lal & S. K. Choudhary	Narosa Publishing House
Manufacturing Technology Vol. II	P.N. Rao	Tata McGraw Hill Publishing Co

REFERENCE BOOKS:

Fundamentals of Modern Manufacturing	Mikell P. Groover,	Wiley Student Edition.
Quality Management	Donna C.S. Summers	Pearson Prentice Hall
Total Quality Management	L. Sugandhi & Anand A. Samuel	Prentice Hall of India Pvt. Ltd

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Professional Elective (Automobile Engineering)

COURSE OBJECTIVE:

The student will be made to learn

1. The anatomy of the automobile in general
2. The location and importance of each part
3. The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels

Syllabus:

UNIT-I   Introduction: Meaning of automobile, elements of automobile, classification of automobile, layout of chassis, various operating systems used in automobile.
Auto Engines: Meaning of I.C. Engines, Classification on the basis of cycle, fuel used, ignition system, number of cylinders, number of strokes etc. Otto/ Diesel cycles. Two stroke and four stroke engines, merits and demerits, scavanging comparison of petrol and diesel engines. Cooling systems, firing order. Valve timing diagrams. Engine rating. Lubrication, factors affecting lubrication, Lubrication systems, Fuel Supply system, fuel pump - SPU electric pump. Carburettor, air fuel ratio, Solex and amal carburettor

UNIT-II   Auto Electric System: Wiring diagram of a car and functions of various components used in the electric circuits, function and working principle of a starter and generator, function of voltage- current regulator, ignition timing, spark plugs- their classification, gap setting and common ignition troubles, their causes and remedies . Automobile battery - construction and working, electronic ignition system of modern vehicles.
Transmission System: Clutch : necessity, function of its components, Types -single & multi plate and centrifugal clutches, cluth actuating mechanism and fluid flywheel.
Gear Boxes : necessity, Types of gear boxes and their working. Importance of gear shifting mechanism, gear box troubles, their causes and remedies.

UNIT-III   Final Drives System: Drive mechanism in cars, purpose and working of propeller shaft, construction of propeller shaft. Types of universal joints.
Rear axle assembly : function of differential - constructional features and working. Arrangement of semi floating and fully floating rear axle, and their troubles.
Braking system: Introduction, classification of brakes, construction & working of mechanical brake, hydraulic brake, Electric brake , advantages and disadvantages of each type of brakes, Servo brake system.

UNIT-IV   Front Axle and Steering: Function of front axle, axle type, wheel alignment and its elements toe- in, toe -out. King pin inclination. Ackerman steering principle. Camber and castor angle . Elements of steering - types and working ,Under and over steering, power steering and advanced steering systems. Frame and Suspension: Frames : necessity, function, Classification, suspension system, types, leaf, coil spring. Telescopic shock absorber. Air suspension, independent suspension system.

UNIT-V   **Tyres** : structure of tyre section, rating of tyres, tyre- pressure measurement, material

and specification. Tyre wear and remedies.

Miscellaneous:

Maintenance of Vehicles : need, classification maintenance procedure of engine, transmission system, electrical system, braking system and steering mechanism.

Garage and Service Station: Types, layout, equipment tools and service procedure.

Exhaust Gas, Pollutants: Their hazards and controls with reference to motor vehicle act.

Motor Vehicle act, registration of vehicles, driving license and Traffic Signals.

LIST OF EXPERIMENTS:

1. Study of automobile chassis and function of various components.
2. Study of various components used in auto vehicles.
(a) Engine (b) Transmission system (c) Final Drive (d) Braking system (e) Electrical system (f) Steering Mechanism.
3. Study of various elements of scooter/ car/bus servicing.
4. Engine tuning and adjustment for smooth, idle speed of a scooter/moped/ motor cycle/ car etc.
5. Starting troubles andtheir rectifications.
6. Rectification procedure for :
(a) Air bleeding. (b) Brake adjustment. (c) Problems in Carburettor. (d) Wheel alignment.
7. Battery, servicing and charging.
8. Repair of punctured tyre and re-treading of tyres.
9. Study of auto servicing centre.
(a) Layout (b) Instruments/ Tools used (c) Servicing procedures.
10. Visit of a local auto service centre and prepare a report in respect of
(a) Layout (b) Instruments/ Tools used (c) Servicing/ Reconditioning/ Maintenance procedure.

11. Collect specifications for 2/3/4 Wheeler and prepare a comparison table and their manuals.

TEXT BOOKS:

Automobiles Engineering Vol. I & I I	Dr. Kirpal Singh.	Standard Publisher)
Automobile mechanism	Joseph Heither	TMH
Automobile Engineering	R. P. Sharma	Dhanpat Rai & Sons
Automobile Engineering	Prof. S.M. Pande and K.K. Jain	Deepak Prakashan, Morar Gwalior

REFERENCE BOOKS:

Automobile Engineering	T.R. Banga & Nathu Singh	Khanna Publicers
Automobile Mechanism	William H. Crouse	TMH
I.C. Engines	Dr. A.C. Rad and S.B. Bechar	Pearson

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Professional Elective (CAD/CAM)

COURSE OBJECTIVE:

The general objectives of the course are to enable the students to-

1.   Understand the basic fundamentals of computer aided design and manufacturing.
2.   To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.
3.   To understand the different geometric modeling techniques like solid modeling, surface modeling, feature based modeling etc. and to visualize how the components look like before its manufacturing or fabrication.

Syllabus:

UNIT-I   Introduction to CAD/ CAM :
   (i)   Automation and its types

   (ii)   Definitions : CAD,CAAD CAM, CIM and CAE

   (iii)   Concept of CAD/CAM

   (iv)   Computers in industrial Manufacturing

   (v)   General Design procedure and application of computers in it.

   (vi)   Benefits of CAD/CAM.

UNIT-II   Hardware of CAD/CAM System:
   (i)   Basic structure
   (ii)   Hardware components of CAD workstations and their functions: CPU, Memory devices, input devices, display devices, output devices and storage devices
   (iii)   Hardware components of CAM system and their functions: CNC controller and CAD interfacing, CNC components. Conveyers and robot units.
   (iv)   Functions of each hardware unit in CAM.
   (v)   Block diagram of integrated CAD/CAM system.
          Introduction to CAD software:
   (i)   Block diagram of graphics software configuration.

   (ii)   Functions of a graphic package.

   (iii)   2D transformation translation, rotation and scaling with numerical examples.

   (iv)   3D Modeling: Wire frame and solid type

UNIT-III   Introduction to Conventional Numerical Control:
   (i)   Definition of NC

   (ii)   Basic components of an NC system : Program, MCU and Machine tools

   (iii)   The NC procedure

   (iv)   NC coordinate systems, fixed zero and floating zero, Absolute and incremental positioning

   (v)   NC motion control systems

   (vi)   Components of MCU, Open and closed loop axis positioning systems

   (vii)   Applications of numerical control in Machine Tools

   (viii)   Advantages of NC systems

UNIT-IV   Introduction to NC Programming:

    (i)   NC Part program and different codes used in it: N,G,M,F,S,T codes and co-ordinates

    (ii)   Writing Program blocks using NC program codes

    (iii)   Manual and Computer assisted part programming

    (iv)   Introduction to NC part programming languages like APT Different statements in APT language and writing program through it

UNIT-V   NC Control technology:

    (i)   Different type of computer controls : CNC, DNC and Adaptive

    (ii)   General Configuration, functions, and advantage of CNC, straight and hybrid CNC

    (iii)   General Configuration, types, functions, and advantage of DNC, BTR and Special Machine control unit DNC

    (iv)   Introduction, types and benefits of adaptive control, ACC and ACO systems

List of Experiments:

1.   Study of CAD Hardware system using physical and visual aid.
2.   Auto CAD commands and their applications in various types of designs/ drawings. ten/fifteen experiments.
3.   Solid modeling using parametric software
4.   Demonstration of CNC machine for identifying machine zero, drive systems, safety precautions, and dry run of demo part programme
5.   Tool setting, Job setting , part programme execution on CNC machine.
6.   Material job handling using Robot system and conveyor assembly.

TEXT BOOKS:

Aided Design and Manufacturing	M.P. Groover, & E.W. Zimmer	Prentice-Hall of India pvt. Ltd. (EEE), New Delhi
CAD/CAM	Kuldeep Sareen & Chandadeep Grewal	S,Chand & Co, Delhi
Numerical Control	Marthin	E.L.B.S.

REFERENCE BOOKS:

Inside Auto CAD	Deniel Raker and Harbest Rice	BPB Publications, Delhi
Introduction to Computer Aided Drafting	Donald D. Voisinet	McGraw Hill
Understanding CAD/CAM-Design with Computer	D.J. Bowman, and R.N. MC-Dougal	BPB Publications, Delhi

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Design of machine elements

COURSE OBJECTIVE:

To teach students how to apply the concepts of stress analysis, theories of failure and material science to analyze, design and/or select commonly used machine components.
To illustrate to students the variety of mechanical components available and emphasize the need t continue learning.
To teach students how to apply mechanical engineering design theory to identify and quantify machine elements in the design of commonly used mechanical systems.
To teach students how to apply computer based techniques in the analysis, design and/or selection of machine components.

Syllabus:

UNIT-I **Introduction to Machine Design**: Machine and machine elements, bolt, nut, axle, shaft, bearing, coupling, clutch, belt, rope, chain, gear etc. Specific purpose of piston connecting rod, crank shaft, turbine blade etc. Factors influencing design of machine elements - Strength stiffness, light weight, wear resistance minimum size, availability, processebility, safety, compliance with standards. Basic design procedure. Selection of mechanism, material, shape and size. Preliminary design, applying checks, revision of design final design. Factors influencing selection of materials. Type of failures, types of forces. Types of loading. Safe design stress and factors of safety.

UNIT-II Design of Machine Elements Subjected to Direct and Shear Loads: Introduction members subjected to direct loads - bolt, column, rod, cotter and knuckle joints, members subjected to shear loads rivet, cotter knuckle pin, root of threaded bolt, coupling, bolt, key. Function, application and design of knuckle and cotter joint.
Design of Machine Elements Subjected to Bending Moment, Twisting Moment and Combined Bending and Twisting Moment:

UNIT-III Introduction to pure bending, fundamental equation of pure bending viz :
$M/I = f/y = E/R$

Design of shaft, key, flange coupling, leaf and helical spring, pulley arms, axle

Design of Riveted Joint: Type of fastening - temporary and permanent, types of riveted joint - lap and butt joint, definition of common terms like pitch, back pitch, efficiency, margin. Modes of failure of riveted joints

UNIT-IV Design of Simple Welded Joints**:** Definition of welding advantages of welding over riveted joints, types of welded joints, strength of the butt weld, types of fillet joints and strength of fillet joint problem solving.

Design of Threaded Joints: Types of threads and their proportions, Types of bolts, proportion of nut and bolt dimensions, design of bolt, designation of threads as per I.S. codes.

UNIT-V Design of Clutch: Pivots and Collars friction. Horse power lost assuming uniform pressure and uniform wear. Clutch- need, classification and construction and working of single and multi plate clutches, horse power transmitted by single and multi plate clutches.

Selection of Rolling and Sliding contact Bearing: Types of rolling contact bearing , Ball bearing Roller bearing, bearing designation, bearing installation. Application of bearing. Basic principle of Hydro dynamic and Hydro static bearing. Bearing modulus and Bearing characteristics number.

COURSE OUTCOME:

1. Understand the customers' need, formulate the problem and draw the design specifications.
2. Understand component behaviour subjected to loads and identify the failure criteria.
3. Analyze the stresses and strains induced in a machine element.
4. Design a machine component using theories of failure.

TEXT BOOKS:

Machine Design	Sharma and Agrawal.	S.Chand
Machine Design	Shigley	Tata Mcgraw Hill
Machine Design	R S Khurmi	S. Chand publication

REFERENCE BOOKS:

Machine Design	R.K. Jain	Khanna publishers
Introduction to Machine Design	Bhandari	Tata Mcgraw Hill
Machine Design	Pandya and Shah	Charotar publishers

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Refrigeration & Air Conditioning

COURSE OBJECTIVE:-

With the advancement of science and technology, the use of refrigeration, air conditioning and production of low temperature is getting momentum and has become of paramount importance. The course in "Refrigeration and Air Conditioning" is introduced as an elective subject with the objective to provide enough training to mechanical engineering technicians, so that when they go infield, they can take up the task related to refrigeration and air conditioning without much difficulty.

Syllabus

UNIT-I   Introduction to Refrigeration: History of refrigeration, meaning and need of refrigeration, difference between refrigeration and Cryogenics, production of refrigeration by various methods. Refrigeration systems and their classification on the basis of use, size and application.

UNIT-II   Thermodynamics of Refrigeration: Revision of I and II law of thermodynamics, comparison between heat engine, heat pump and refrigerator using heat reservoir, heat source, sinks & work. Unit of refrigeration, refrigeration effect, work input, co-efficient of performance, Reversed carnot cycle with gas and vapour as working substance. P-V, T-S and schematic diagrams. Calculation of refrigeration effect, work C.O.P and Heat rejection. Practical difficulties with carnot cycle. with gas and vapour as working substance. Vapour compression refrigeration cycle its schematic diagram and representation on P-V,T-S and P-H diagrams. Wet, dry and superheated vapour compression. Use of tables and charts of common refrigeration for calculating work input, refrigeration effect and C.O.P deviation of actual vapour compression system form, theoretical cycle and reasons for deviation. Effect of sub-cooling and superheating on vapour compression system

UNIT-III   Basic Components of Vapour Compression Refrigeration Systems: Basic components of vapour compression refrigeration system and their function- compressor, condensor, expansion device and evaporator.
Compressor **:** Classification, reciprocating- open and hermetically sealed rotary, and their field of application. Working of single and double acting reciprocating compressor. Working of hermetically sealed compressor.

Condensor : Types (Water cooled, air- cooled evaporative) and their field of application and brief description.

Expansion: Types of evaporators (Dry expansion and flooded type, and principle of their working and application.

Vapour Absorption Refrigeration System: Comparison between vapour compression and vapour absorption system, the theoretical and practical vapour absorption system, Lithium bromide- water absorption system. Three fluid system. (Electrolux systems)

UNIT-IV   Properties of Commonly Used Refrigerants: Definition, primary and secondary refrigerants, designation of refrigerant, examples of each type. Desirable properties of good refrigerant Azeotropic mixtures. Environmental problems related to halogenated hydrocarbons as refrigerants. New developments.
Refrigeration Plants: Layout and working of Ice plant, cold storage. Water cooler and household refrigerator.

Refrigeration Fittings, Tools, Charging and Leak Detection: Tubing, Materials heat treatment specifications.

Tools: Use and types of cutter, spring and mechanical bender- flaring and swaging tools pinch of tool, wrenches, Pliers etc.

Fittings: Flared tube fittings, unions, elbows tee.

Joints: Making soldered and brazed joints. Installation and removal of servicing gauge and testing manifold: Working of suction and discharge compressor service values.

Charging of Refrigerant: evacuating a refrigeration system, removing, refrigerant form a refrigeration system leak detection methods.

UNIT-V   Introduction to Air Conditioning : Meaning of air conditioning, application of Air conditioning in theatres, community halls, industry, restaurants, hospitals and windows air conditioner.
Psychometry: psychometric - definition, terminology, psychometric charts and tables, using psychometric charts for solving simple problems.

Air Conditioning Systems: Central and unit air conditioning, residential and commercial air conditioning system. Types of fans and ducts - air distribution systems. Thermal insulator, methods and insulation cladding.

Maintenance and Repairing of Refrigeration and Air Conditioning Units: Fault location in vapour compression system and air conditions. Repair and maintenance of house hold refrigerators. Water coolers and air conditioners.

LIST OF EXPERIMENTS:

1.   Handling and use of tools such as- Tube cutter, tube bender, (Spring and mechanical type). Flaring and Swaging tool, wrenches, pliers, service valves, service gauges, preparation of soldered and brazing joints.
2.   Study of water cooler with respect to
(a)   Refrigerant used and flow path.
(b)   Electric circuit
(c)   Water flow path
(d)   Specification of main components used.
(e)   Capacity of the unit.
3.   Study of packaged/ Window/ Air conditioner with respect to-
(a)   Capacity.
(b)   Electric circuit
(c)   Air flow path.
(d)   Specification of main components used.
(e)   Refrigerant used.
4.   Study of Ice-plat/ refrigeration cold storage with respect to-
(a)   Electric circuit
(b)   Refrigerant used and its flow path.
(c)   Capacity.
(d)   Specification
5.   Leakage detection using ;
(a)   Soap and water.
(b)   Halide torch.
(c)   Vacuum method.

(d) Pressure method.
6. Operating service valves and gauge manifold.
7. Removing refrigerant from systems.
8. Charging/Recharging the system refrigerator, water cooler, air conditioner.
9. Determination of refrigeration capacity.
   Power input, C.O.P of the given unit available in the institution.
10. Testing refrigeration and air conditioning system control components for proper functioning and replacement.
(a) Capacitor
(b) Starting and running windings of hermetically sealed compressor.
(c) Overload
(d) Relay
(e) LP and HP
(f) Thermostat.

TEXT BOOKS:

Refrigeration and Air Conditioning	C.P. Arora	Tata Mc Graw Hill
Refrigeration and Air Conditioning	A.S. Sarao & P.C. Gaabi	Satya Prakashan
Modern Refrigeration Practice	G.P. King	McGraw Hill

REFERENCE BOOKS:

A Course in Refrigeration & Air Condition	S. Lomkkundwar & S.C. Arora	Dhanpat Rai & Sons
Refrigeration and Air Conditioning	R.C. Jorden & S.B. Priester	Prentice Hall
Refrigeration and Air Conditioning	P.L . Ballanney	Khanna Publishers

Project

Rationale:

The necessity of the project work has been emphasized on group work. Proper group functioning is a prerequisite for maximising output form a problem-solving group in work environment, proper organisation of project work should be able to simulate such a situation that the students may be able to effectively work in groups and thus gain confidence to effectively take up responsibilities in their careers. The students will prepare a final project report.

Syllabus:

UNIT-I   Specification on Minor Projects : To prepare a write up or feasible report containing not more than 1500 words, using appropriate diagrams & Illustrations, and in simple language to be understood by non- technical readers, about an engineering topic.
Suggested Topics : Feasibillty of non conventional sources of energy for a particular application.

Solar heaters (Gobar gas Plant) Technicians role in village feasibility of certain projects.

UNIT-II   Prepare a comparative study report about alternative materials available for a particular application.
Suggested Topics : Electrical conductors.

Cutting tools for high speed, machining. Furniture making. Cooking utensil.

UNIT-III   Prepare a technical paper to be read to the rest of the class, about the process of conversion of raw material in to a finished product.
Suggested Topics : Rubber tyres.

Production of mechanical engineering products.

Lubricating oils

Production of plastic buckets.

Production of stainless steel products.

Detergents.

Products involving special welding or costing processes

UNIT-IV   Prepare a survey of equipment, available for a particular engineering situation, make a comparative study and suggest a suitable choice.
Suggested Topics : Material handling equipment

Machine tool for given product.

Measuring instruments.

Prepare a simple machine or component as per given drawing specification. Suggested Jobs: A simple drilling machine model.

A punching Machine.

An inexpensive hardness tester.

Simple materials testing equipment.

UNIT-V   Reclaiming a worn out component or equipment and putting it to use. Suggested Job : A worn out cam shaft bearing assembly. A rejected I.C. Engine used in a motor cycle.

Re- conditioning a discarded pump.
Construction of simple laboratory equipment/ teaching aids.

Major Project:

1. **Design and Make Type Projects:**
   Suggested Projects : Lab equipment to demonstrate and verify the principle of conservation of momentum either linear angular with an accuracy of 5%
   A lathe tool dynamometer to measure cutting forces.
   A working model of a variable speed drive, which when given a fixed R.P.M. input, will be able to give a step less variable output R.P.M., within the range of 3 times the in put to 1/3 times the input.
   A Sheet metal cutting machine, useful to village blacksmiths in preparing articles like hand pumps, funnels, containers etc.
   A Wood working machine, hand or pedal operated to be useful in a village situation.
   Equipment to provide hot water in your hostel, using solar energy.
   A suitable hand operated press for producing ornamental tiles.
   A device to utilize energy from the wind, for drawing water from a well for irrigating a small farm.
   A Design and development of hand operated grinder/juicer.
   Design and development of special furniture, e.g. for hospitals, handicapped persons etc.
   Material handling equipment to suit the needs of a local industry.
   Design and development of jigs / fixture for a live production situation.

2. **Investigation Projects:**
   Suggested Themes : Selection of a suitable machine tool to produce a given component with specified tolerances, economically.
   Analysing the causes and suggesting remedial steps for a machine which is functioning erratically.
   Causes of bearing failure in a given situation.
   Investigation in to the cutting forces set up on a lathe for different feeds, speeds and materials.
   Determining the most economical, running conditions for an. I.C. engine. Investigation in to the different methods of measurements of flow/ temperature/ pressure with a view to suggest a suitable method for a live situation.
   Installing, commissioning and fault rectification of a test/ measuring set up or a machine.

3. **Feasibility Studies:**
   Suggested Products : Packaging material.
   Household utensils.
   Furniture, Match boxes, Wire nails, Vulcanising unit. Time Piece components, plastic buckets, Aluminium anoidised tittin boxes, Raxine bags, folders etc. Washing soap, Instrument boxes for schools.

List of Suggested Skills to Acquire

S.No. Suggested Skills

1. Participate effectively in group work.

2. Analyse, synthesise and evaluate at technician level while dealing with engineering situations.

3. Apply his knowledge in practical situations.

4. Be able to plan ahead.

5. Be able to take appropriate decisions.

6. Maintain good human relations, by possessing social skills and tolerance.

7. Be able to arrive at creative solutions to problems.

8. Demonstrate self reliance and self discipline.

9. Understand and accept his own strengths and limitations

10. Adapt readily to changing environments.

11. Have a sense of purpose and pride of achievement.

12. Demonstrate his initiative.

13. Reliably work independently.

14. Be able to seek, select, use and present information's.

Project Work:

S.No. The following points, concerning the project should be noted:

1. A record of all calculations, drawings and designs must be kept.

2. Student will work either individually or in a group or 2, 3, or

3. A Written report must be available to the supervisor at the end of the course. This report should be neatly written and produced in a suitable folder which bears the name of the polytechnic, the title of the projectand the name of the contributor and the dates of the work. Although the reports will obviously vary from project to project, yet, they should in general, confirm to the following pattern :

   (a) **Summary:** A summary of the report which should not exceed one page in length.

   (b) **Index:** The report should be logically indexed.

   (c) **Introduction:** This should introduce the reader to the objectives of the exercise.

   (d) **Main body:** this will vary considerably from project to project and will contain all design calculations, drawings. results etc.

   (e) **Conclusion:** This will state the main conclusions of the exercise.

   (f) **Bibliography:** A list of all references used.

   In general, you will find that a well presented brief concise and logical report will score a higher assessment than a badly presented, lengthy muddled and illogical report.

PROJECT WORK:

S.No. The following points, concerning the project should be noted :

1 The examiners will look for the following points when assessing your project

   (a) The way in which you have applied existing knowledge to your project.

   (b) Mental skill in manipulations of formulas etc.

   (c) The quality of physical skills in the manufacture and assembly of apparatus and test pieces etc.

   (d) Analysis of test results to produce a conclusion.

   (e) The ability to produce a complete project from all the individual elements.

   (f) Skill in evaluating between, for instance, various design alternatives.

(g)   The way in which the initial specifications are interpreted and translated in to a finished project.

(h)   The quality of the creative aspect of the design to meet the given specifications.

(i)   The quality of the written content of the report.

(j)   The quality to the graphical content of the report.

The assessment of your project will count towards your final diploma, and the accompanying marking grid shows how the marks are allotted in your particular case.

Remember that this is your project. The supervisor is there to give guidance if and when it is necessary. He will start you off on the right lines but will only intervene at the later stages, if asked.

Chairperson   **Dean**   **(Registrar)**
(Board of Studies)   **(Academic Council)**   **Seal**

Professional Activities

COURSE OBJECTIVES:

Student will be able to:

1.   Acquire information from different sources.

2.   Prepare notes for given topic.

3.   Present given topic in a seminar.

4.   Interact with peers to share thoughts.

5.   Prepare a report on industrial visit, expert lecture.

Rationale:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts. The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

Syllabus:

UNIT-I   Industrial Visits:

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.(2 visits)

Following are the suggested types of Industries/ Fields -

(i)   Automobile manufacturing / auto component manufacturing units to observe the working of SPM

(ii)   Refrigeration and air conditioning manufacturing / servicing units / industries / workshops

(iii)   Automobile service stations for four wheelers

(iv)   Co-ordinate measuring machine to observe its construction working specifications and applications.

(v)   Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc.

(vi)   Wheel Balancing unit for light and/or heavy motor vehicles.

(vii)   Food processing unit.

(viii) Textile industry machinery manufacturing / servicing units.

(ix)   Hydro electric and Thermal power plants.

(x)   Engine testing, exhaust gas analysis and vehicle testing

(xi)   PWD workshop.

UNIT-II   The Guest Lectures:

From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work

    (a)   Electronic fuel injection systems

    (b)   Exhaust gas analysis.

    (c)   Vehicle testing.

    (d)   Transducer application in automobiles.

    (e)   Environmental pollution & control.

    (f)   Vehicle aerodynamics & design.

    (g)   Earth moving machines.

    (h)   Automobile pollution, norms of pollution control.

    (i)   Biotechnology

    (j)   Nanotechnology

    (k)   Rapid prototyping

    (l)   Programmable logic controllers

    (m)   TQM

    (n)   MPFI

    (o)   Hybrid motor vehicles

    (p)   Packaging technology

    (q)   Appropriate technology (r) Six sigma systems

    (s)   LPG / CNG conversion kit.

UNIT-III   Group Discussion:

The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one)-

    (i)   CNG versus LPG as a fuel.

    (ii)   Petrol versus Diesel as a fuel for cars.

    (iii)   Trends in automobile market.

    (iv)   Load shading and remedial measures.

    (v)   Rain water harvesting.

    (vi)   Trends in refrigeration Technology.

    (vii)   Disaster management.

    (viii)   Safety in day to day life.

    (ix)   Energy Saving in Institute.

    (x)   Nano technology.

Seminar: (Any 2 Topics)

Seminar topic should be related to the subjects of fifth semester / topics from

guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes for a group of 2 students)

UNIT-IV **Individual Assignments:**

Any two from the list suggested

(a)   Process sequence of any two machine components.

(b)   Write material specifications for any two composite jobs.

(c)   Collection of samples of different plastic material or cutting tools with properties , specifications and applications.

(d)   Preparing models using development of surfaces.

(e)   Assignments on bending moment , sheer forces , deflection of beams and torsion chapters of strength of material.

(f)   Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.

(g)   Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes.

(h)   List the various properties and applications of following materials - a. Ceramics, b. fiber reinforcement plastics,c. thermo plastic plastics d. thermo setting plastics,e. rubbers.

OR

Conduct ANY ONE of the following activities through active participation of students and write report

i)   Rally for energy conservation / tree plantation.

ii)   Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc.

iii)   Conduct aptitude , general knowledge test , IQ test

iv)   Arrange any one training in the following areas :

a)   Yoga.

b)   Use of firefighting equipment and First aid Maintenance of Domestic appliances.

UNIT-V **Mini Projects: (In a Group of 4-5 Students):**

(1)   Design / drawing of simple jigs, fixtures

(2)   Thermocouple based temperature controller.

(3)   Pump on / off timer

(4)   Models of jigs / fixtures

(5)   Layout design of SSI units / factory / workshop of the institute Models of material handling route systems

OR

Modular Course on any one of the suggested or alike relevant topic be

undertaken by a group of students :

    (a)   LPG/CNG conversion of vehicles

    (b)   Advance features in CAD - CAM

    (c)   basics of PLC programming

    (d)   die design

    (e)   JIT techniques

    (f)   Non traditional manufacturing methods

    (g)   jigs and fixture design

    (h)   3D Modeling

    (I)   finite element method

    (j)   Mechatronics

    (k)   Advanced computer programming

    (l)   maintenance of home appliances

    (m)   value stream mapping n) piping technology

Student Activities:

Students in a group of 3 to 4 shall perform ANY TWO of the following activities (Other similar activities may be considered) and write a report as a part of term work.

Activities:

1. Collection of data regarding loan facilities or other facilities available through different organizations / banks to budding entrepreneurs
2. Survey and interviews of successful entrepreneurs in nearby areas3. Survey of opportunities available in thrust areas identified by Government or DIC.
4. Measuring Screw thread parameters on floating carriage dial micrometer and select the optimum diameter of wire.
5. Survey of data regarding different types of pumps with specifications from manufacturers catalogue, local markets, end users (any other engineering products may be considered for survey)
6. Survey of farm implements used by farmers.
   Learning Resources:

TEXT BOOKS:

Nanotechnology	Mark Ratner and Daniel Ratner	Pearson Education, New Delhi
Supply Chain Management	Sunil Chopra, Peter Meindl	Pearson Education, New

REFERENCE BOOKS:

Computer Control of Manufacturing System	Yoram Korem	Mcgraw Hill Publication