

J. S. University, Shikohabad



Diploma

(Mechanical Engineering-Production)

(Mechanical Engineering-Automobile)

Scheme & Syllabus

[Effective from the session 2015-16]

STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
MECHANICAL (PRODUCTION ENGG.& AUTOMOBILE ENGG.)

SEMESTER - First

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DAS-11	Professional Communication	4	1	-	-	20	50	70	2.5
2	DAS-12	Applied Mathematics-I	4	1	-	-	20	50	70	2.5
3	DAS-13	Applied Physics-I	4	1	-	-	20	50	70	2.5
4	DAS-14	Applied Chemistry	4	1	-	-	20	50	70	2.5
5	DDW-11	Engineering Drawing	-	-	-	12	20	50	70	3

PRACTICA/DRAWING SUBJECTS

6	DAS-11P	Professional Communication	-	-	4		20	40	60	3
7	DAS-14P	Applied Chemistry	-	-	4		20	40	60	3
8	DGD-10	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									495	

NOTE:- (1) Each period will be 50 minutes duration.

(2) Each session will be of 16 weeks.

(3) Effective teaching will be at least 14 weeks.

(4) Remaining periods will be utilised for revision etc.

**STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
MECHANICAL (PRODUCTION ENGG.& AUTOMOBILE ENGG.)**

SEMESTER - Second

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DAS-22	Applied Mathematics-II	4	1	-	-	20	50	70	2.5
2	DAS-23	Applied Physics-II	4	1	-	-	20	50	70	2.5
3	DME-21	Applied Mechanics	4	1	-	-	20	50	70	2.5
4	DME-22	Elements of Mech. Engg.	4	1	-	-	20	50	70	2.5
5	DME-23	Elementary Workshop Tech.	4	1	-	-	20	50	70	2.5

PRACTICA/DRAWING SUBJECTS

6	DAS-23P	Applied Physics-II Lab	-	-	4	-	20	40	60	3
7	DME-21P	Applied Mechanics Lab	-	-	4	-	30	60	90	3
8	DWP-21P	Workshop Practice	-	-	4	-	30	60	90	3
9	DME-22P	Elements of Mech. Engg. Lab	-	-	4	-	20	40	60	3
10	DFE-21P	Field Exposure-I	-	-	-	-	30	-	30	2
11	DGD-20	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									705	

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STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
MECHANICAL (PRODUCTION ENGG.& AUTOMOBILE ENGG.)
SEMESTER - THIRD

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DAS-31	Applied Mathematics-III	4	1	-	-	20	50	70	2.5
2	DME-31	Materials & Material Science	4	1	-	-	20	50	70	2.5
3	DME-32	Thermal Engineering	4	1	-	-	20	50	70	2.5
4	DME-33	Manufacturing Processes	4	1	-	-	20	50	70	2.5

PRACTICA/DRAWING SUBJECTS

5	DCS-31P	Computer Application For Engg. Lab	-	-	4		30	40	70	3
6	DME-32P	Thermal Engineering Lab	-	-	4		30	50	80	3
7	DME-33P	Manufacturing Processes Lab	-	-	4		30	60	90	3
8	DGD-30	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									545	

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**STUDY AND EVALUATION SCHEME FOR
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SEMESTER - FOURTH

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DME-41	Mechanics of Solids	4	1	-	-	20	50	70	2.5
2	DCE-45	Hydraulics & Hydraulic Machines	4	1	-	-	20	50	70	2.5
3	DEE-44	Electrical Technology & Electronics	4	1	-	-	20	50	70	2.5
4	DME-42	Mechanical Engg. Drawing	-	-	-	10	20	50	70	3
PRACTICA/DRAWING SUBJECTS										
5	DME-41P	Mechanics of Solids Lab	-	-	4	-	30	50	80	3
6	DEE-44P	Electrical Technology & Electronics Lab	-	-	4	-	30	60	90	3
7	DCE-45P	Hydraulics Lab	-	-	4	-	30	50	80	3
8	DGD-40	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									555	

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(4) Remaining periods will be utilised for revision etc.

**STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
AUTOMOBILE ENGG.**

SEMESTER - Fifth

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DIM-51	Industrial Management and Entrepreneurship Development	4	1	-	-	20	50	70	2.5
2	DME-51	Theory of Machine	4	1	-	-	20	50	70	2.5
3	DME-52	M/c Tool Tech. &Maintenance	4	1	-	-	20	50	70	2.5
4	DME-53	Design & Estimation	4	1	-	-	20	50	70	2.5
5	DME-54	Automobile Engine	4	1	-	-	20	50	70	2.5
PRACTICA/DRAWING SUBJECTS										
6	DFE-51P	Field Exposure	-	-	4	-	20	50	70	3
7	DME-52P	AUTOSHOP	-	-	4	-	30	70	100	3
8	DGD-50	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									545	

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**STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
AUTOMOBILE ENGG.**

SEMESTER - Sixth

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DDM-61	Environmental Education & Disaster Management	4	1	-	-	20	50	70	2.5
2	DME-61	Industrial engg.& Safety	4	1	-	-	20	50	70	2.5
3	DME-62	Metrology & Measuring Instrumentss	4	1	-	-	20	50	70	2.5
4	DME-63	Automobile Technology	4	1	-	-	20	50	70	2.5
5	DME-64	Automobile Maintenance servicing & Repair	4	1	-	-	20	50	70	2.5

PRACTICA/DRAWING SUBJECTS

5	DME-61P	Project	-	-	10	-	50	100	150	3
6	DME-62P	Metrology lab	-	-	4		20	50	70	
7	DME-63P	Automobile Engine Lab	-	-	4	-	20	40	60	3
8	DGD-60	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									655	

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**STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
PRODUCTION ENGG.**

SEMESTER - Fifth

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DIM-51	Industrial Management and Entrepreneurship Development	4	1	-	-	20	50	70	2.5
2	DME-51	Theory of Machine	4	1	-	-	20	50	70	2.5
3	DME-52	M/c Tool Tech. &Maintenance	4	1	-	-	20	50	70	2.5
4	DME-53	Design & Estimation	4	1	-	-	20	50	70	2.5
5	DME-55	Production Technology-I	-	-	-	8	20	50	70	2.5
PRACTICA/DRAWING SUBJECTS										
6	DFE-51P	Field Exposure	-	-	4	-	20	50	70	3
7	DME-53P	Mechanical Workshop	-	-	4	-	30	100	130	3
8	DGD-50	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total									575	

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**STUDY AND EVALUATION SCHEME FOR
THREE YEAR DIPLOMA COURSE IN
PRODUCTION ENGG.**

SEMESTER - Sixth

S.No.	Subject Code	Name of Subject	Periods Per Week				Evaluation Scheme			
			L	T	P	D	Sessional	End Exam	Total	Duration
THEORY SUBJECT										
1	DDM-61	Environmental Education & Disaster Management	4	1	-	-	20	50	70	2.5
2	DME-61	Industrial engg.& Safety	4	1	-	-	20	50	70	2.5
3	DME-62	Metrology & Measuring Instrumentss	4	1	-	-	20	50	70	2.5
4	DME-65	Production Technology-II	4	1	-	-	20	50	70	2.5
5	DME-66	Production Automation	4	1	-	-	20	50	70	2.5

PRACTICA/DRAWING SUBJECTS

5	DME-61P	Project	-	-	10	-	30	100	130	3
6	DME-62P	Metrology lab	-	-	4		20	50	70	3
7	DME-64P	Production Tech. Lab	-	-	4	-	20	30	50	3
8	DGD-60	Games//Social and Cultural Activities + Discipline (15 + 10)							25	
Grand Total								625		

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DAS-11 Professional Communication

1. PART I : COMMUNICATION IN ENGLISH

1.1 Concept of communication, importance of effective communication, types of communication, formal, informal, verbal and nonverbal, spoken and written. Techniques of communication, Listening, reading, writing and speaking, Barriers in communication, Modern tools of communication-Fax, e-mail, Telephone, telegram, etc.

1.2 Technical communication Vs. General Communication :Development of comprehension and knowledge of English through the study of text material and language exercises based on the prescribed text book of English.

1.3 Development of expression through:

1.3.1 Paragraph writing, Essay writing, Proposal writing.

1.3.2 Business and personal correspondence (Letters) :Kinds of letters:-Official, semi-official, unofficial , for reply or inreply, quotation, tender and order giving letters.Application for a job, Resume.

1.3.3 Report writing and Note making and minutes writing.

1.4 Functional Grammar : Study of sentences and parts of speech(word class), Preposition, Verb, Articles, Abbreviations.

1.5 Vocabulary Building : Homophones, One word substitution,Idioms and Phrases.

1.6 Composition on narrative, descriptive, imaginative,argumentative, discussion and factual topics.

2. PART II : COMMUNICATION IN HINDI

2.1 Development of comprehension and knowledge of Hindi usage through rapid reading and language exercises based on prescribed text material developed by IRDT.

2.2 Development of expression through ;Letter writing in Hindi:Kinds of letters:-Official, semi-official, unofficial , for reply or inreply, quotation, tender and order giving letters.Application for a job, Press release in Hindi, Report writing.

Note: Paper should be in two parts, part I - English and part II -Hindi.

REFERENCE BOOKS

1. Bookshelf worksheet of Professional Communication, New Delhi: Bookshelf 2008

2. Functional Skills in language and literature by R. P. Singh,New Delhi : Oxford University Press.

3. Oxford English Hindi English Dictionary, New Delhi : Oxford 2008

DAS-11P Professional Communication Lab

For the practice/exercise the following is suggested :-

1.A. Phonetic transcription

B. Stress and intonation :

(At least 10 word for writing and 10 word for pronunciation)

2. ASSIGNMENT : (Written Communication)

Two assignment of approximately 400 word each decided by the teacher concerned.

THE FOLLOWING MODEL IS PROPOSED :

1. a picture/photograph

2. an opening sentence or phrase
3. a newspaper/magazine clipping or report
4. factual writing which should be informative or argumentative.

(The students may refer to "Bookshelf worksheet" for technical communication)

3. Oral Conversation:

1. Short speeches/declamation : Bid farewell, Felicitate somebody, Celebrate a public event, Offer condolences
2. Debate on current problems/topics
3. Mock Interview : Preparation, Unfolding of personality and Expressing ideas effectively
4. Group discussion on current topics/problems
5. Role Play/ general conversation : Making polite enquiries at Railway Station, Post Office, Banks and other Public places, Replying to such enquiries, enquiring about various goods sold in the market and discussing their prices. Complaining about service at Hotel, restaurant, Offering apologies in reply to such complaints, complain to a company about a defective product you have brought, reply to such complaints.
6. Presentation skill, Use of OHP and LCD.
7. Through drilling of model words involving different phonetic symbols (Vowels, Consonants, Diphthongs).
4. Aural : Listening to conversation/talk/reading of short passage and then writing down the relevant or main points in the specified number of words and answering the given questions. The assignments/project work are to be evaluated by the internal/ external examiner. The distribution of 30 marks e.g.

10 marks for assignment (Given by subject teacher assessmental marks)

10 marks for conversation and viva-voce

10 marks for phonetic transcription

DAS-12 APPLIED MATHEMATICS - I

Unit -1: Algebra-I

1. Arithmetic Mean: nth term, sum, Mean
2. Geometric Mean: nth term, sum, Mean
3. Binomial Theorem for positive, negative and fractional index (without proof)
4. Determinants: Elementary properties of determinants of order 2 and 3, system of linear equations and solution, Cramer's Rule

. Unit -2: Algebra-II

1. Vector Algebra: Dot and cross product, Scalar and vector triplet product
2. Complex Numbers: Representation, Modulus and Amplitude, De-Moivre theorem application in solving algebraic equations.

Unit -3: Trigonometry

1. Relation between sides and angles of a triangle : Statement of various formula showing Relationship between sides and angles of a triangle.
2. Inverse Circular Functions

Unit -4: Differential Calculus-I

1. Functions, limits, continuity , elementary methods of finding limit(right and left)
2. Differentiability, method of finding derivatives, functions of a function, Logarithmic Differentiation, Differentiation of Implicit functions.

Unit -5: Differential Calculus-II

1. Higher order derivatives
2. Derivatives of Special Functions (Exponential , Logarithmic , and Inverse circular functions)
3. Application : Finding Tangent, Rate Measure , Velocity and Acceleration

DAS-13 APPLIED PHYSICS-I

Topic Wise Distribution

S.no.	Topics	Marks Distribution
1	Unit &Dimensions	4
2	Errors & Measurement	4
3	Heat & Thermodynamics	5
4	Friction	4
5	Circular Motion	5
6	Motion of Planets & satellites	5
7	Dynamic of Rigid Body	6
8	Fluid Mechanics	6
9	Harmonic Motion	6
10	Acoustics	5
	Total	50

Detailed Contents

UNIT AND DIMENSION

Physical quantity and its types, Unit and its types, Definition of SI units, Dimensions of physical quantities, Dimensional formula and dimensional equation, Principle of homogeneity and its applications, Limitations of dimensional analysis

ERRORS AND MEASUREMENTS

Errors, Accuracy and Precision, Types of errors in measurement, Combination of errors, Significant figures, Rounding off

HEAT AND THERMODYNAMICS

Modes of heat transfer, Coefficient of thermal conductivity, Conduction through compound medium, Isothermal and Adiabatic process, Zeroth and First law of thermodynamics

FRICITION

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in daily life, Coefficient of static and dynamic friction and their measurement, Angle of friction, Angle of repose, Motion of a body on an inclined plane

CIRCULAR MOTION

Uniform circular motion, Angular velocity and acceleration, Centripetal acceleration, Relation between linear and angular velocity and acceleration, Centripetal and centrifugal forces, Practical applications of centripetal forces

MOTION OF PLANETS AND SATELLITES

Gravitational force, Acceleration due to gravity and its variation with respect to height and depth from earth, Kepler's law, Escape and orbital velocity, Time period of satellite, Geo-stationary satellite

DYNAMIC OF RIGID BODY

Rigid body, Rotational motion, Moment of inertia, Theorems (parallel and perpendicular) of moment of inertia, Expression of M.I. of regular bodies (lamina, disc, sphere, cylindrical), Radius of gyration, Angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy, Rolling of sphere on the slant plane

FLUID MECHANICS

Surface tension, Capillary action and determination of surface tension from capillary rise method, Equation of continuity, Bernoulli's theorem and its application, Stream line and Turbulent flow, Viscosity, Stokes law, Reynold's number

HARMONIC MOTION

Periodic function, Characteristics of SHM, Equation of SHM and determination of velocity and acceleration, Simple pendulum and derivation of its periodic time, Spring-mass system, Energy conservation of SHM, Concept of phase, Definition of free, forced, damped and undamped vibrations, Resonance and its application, Q-factor

ACOUSTICS

Definition of pitch, loudness, quality and intensity of Sound waves, Echo, Reverberation and reverberation time, Sabine's formula without derivation, Acoustics of building defects and remedy

DAS-14 APPLIED CHEMISTRY

1. ATOMIC STRUCTURE :

Basic concept of atomic structure, Matter wave concept, Quantum number, Heisenberg's Uncertainty Principle, Shapes of orbitals.

2. CHEMICAL BONDING :

Covalent bond, Ionic & Coordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. CLASSIFICATION OF ELEMENTS :

Modern classification of elements (s, p, d and f block elements), Periodic properties : Ionisation potential, electronegativity, Electron affinity.

4. ELECTRO CHEMISTRY-I:

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions,

Indicators, Solubility product, Common ion effect with their application,

5. ELECTRO CHEMISTRY-II:

Redox reactions, Electrode potential (Nernst Equation), Electro-chemical cell (Galvanic and Electrolytic). EMF of a cell and free energy change. Standard electrode potential, Electrochemical series and its application. Chemical and Electrochemical theory of corrosion, Galvanic Series. Prevention of corrosion by various methods.

6. CHEMICAL KINETICS :

Law of mass action, order and molecularity of reaction. Activation energy, rate constants, 1st order reactions and 2nd order reactions.

7. CATALYSIS :

Definition Characteristics of catalytic reactions, Catalytic promoters and poisons, Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. SOLID STATE :

Types of solids (Amorphous and Crystalline), Classification (Molecular, Ionic, Covalent, Metallic), Band theory of solids (Conductors, Semiconductors and Insulators), types of Crystals, FCC, BCC, Crystal imperfection.

9. FUELS :

Definition, its classification, high & low Calorific value. Determination of calorific value of solid and liquid fuels by Bomb calorimeter. Liquid fuel - Petroleum and its refining, distillate of petroleum (Kerosene oil, Diesel and Petrol), Benzol and Power alcohol. Knocking, Anti-knocking agents, Octane number and Cetane number. Cracking and its type, Gasolining from hydrogenation of coal (Bergius process and Fischer-Tropsch's process) Gaseous Fuel - Coal gas, Oil gas, Water gas, Producer gas, Bio gas, LPG and CNG. Numerical Problems based on topics

10. WATER TREATMENT :

Hardness of water, Its limits and determination of hardness of water by EDTA method. Softening methods (Only Soda lime, Zeolite and Ion exchange resin process). Disadvantage of hard water in different industries, scale and sludge formation, Corrosion, Caustic embrittlement, priming and foaming in boilers. Disinfecting of Water By Chloramine-T, Ozone and Chlorine. Advantage and disadvantage of chlorination, Industrial waste and sewage, Municipality waste water treatment, Definition of BOD and COD. Numerical Problems based on topics.

11. COLLOIDAL STATE OF MATTER :

Concept of colloidal and its types, Different system of colloids, Dispersed phase and dispersion medium. Methods of preparation of colloidal solutions, Dialysis and electrodialysis. Properties of colloidal solution with special reference to absorption, Brownian Movement, Tyndall effect, Electro phoresis and coagulation. Relative stability of hydrophilic and hydrophobic colloids. Protection and protective colloids. Emulsion, Types, preparation, properties and uses. Application of colloids chemistry in different industries.

12. LUBRICANTS :

Definition, classification, Necessity and various kinds of lubricants. Function and mechanism of action of lubricants and examples. Properties of lubricants, Importance of additive compounds in lubricants, Synthetic lubricants and cutting fluids. Industrial application, its function in bearing.

13. HYDROCARBONS:

A. Classification and IUPAC nomenclature of organic compounds homologous series (Functional Group)

B. Preparation, properties and uses of Ethane, Ethene, Ethyne (Acetylene), Benzene and Toluene.

14. ORGANIC REACTIONS & MECHANISM:

1. Fundamental aspects -

A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion

B. Inductive effect, Mesomeric effect, Electromeric effect.

2.A. Mechanism of addition reaction (Markovnikov's Rule, Cyanohydrin and Peroxide effect),

B. Mechanism of Substitution reactions; (Nucleophilic) hydrolysis of alkyl halide, electrophilic substitution halogenation, Sulphonation, Nitration and Friedel-Crafts reaction.

C. Mechanism of Elimination reaction - Dehydration of primary alcohol, Dehydrohalogenation of primary alkyl halide.

15. POLYMERS :

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)

2. Thermosetting and Thermoplastic resins -

A. Addition polymers and their industrial application - Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

B. Condensation polymer and their industrial application : Nylon 6, Nylon 6,6, Bakelite, Melamine formaldehyde, Urea formaldehyde, Terylene or Decron, Polyurethanes.

3. General concept of Bio polymers, Biodegradable polymers and inorganic polymers (Silicon).

16. SYNTHETIC MATERIALS :

A. Introduction - Fats and Oils

B. Saponification of fats and oils, Manufacturing of soap.

C. Synthetic detergents, types of detergents and its manufacturing.

3. EXPLOSIVES: TNT, RDX, Dynamite.

4. Paint and Varnish

DAS-14P LIST OF PRACTICALS

1. To analyse inorganic mixture for two acid and basic radicals from following radicals:

A. Basic Radicals : NH_4^+ , Pb^{++} , Cu^{++} , Bi^{+++} , Cd^{++} , As^{+++} , Sb^{+++} , Sn^{++} , Al^{+++} , Fe^{+++} , Cr^{+++} , Mn^{++} , Zn^{++} , Co^{++} , Ni^{++} , Ba^{++} , Sr^{++} , Ca^{++} , Mg^{++}

B. Acid Radicals : CO_3^{--} , S^{--} , SO_3^{--} , CH_3COO^- , NO_2^- , NO_3^- , Cl^- , Br^- , I^- , SO_4^{--}

2. To determine the percentage of available Chlorine in the supplied sample of Bleaching powder.

3. To determine the total hardness of water sample in terms of CaCO_3 by EDTA titration method using Eriochrome black-T indicator.

4. To determine the strength of given HCl solution by titration against NaOH solution using Phenolphthalein as indicator.

5. To determine the Chloride content in supplied water sample by using Mohr's method.

6. Determination of temporary hardness of water sample by Hardness method.

DDW-11 ENGINEERING DRAWING

1. Drawing, instruments and their uses.

1.1 Introduction to various drawing, instruments.

1.2 Correct use and care of Instruments.

1.3 Sizes of drawing sheets and their layouts.

2. (a) Lettering Techniques

1 Sheet

Printing of vertical and inclined, normal singlestroke capital letters. Printing of vertical and inclined normal singlestroke numbers. Stencils and their use.

(b) Introduction to Scales

2 Sheet

Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal and chord scales.

3. Conventional Presentation:

2 Sheet

Types of lines, Conventional representation of materials, Thread (Internal and External), Conventional representation of machine parts, Welded joint.

4. (a) Principles of Projection

1 Sheet

Orthographic, Pictorial and perspective. Concept of horizontal and vertical planes. Difference between I and III angle projections. Dimensioning techniques.

(b) Projections of points, lines and planes.

2 Sheet

5 (a) Orthographic Projections of Simple Geometrical Solids

3 Sheet

Edge and axis making given angles with the reference planes. Face making given angles with reference planes. Face and its edge making given angles with reference planes.

(b) Orthographic views of simple composite solids from their isometric views.

(c) Exercises on missing surfaces and views

6. Section of Solids

2 Sheet

Concept of sectioning Cases involving cutting plane parallel to one of the reference planes and perpendicular to the others. Cases involving cutting plane perpendicular to one of the reference planes and inclined to the others plane, true shape of the section

7. Isometric Projection.

1 Sheet

Isometric scale Isometric projection of solids.

8. Free hand sketching

1 Sheet

Use of squared paper Orthographic views of simple solids Isometric views of simple job like carpentry joints

9. Development of Surfaces

2 Sheet

Parallel line and radial line methods of developments. Development of simple and truncated surfaces (Cube, prism, cylinder, cone and pyramid).

10. ORTHOGRAPHIC PROJECTION OF MACHINE PARTS:

3 Sheet

Nut and Bolt, Locking device, Bush Bearing

11. PRACTICE ON AUTO CAD :

2 Sheet

Concept of AutoCAD, Tool bars in AutoCAD, Coordinate System, Snap, Grid and Ortho mode. Drawing Command - Point, Line, Arc, Circle, Ellipse. Editing Commands - Scale, Erase, Copy, Stretch, Lengthen and Explode. Dimensioning and Placing text in drawing area. Sectioning and hatching. Inquiry for different parameters of drawing.

NOTE :

A. The drawing should include dimension with tolerance wherever necessary, material list according to I.S. code.

25% of the drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle figure

B. Practice on AutoCAD latest software is to be done in AutoCAD lab of Mechanical Engineering Department of the Institute.

DAS-22 Mathematics - II

Unit -1: Integral Calculus-I

Methods of finding indefinite integral

1. Integration by substitution
2. Integration by parts
3. Integration by partial fraction
4. Integration of special functions

Unit-2: Integral Calculus-II

1. Definite integral: definition and properties, Evaluation of integrals
2. Applications of definite integrals: Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution,
3. Numerical Integration: Trapezoidal rule, Simpson's 1/3rd rule and Simpson's 3/8 th rule

Unit-3: Coordinate Geometry-I

1. Circle : Equation of circle in standard form, centre –radius form , diameter form and two intercept form.
2. Standard form of curves and their simple properties:
 - Parabola
 - Ellipse
 - Hyperbola

Unit-4: Coordinate Geometry-II

1. Distance between two points in space , direction cosines and direction ratios, Finding equation of a straight line and shortest distance between two lines.
2. Sphere

DAS-23 Applied Physics-II

1. Optics

Nature of light, Laws of Reflection and Refraction, Snell's Law, Interference (Constructive and Destructive), Diffraction and Polarization (Concept Only), Law of Malus and Polaroids.

2. Introduction To Fibre Optics :

Critical angle, Total internal reflection, Principle of fibre optics, Optical fibre, Pulse dispersion in step-index fibres, Graded index fibre, Single mode fibre, Optical sensor.

3. Lasers and its Applications

Absorption and Emission of energy by atom, Spontaneous and Stimulated Emission, Population inversion, Main component of laser and types of laser- Ruby Laser, He-Ne laser and their applications. Introduction to MASER.

4. Electrostatics :

Coulomb's Law, Electric field, Electric potential, Potential energy, Capacitor, Energy of a charged capacitor, Effect of dielectric on capacitors.

5. D.C. Circuits

Ohm's Law, Kirchhoff's Law and their simple application, Principle of Wheat Stone bridge and application of this principle in measurement of resistance (Meter bridge and Post Office Box); Carey Foster's bridge, potentiometer.

6. Magnetic Materials and Their Properties:

Dia, Para and Ferro-magnetism, Ferrites, Magnetic Hysteresis Curve and its utility. Basic idea of super conductivity, Meissner's effect.

7. Semiconductor Physics

Concept of Energy bands in solids, classification of solids into conductors, insulators and semiconductors on the basis of energy band structure. Intrinsic and extrinsic semiconductors, Electrons and holes as charge carriers in semiconductors, P-type and N-type semiconductors.

8. Junction Diode and Transistor :

Majority and Minority charge carriers, P-N junction formation, barrier voltage, Forward and reverse biasing of a junction diode, P-N junction device characteristics, Formation of transistor, transistor action, Base, emitter and collector currents and their relationship LED's.

9. Introduction To Digital Electronics :

Concept of binary numbers, Interconversion from binary to decimal and decimal to binary. Concepts of Gates (AND, NOT, OR).

10. Non-conventional energy sources:

(a) Wind energy : Introduction, scope and significance, measurement of wind velocity by anemometer, general principle of wind mill.

(b) Solar energy: Solar radiation and potentiality of solar radiation in India, uses of solar energy: Solar Cooker, solar water heater, solar photovoltaic cells, solar energy collector.

DAS-23P Applied Physics-II Lab

Note: Any 5 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T^2 versus l and using the formula $g = 4\pi^2 / \text{Slope of the graph line}$
3. Determine the force constant of combination of springs in case of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E_1/E_2 of cells by potentiometer.
8. Determination of specific resistance by Carey Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchhoff's Law.
11. To draw Characteristics of p-n Junction diode.

DME-21 Applied Mechanics

1. Introduction:

Mechanics and its utility. Concept of scalar and vector quantities. Effect of a force. Tension & compression. Rigid body. Principle of physical independence of force. Principle of transmissibility of a force.

2.A. System of Forces :

Concept of coplanar and non-coplanar forces including parallel forces. Concurrent and non-concurrent forces. Resultant force. Equilibrium of forces. Law of parallelogram of forces. Law of triangle of forces and its converse. Law of polygon of forces. Solution of simple engineering problems by analytical and graphical methods such as simple wall crane, jib crane and other structures. Determination of resultant of any number of forces in one plane acting upon a particle, conditions of equilibrium of coplanar concurrent force system.

B. General Condition of Equilibrium: General condition of equilibrium of a rigid body under the action of coplanar forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

3. Moment & couple:

Concept of Varignon's theorem. Generalised theorem of moments. Application to simple problems on levers - Bell crank lever, compound lever, steel yard, beams and wheels, lever safety valve, wireless mast, moment of a couple; Properties of a couple; Simple applied problems such as pulley and shaft.

4. Friction:

Types of friction: static, limiting and dynamical friction, statement of laws of sliding friction, Coefficient of friction, angle of friction; problems on equilibrium of a body resting on a rough inclined plane, simple problems on friction. Conditions of sliding and toppling.

5. Machines:

Definition of a machine. Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine. Lifting machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

Concept, definition of centroid of plain figures and center of gravity of symmetrical solid bodies. Determination of centroid of plain and composite lamina using moment method only, Centroid of bodies with removed portion. Determination of center of 'gravity' of solid bodies - cone, cylinder, hemisphere and sphere, composite bodies and bodies with portion removed.

7. Moment of Inertia:

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical section: rectangle, triangle, circle (without derivations). Second moment of area for L, T, I and channel section, section of modulus.

8. Beams & Trusses:

Definition of statically determinate and indeterminate trusses. Types of supports. Concept of tie & strut, Bow's notation, space diagram, polar diagram, funicular polygon; calculation of reaction at the support of cantilever and simply supported beams and trusses graphically and analytically; graphical solution of simple determinate trusses with reference to force diagram for determining the magnitude and nature of forces in its various members.

Analytical methods: method of joints and method of sections.

DME-22 Elements of Mech. Engg.

1. Thermal Engg.

A. SOURCES OF ENERGY:

Definition, Concept of thermodynamic system and surroundings, Closed system, Open system, Isolated system, Thermodynamics definition of work. Zeroth law of dynamics

Basic ideas, conventional and nonconventional forms-Thermal, Hydel, Tidal, wind, Solar, Biomass and Nuclear and their uses.

B. FUELS & COMBUSTION:

Introduction to common fuels - solid, liquid and gases and their composition. Combustion of fuels- their higher and lower calorific values. Combustion equations

for carbon, sulphur, hydrogen and their simple Corrected and Approved By B.T.E. on Dated 27.05.2015 compounds.

Calculation of minimum amount of air required for complete combustion. Combustion analysis on mass basis and on volume basis. Concept of excess air in a boiler furnace combustion. Heat carried away

by flue gases. Analysis of flue gases by Orsat apparatus. Simple numerical problems

Idea of specific properties of liquid fuels such as detonation, knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.

2. MACHINE COMPONENTS:

Brief Idea of loading on machine components.

(i) Pins, Cottor and Knuckle Joints.

(ii) Keys, Key ways and spline on the shaft.

(iii) Shafts, Collars, Cranks, Eccentrics.

(vi) Couplings and Clutches.

(v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and

their applications. Selection of ball bearing and roller bearing for given application using design data book.

(vi) Gears :

Different types of gears, gear trains and their use for transmission of motion. Determination of velocity ratio for spur gear trains; spur gear, single and

double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module.

(vii) Springs:

Compression, Tension, Helical springs, Torsion springs, Leaf and Laminated springs. Their use and material. Selection of spring by design data book, simple numerical problem.

(viii) Transmission of Motion By Belts, Ropes & Pulleys, Chain & Sprockets : Open and cross belt drive, determination of velocity ratio. Effect of thickness and slip on the velocity ratio (Concept only, No mathematical treatment), Method of prevention of slip. Determination of velocity ratio in compound belt drive, use of stepped pulley. Classification and uses of ropes in transmission operation. Chains and their classifications, their application in power transmission, their comparison

with other drive systems

3. MECHANISMS:

Definition of link, Frame and mechanism. Difference between machine and mechanism, kinematic pairs, lower and higher pairs. Velocity diagram for four bar mechanism, slider crank mechanism, quick return mechanism. Introduction to Cam and its use.

4. LUBRICATION:

Different lubrication system for lubricating the components of machines. Principle of working of wet sump and dry sump system of lubrication. (Explain with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue). NOTE: While teaching theory it is important to bring and show the

machine components to the students.

DME-22PELEMENTS OF MECHNICAL ENGINEERING-LAB

A. Study and demonstration of the following

1. (a) Bio Gas Plant.
(b) Wind Mill.
(c) Solar Cooker.
(e) Voltaic Cell Type Soalr Energy Converter.
2. Key's, Key ways and Splined shaft e.g. Jib head key, Flat key, Saddle key, Woodruff key, Feather key, Pin key, Splinedshaft.
3. Pins- Split pin, Taper cotter type split pin, Cottorpin,Foundations Bolts- Lewis rag bolt, Fish tail bolt and Square head bolt.
4. Friction clutch and Coupling- Cone cluch, Plate cluch (Single Pair); Muff coupling, Flange coupling, Universal or Hook's joint coupling. Flexible coupling- Belt and Pin Type,Coil spring type.
5. Bearings- Plane, Bush, Split step bearings, Ball Roller bearings, Thrust bearings.
6. Gears- Spur gear, Single and Double herical gears, Bevelgears.
7. Gear Trains- Simple spur gear train, Compound gear train,Epicyclic gear train.
8. Compressor and Tension helical springs.
9. Slider Crank Mechanism.PerformancePracticals:
10. Determine the angle covered in forward and return stroke of Quick Return Mechanism of available shaper in machine shop.
11. Estimate the amount of ash and moisture in given sample of coal or coke
12. Deterimination of velocity ratio of a spur gear train.
13. Velocity diagram of a four bar chain mechanism.
14. Performance evaluation of solar cooker.

DME-23 Elementary Workshop Tech.

1. GENERAL INTRODUCTION:

- (a) Scope of subject "Workshop Technology" in engineering.(b) Different shop activities and broad division of the shops on the basis of nature of work done such as
- (i) Wooden Fabrication (Carpentry)
 - (ii) Metal Fabrication (shaping and Forming, Smithy,Sheet metal and Joining-welding, Rivetting,Fitting and Plumbing.
- (c) Organization and layout of workshop.
(d) General safety preaction in workshop

2. CARPENTRY :

- (a) Types of wood and timber, Cutting and seasoning of wood, Decaying of wooden component.
(b) Fundamental of wood working operations:
- Marking & Measuring.
 - Holding & Supporting.
 - Cutting & Sawing.
 - Drilling & Boring.
 - Turning.
 - Jointing.
- (c) Common Carpentry Tools:Their classification, size, specification (name of the parts and use only).
- (1) Marking and measuring tools:Rules, try square, Bevel Square, Marking gauge, Mortise gauge, Scriber (marking knife). Combination set
 - (2) Holding and supprotingTools:Carpentary vice, Bench hold fast, Bar clamp, Bench hook, Hand clamp C and G clamp.

(3) Cutting and Sawing Tools:Saws: (Grip or Hand, panel, cross cut, Tenon, dove tail, compass, key hole and bow saw),

Chisel: (Firmer, dovetail, mortise and gauge),

Planes: (Wooden & Iron plane. Jack plane, Smoothing plane).

(4) Drilling and Boring tools: Auger, Gimlet, Hand drill,Brace and bits.

(5) Striking Tools: Mallet and Claw hammer.

(6) Turning Tools &Equipments: Wood working lathe and lathe tools.

(7) Miscellaneous Tools: Screw driver, Rasp, Pincer, Oil stone, Triangular file and Saw set.

(d) Joining of Timber Components For Fabrication Works:Assembly of joints (Preparation steps and tools usedonly) Mortise, Tenon, Rivet , Groove, Tongue, Dowel,operations in assembly-Simple lap and butt, Mortise,Tenon, Dovetail, Mitre &briddle joints. Uses of glue,dowelpin and screw in preparation of joints. Common defects likely to occur during and after joining,defects due to wrong use of tools, defects due to wrong operation, defects due to improper seasoning of timbertheir identification and remedy. Safety (personal and equipment) to be observed.

3. METAL FABRICATION:

(A) Metal Shaping :Smithy:

(1) Operations involved (concept only)-Preparation of fire, Supporting and holding the metal, cutting the metal in size, heating, drawing down or fullering, usetting, swaging, bending, punching,blanking, drifting and forge welding,

(2) Tools and equipment used (Names, size,specification for identification only).

(3) Heating and fuel handling equipment-Smithy Forge,Blower, Shovel, Poker.

(4) Holding and supporting tools-Common tongs, anvil,swage block.(5) Striking Tools-Ball pein, cross pein ,Straightpein double face and sledge hammers .

(6) Cutting tools - Hot and cold chisel and shear set.

(7) Punching &Drifiting Tools - Punch & Drift.

(8) Bending Tools and fixture.

(9) Forming & Finishing Tools - Fullers, Swage Flatters, Set hammers.

(10) Defects likely to Occur during and after operations their Identification and Remedy.Defects due to wrong operation , wrong tool and wrong heating.

(11) Safety of Personnel, Equipment & Tools to be observed.

(12) Study of forge hammers and power presses.

(2) Sheet metal working:

(I) Tools and Operation:

(1) Operations involved (Names and concept only)Laying out, marking and measuring,cutting, Shearing and blanking, Straightening bending and seaming,Punching and piercing , burring and stamping,

(2) Sheet metal joints - Lap, seam, Locked seam,hemp,wirededge, cup or circuler, Flange, angular and cap.

(3) Tools and equipments used (Name, size,specification for identification only).

(4) Marking Tools- Scriber, Divider and Trammel,Protractor, Trysquare, Dot punch, Steel Rule, Steel tape, Sheet metal gauge.

(5) Cutting and shearing Tools-hand Shear and lever,Snips, Chisels.

(6) Straightening tool-Straight edge.

(7) Striking Tools-Mallet, Hammer.

(8) Holding Tools-Vice, Plier, C or G clamps, Tongs.

(9) Supporting Tools-Stakes and Anvil.

(10) Bending Tools-Crimpers, Form dies,Roundnose plier, Rails.

(11) Punching-Piercing and Drifting tools.

(12) Burring Tools-Files.

(13) Common defects likely to occur during and after operation-Their identification and remedy. Defects due to wrong operation or wrong tool.

(14) Safety of Personnel, Equipment & Tools to be observed.

(15) Development and estamination of sheet for simple articles.

(B) Metal Joining During Fabrication:

(1) Permanent Joining:

(a) (1) Welding methods-Forgewelding, gas welding (high and low pressure-oxyacetylene welding, types of flames.

(2) Electric welding- D.C. & A.C., Connected tools, operation, materials and safety measures.

(b) Soldering & Brazing: For black Galvanised and Tinfoated Iron sheet, brass and copper sheets only.

(1) Its concept, comparison with welding as joining method and classification, electric soldering and forge soldering.

(2) Soldering operation- edge preparation of joints, Pickling and degreasing, Fluxing, Tinning and Soldering.

(3) Materials Used- Common fluxes, soft and hard solder, solder wire (Plain and Resin core) and sticks, spelters and their specifications and discription(For Identification Only), forge soldering bits.

(4) Electric soldering iron.

(5) Common defects likely to occurs during and after soldering.

(6) Safety of Personnel, Equipment & Tools to be observed.

(c) Rivetting:

(1) Its comparison with welding as joining method.

(2) Rivets and Materials.

(3) Operation involved- Marking from given data, edge preparation, drilling and punching arrangements of joint elements (Lap, Butt with single cover plate and double cover plate) upsetting of rivet tail, shaping head and caulking.

(4) Tools and equipments used- (Names, Size, Specification and uses)- Supporting and holding

tools (Stakes and Tonqs)- Striking tools- Ball pien, Straight pien and Cross pien hammers and head forming tools (Shapes), drills punches and solid punches, drift, elementary knowledge about working of pneumatic, hydraulic and electric rivetor.

(2) Temporary Joining (Fastners & Their Uses): Introduction to

(1) Various types of Bolts (Names of prats and specification) and various types of washers and nuts used with them and their uses, material they are made of , studs and foundation bolts.

(2) Screws, keys, pins and cottors- their material and use.

(3) Pipe connectors- Sockets, elbows, tees, cross and bends, unions, volves, glands packing and operation in use of pipe connectors- cutting, marking, threading, pipe bending, joining

different pipe line fittings- (Steps of operation only). Tools and equipment used in their operations (Name, Size, Specification and Discription for Identification). Supporting and holding tools- Pipe vices (Bench, leg and hand), Pipe wrenches, Spanners. Cutting Tools- Hack saw and Pipe cutters. Threading Tools- Pipe dies and Taps. Materials Used for Joining- White lead, Cotton and Gasket. Common defects lickely to occur during and after operation and their remedies.

(3) Familiarity with The Use of Various Tools Used In Mechanical Engineering Workshop:

Marking & Measuring: Steel rule, surface gauge, marking block, protractor, try square, scribe, punches, divider and callipers, surface plate, V. block, gauges- (screw, pitch, radius, feeler), Vernier callipers, Micrometer, Vernier height and depth gauge, use of dial gauge.

Holding Tools: Vices (Bench, leg and hand vice), clamps tongs, pliers, Cutting Tools:

Hack saw (Fixed and Adjustable frame), chisels- flat, cross cut, diamond, round nose.

Files: According to section- Knife edge, Flat, Triangular round, Square, Half round, According to grade - Rough, Bastard, Second cut, Smooth and Dead smooth, Drills and Allied Tools:

Parallel and taper shank Twist drill, Thread Cutting Tools: Taps and Dies, Miscellaneous Tools:

Wrenches, Keys, Spanners, Pliers, Screw drivers their specification and many others which have not been named for use in various shops. They should be shown physically to each student for familiarity.

4. PROTECTION OF FABRICATED STRUCTURES FROM WEATHER:

1. PAINTING: Its need, Introduction to methods of paintings (Classification only); Manual, Machine (spray) and dipping at room temperature, operations involved discription

of steps only eg. surface preparation method for old and new surface in timber and iron structure- sanding, derusting, degreasing, filling of pore and dents, paint application- manual, machine (spray and dip painting drying of paint air drying and oven drying under coat and filler material (red oxide, putty, yellow clay), surface preparation materials (sand and emery papers); tools and equipments used (Name, size specification for indification).

Brushes- Round and flat wire brush, scraper, trowel , spray gun, compressor. Defects likely to occur in painting and their remedies Safety of Personnel, Equipment & Tools to be observed.

2. VARNISHING & POLISHING:

Its need operation involved (description of step only), surface preparation method of old and new articles, application of polishing materials, materials used for preparation of french and spirit polish, copal varnish. Defects likely to occur. Safety of Personnel, Equipment & Tools to be observed.

5. FOUNDRY WORK:

Elementary idea of patterns, Types of moulds, sand and green sand moulds and moulding, tools and equipment used in green sand moulding.

6. MACHINE SHOP:

Introduction to machine tools viz lathe, drilling machine, shaper and planer simple line and block diagram of components and their functions. Brief concept of NC and CNC machines.

DWP-21P WORKSHOP PRACTICE

1. Carpentry Shop :

EX-1 Introduction & demonstration of tools used in carpentry shop and different types of joints, types of wood, seasoning and preservation of wood

EX-2 Planing and sawing practice

EX-3 Making of lap joint

EX-4 Making of mortise and tenon joint

EX-5 Making of any one utility article such as wooden picture frame, hanger, peg, name plate, etc.

2. Painting and Polishing Shop:

EX-1 Introduction of paints, varnishes, Reason for surface preparation, Advantage of painting, other method of surface coating i.e. electroplating etc.

EX-2 To prepare a wooden surface for painting apply primer on one side and to paint the same side. To prepare french polish for wooden surface and polish the other side.

EX-3 To prepare metal surface for painting, apply primer and paint the same.

EX-4 To prepare a metal surface for spray painting, first spray primer and paint the same by spray painting gun and compressor system.

* The sequence of polishing will be as below:

i) Abrasive cutting by leather wheel.

ii) Polishing with hard cotton wheel and with polishing material.

iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

EX-1 Introduction and Types of sheets, measuring of sheets

EX-2 Study and sketch of various types of stakes/anvil.

EX-3 Introduction & demonstration of tools used in Sheet metal working shop.

EX-4 Cutting, shearing and bending of sheet.

EX-5 To prepare a soap case by the metal sheet.

EX-6 To make a funnel with thin sheet and to solder the seam of the same.

EX-7 To make a cylinder and to solder the same.

EX-8 Preparation of different type of joints such as Lap joint-single seam, double seam. Hemp and wired joints.

EX-9 To braze small tube/conduit joints.

4. Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and tolerances.

EX-2 Introduction & demonstration of tools used in Fitting Shop.

EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.

EX-4 Making bolt & nut by tap and die set and make its joints

EX-5 To drill a hole in M.S. Plate and tapping the same to create threads as per need.

EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.

EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.

EX-8 Study of bib cock, cistern or stop cock, wheel valve and gate valve etc.

EX-9 Practice of bolted joints

EX-10 To prepare a rivetted joint

EX-11 To make a pipe joint

EX-12 To make a threaded joint

EX-13 Practice of sleeve joint

5. Foundry Work

Ex-1 Study of metal and non metals

Ex-2 Study & sketch of the foundry tools.

Ex-3 Study & sketch of cupola & pit furnace.

Ex-4 To prepare the green moulding sand and to prepare moulds (single piece and double piece pattern sweep mould)

Ex-5 Casting of non ferrous (lead or aluminium) as per exercise 3.

6. Smithy Shop :

EX-1 Study & Sketch of Tools used in smithy shop.

EX-2 To prepare square or rectangular piece by the M.S.rod.

EX-3 To make a ring with hook for wooden doors.

EX-4 Utility article-to prepare a ceiling fan hook.

7. Welding Shop :

EX-1 Introduction to welding, classification of welding, types of weld joints.

EX-2 Welding practice-gas and electric.

EX-3 Welding for lap joint after preparing the edge.

EX-4 Welding of Butt joint after preparation of the edge.

EX-5 'T' joint welding after preparation of edge.

EX-6 Spot welding, by spot welding machine.

8. Machine Shop

EX-1 Study & sketch of lathe machine.

EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines

Ex-2 Plain and step turning & knurling practice.

Ex-3 Study and sketch of planing/Shaping machine and to plane a Rectangle of cast iron.

DFE-21P FIELD EXPOSURE-1

The aim of this course is to train the students to learn working in industry situations under supervision of industry staff. The whole department faculty should be deputed for this purpose. Head of faculty should procure seats for giving summer training for students with the assistance of Director, Board of Apprenticeship Training.

A small project like study of material handling system, Plant layout study, Inventory control, Work study, Process control rejection and rework study, Inspection system and Quality control, etc. may be allotted.

DME-21P Applied Mechanics Lab

1. To verify the law of Polygon of forces.
2. To verify the law of parallelogram and triangle of forces.
3. To verify the law of principle of moments.
4. To find the coefficient of friction between wood, steel, copper and glass.
5. To find the reaction at supports of a simply supported beam carrying point loads only.
6. To find the forces in the jib & tie of a jib crane
7. To find the forces in the members of a loaded roof truss. (King / Queen post truss)
8. To find the mechanical advantage, velocity ratio and efficiency of any three of the following machines:
 - (i) Simple wheel & axle
 - (ii) Differential wheel & axle
 - (iii) Differential pulley block
 - (iv) Simple Screw jack
 - (v) Simple Worm & worm wheel
 - (vi) System of Pulleys (any type).
9. To find out center of gravity of regular lamina.
10. To find out center of gravity of irregular lamina

SECOND YEAR

[DAS-31] APPLIED MATHEMATICS III

1. MATRICES :

1.1 Algebra of Matrices, Inverse : Addition, Multiplication of matrices, Null matrix and a unit matrix, Square matrix, Symmetric, Skew symmetric, Hermitian, Skew hermitian, Orthogonal, Unitary, diagonal and Triangular matrix, Determinant of a matrix. Definition and Computation of inverse of a matrix.

1.2 Elementary Row/Column Transformation : Meaning and use in computing inverse and rank of a matrix.

1.3 Linear Dependence, Rank of a Matrix : Linear dependence/independence of vectors, Definition and computation of a rank of matrix. Computing rank through determinants, Elementary row transformation and through the concept of a set of independent vectors, Consistency of equations.

1.4 Eigen Pairs, Cayley-Hamilton Theorem : Definition and evaluation of eigen values and eigen vectors of a matrix of order two and three, Cayley-Hamilton theorem (without Proof) and its verification, Use in finding inverse and powers of a matrix.

2. DIFFERENTIAL CALCULUS :

2.1 Function of two variables, identification of surfaces in space, conicoids

2.2 Partial Differentiation : Directional derivative, Gradient, Use of gradient f , Partial derivatives, Chain rule, Higher order derivatives, Euler's theorem for homogeneous functions, Jacobians.

2.3 Vector Calculus : Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :

3.1 Formation, Order, Degree, Types, Solution : Formation of differential equations through physical, geometrical, mechanical and electrical considerations, Order, Degree of a differential equation, Linear, Nonlinear equation.

3.2 First Order Equations : Variable separable, equations reducible to separable forms, Homogeneous equations, equations reducible to homogeneous forms, Linear and Bernoulli form exact equation and their solutions.

3.3 Higher Order Linear Equation : Property of solution, Linear differential equation with constant coefficients (PI for $X = e^{ax}$, $\sin ax$, $\cos ax$, X^n , $e^{ax}V$, XV).

3.4 Simple Applications : LCR circuit, Motion under gravity, Newton's law of cooling, radioactive decay, Population growth, Force vibration of a mass point attached to spring with and without damping effect. Equivalence of electrical and mechanical system

4. INTEGRAL CALCULUS - II:

4.1 Beta and Gamma Functions : Definition, Use, Relation between the two, their use in evaluating integrals.

4.2 Fourier Series :Fourier series of $f(x)$, $-n < x < n$, Odd and even function,Half range series.

4.3 Laplace Transform :Definition, Basic theorem and properties, Unit step and Periodic functions, inverse laplace transform, Solution of ordinary differential equations.

5. PROBABILITY AND STATISTICS :

5.1 Probability :Introduction, Addition and Multiplication theorem and simple problem.

5.2 Distribution :Discrete and continuous distribution, Binomial Distribution, Poisson Distribution, Normal Distribution..

DME-31 MATERIALS & MATERIAL SCIENCE

GENERAL: Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technological properties and their selection criteria for use in industry.

2. STRUCTURE OF METALS AND THEIR DEFORMATION: Structure of metals and its relation to their physical, mechanical and technological properties. Elementary idea of arrangement of atoms in metals, molecular structures crystal structures and crystal imperfections. Deformation of metals, effects of cold and hot working operations over them. Recovery recrystallisation and grain growth, solid solutions, alloys and inter metallic compounds, allotropy of metals, effect of grain size on properties of metals. Corrosion its causes and prevention.

3. PROPERTIES AND USAGE OF METALS:

(1) (a) Ferrous Metals.

(b) Non Ferrous Metals.

(2) Nonmetallic Materials.

1. METALS:

(a) Ferrous Metals:

(i) Classification of iron and steel. Sources of iron ores and places of availability. Outline of manufacture of pig iron, wrought iron, cast iron and steel. (Flow diagram only)

(ii) Cast iron: Types as per I.S. - White, malleable, grey mottled, nodular and alloy, properties and common uses.

(iii) Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Name and places of steel plant in India. Availability of various section of steel in market, its forms and specifications.

(iv) Alloy Steel : Effect of alloying various elements, viz Cr, Ni, Co, V, W, Mo, Si and Mn on mechanical properties of steel, Common alloy steels, viz,

(a) Ni-Steel

(b) Ni-Cr-steel

(c) Tungsten Steel

(d) Cobalt steel

(e) Stainless steel

(f) Tool steel- High Carbon Steel, High Speed tool Steel, Satellite Metal, Tungsten Carbide Diamonds.

(g) Silicon manganese steel

(h) Spring steel

(i) Heat resisting alloy steels (Nimonic steels).

(j) Impact hardening steel

(B) Non-ferrous Materials:

(i) Important ores and their metal content, outline of manufacturing methods, trade names, properties (Phy/Mech./Elect.) and use of the following metals: Aluminium, Zinc, Copper, Tin, Silver, Lead.

(ii) Base metal with principle alloying elements (I.S.I. specification). Important properties and use of the following alloys:

(a) Aluminium Alloys: Aluminium-Copper alloy, Al, Zn alloy, Aluminium-Silica Alloy-Al-Ni-Alloy, Duraluminium-derived alloys (R.R. and Y-alloy).

- (b) Copper Alloys: Brass, Bronze, Gun metal, Phosphor Bronze, Aluminium Bronze, Ni Bronze.
- (c) Nickel Silver: Nickel-Copper Alloy (monel metal) Inconel, Nickel, Silver.
- (d) Bearing Metals: Lead base alloys, tin base alloys. (White metals or babbitt metals) Copper base alloys.
- (e) Solders: Solders - (Lead, Tin solder, Plumber solder, Tinman's solder or Tin solder) Silver solder, Brazing alloys (spelter), Inconel alloys.

2. NON-METALIC MATERIALS:

(a) Timber: Conversion of Timber: Its meaning necessity, Seasoning of timber, Preservation of Timber : Types of preservation, Methods of application, Defects in timber, surface treatment, Soaking treatment, Hot and Cold treatment; Common Indian timber species, uses, properties identification, units of purchase. Brief study of products of Timber, Plywood, Hard board, Batten Board, Veneer board.

(b) Plastic and Other Synthetic Materials: Plastics - Important sources - Natural and Synthetic, Classification, thermoset and thermoplastic, Various trade names, Important Properties and engineering use of plastics. Market forms - Pellets, Granules, Powder and Liquid forms; Uses of Styrofoam, Linoleum, Plastic coated paper, Fibres - Important sources. Inorganic fibres, Natural Organic Fibres and Synthetic organic fibre and their use.

(c) Paints, Enamels, Varnishes and Lacquers: Paints and Enamels - types, its purpose, essential ingredients and their role, characteristics of a good paint and enamel, Selection of different types of paints, varnishes from manufacturer catalogue.

(d) Heat Insulating Materials: Classification of heat insulating material, properties and uses of China clay, Cork, Slag wool, Glass wool, Thermocole, PUF, Properties and uses of asbestos as filler material.

(e) Electrical Insulating Materials: Classification of electrical insulating materials, properties and use of China clay, Leather, Prespan paper, empire cloth masonite, Bakelite, Ebonite, Fibre, Mica, Wood Wool, Glass wool, Rubber, Felt, Insulating oil and Varnish and Enamel paint. Electrical resistance and fuse materials.

(f) Hardware: General specification, uses and methods of storage of G.I. and C.I. steel, Copper, A.C. pressure conduits, R.C.C. spun, P.V.C. pipes and their uses. General sheets specification (I.S.) and uses. Method of storage of G.I. sheets, M.S. sheets, General specification of pipe fittings viz. Elbow, Tee, Bend, Crosses and Sockets. General specification and use of wire nails, wood screws and door hinges, toggle bolts, sliding bolts.

4. IDENTIFICATION AND TESTING OF METAL ALLOYS: Selection, specification forms and availability of materials. Testing of materials (Destructive and nondestructive), Identification of metal by giving mini project.

5. HEAT TREATMENT OF METALS: Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. or 'S' curve in steels and its significance, micro structure of steels and martensitic transformation (elementary idea). Hardening, Tempering, Annealing, Normalising and case hardening. Ageing, Various temperature ranges for different metals and alloy (From heat treatment handbook)

6. MISCELLANEOUS MATERIALS:

Important properties, characteristics and use of the following materials.

(a) Abrasives - Natural and Manufactured, sand stone, emery and corundum, diamond, garnet, silicon carbide, Boron carbide, aluminum oxide, any other abrasives qualities of good abrasive.

(b) Celluloid or Xylomite

(c) Felt

(d) Magnetic Materials

(e) Mica

(f) Refractory Materials - Fire clay, Dolomite, Magnesite, Porcelain, Fire bricks and their uses

(g) Jointing Materials - Glues and Adhesives, Cements Pyroxyline cement, Rubber cement, Magnestic cement.

(h) Composite Materials : Introduction to polymers of metal matrix composite, Carbon fibre, Glass fibre

(i) Germanium alloys (metal glasses)

(j) Source of procurement of various Ferrous and nonferrous and composite materials

DME-32 THERMAL ENGINEERING

FUNDAMENTAL OF THERMODYNAMICS :

Definition, concept of thermodynamic system and surroundings. Closed system, open system, isolated system, thermodynamics definition of work. Zeroth law of thermodynamics. First law of thermodynamics for cyclic and noncyclic processes. Idea of internal energy and enthalpy. Thermodynamic processes - constant volume, constant pressure, constant temperature (Isothermal) processes, adiabatic process polytropic process, their representation on P-

V diagram and calculation of work done. Application of the first law of these process. Simple numerical problems. Second law of thermodynamic concept of perpetual motion machine of first order and that of second order. Concept of heat engine, heat pump and refrigerator. Carnot cycle efficiency for heat engine and cop for refrigerator and heat pump.

ENTROPY - its physical concept and significance, reversibility and efficiency, Irreversibility and entropy. Expression for change of entropy in various thermodynamic processes. Simple numerical problems concerning the above.

2. PROPERTIES OF STEAM : Idea of steam generation beginning from heating of water at 0°C to its complete formation into saturated steam. Pressure temperature curve for steam. Idea of dry saturated steam, wet steam and its dryness fraction, super heated steam and its degree of super heat. Enthalpy, entropy, specific volume and saturation pressure and temperature of steam. Use of steam table and mollier chart. Simple numerical problems.

3. STEAM GENERATORS: Types of steam generators - Low pressure and High pressure boilers, Modern high pressure high discharge boiler - Stirling boiler, Lamont, Loeffler, Benson, Velox, Ramsbottom and Schmidt-Hartmann boiler, Computer controlled accessories, Equivalent evaporation, Boiler performance efficiency.

4. A STEAM TURBINE : Classification, details of turbine, working principle of impulse and reaction turbine, compounding methods of steam turbine, efficiency bleeding, concept of steam nozzles, governing of turbine.

B. STEAM CONDENSER :

Principle of operation, classification, A brief concept of condenser details.

5. GAS TURBINE : Elements of gas turbine, working principle, fuel and fuel system, open and close cycle, methods of testing, operating characteristics, Atkinson cycle, Brayton cycle, Heat exchanger, Inter cooler, Reheater, Applications, Performance. Brief concept of heat exchanger.

6. AIR COMPRESSOR : Definition and their use, Difference between reciprocating and rotary compressor, their types and working work done during compression in single stage and two stage, Heat rejected and inter cooling in two stage compression, volumetric efficiency, compressor lubrication.

7. THERMAL POWER PLANT : Main parts and working of plant, Thermodynamics cycle, Fuel handling, Combustion and combustion equipments, Problem of ash disposal, Circulating of water schemes and supply of make up water, Selection of economiser, Super heater, Preheater, Feed water heater and dust collector, Steam power plant, Heat balance and efficiency.

8. NUCLEAR POWER PLANT : Elements of nuclear power plant, Types of nuclear reactor, Fuel moderators, Coolants, Controls, Disposal of nuclear wastes, Classification of nuclear power plant, Cost of nuclear power, Nuclear fuels.

9. INTEGRAL COMBUSTION PLANT : Engine classification, Engine cycle, C.I. engine combustion, S.I. engine combustion, Engine structure, Fuel admission system, Air intake system, Engine cooling system, Lubrication system, Engine starting system, I.C. engine in steam plant - Features and working.

10. REFRIGERATION & AIR CONDITIONING SYSTEM : Different types of refrigeration principles and refrigerants. Working of domestic refrigerator. Working of Window/Split type AC system.

DME-33 MANUFACTURING PROCESS

1. (A)-GENERAL FORMING PROCESSES: Classification and elementary idea of metal forming processes on the basis of the properties of deformability (Plasticity), fusibility and divisibility Viz Rolling, Forging, Drawing, Extruding, Spinning, Pressing, Punching, Blanking.

(B)-WELDING:

(I) Welded preparation, Introduction to various welding processes with procedure equipments and applications such as (i) Electric arc welding.

(ii) Resistance welding - Spot welding, Flash butt, Percussion welding.

(iii) Thermit welding.

(iv) Carbon arc welding

- (v) Metal-Inert-Gas welding (MIG).
- (vi) Tungsten arc welding (TIG).
- (vii) Atomic Hydrogen arc welding.
- (viii) Stud welding.
- (ix) Laser Beam, Electromagnetic Beam Welding, Explosive Welding, Ultrasonic Welding.
- (x) Under water welding
- (xi) Submerged Arc welding
- (II) WELDING: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes. Selection of electrode from catalogue, current and voltage setting from welder's hand book.
- (III) WELDING OF SPECIAL MATERIALS:
 - (i) Welding of plastics, equipment, filler, rods, weldability, procedures and precautions.
 - (ii) Welding of Grey Cast Iron, shielded metal arc gas welding procedures.
 - (iii) Welding of Aluminium, Argon arc and gas welding procedures.
 - (iv) Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG, Oxyacetylene method.
 - (v) Welding of Alloy steels welding, Stainless steel, welding by oxyacetylene process, MIG, TIG. Specification of electrode as per latest I.S. code.

(IV) TESTING OF WELDS & RELEVANT WELDING CODES:

- (a) Destructive methods.
- (b) Non destructive methods-visual, X-ray, Gamma-ray, Magnetic particles, flaw detection, fluorescent, dye penetrant and ultrasonic testing.
- (V) COST ESTIMATION OF WELDING : Material cost, Fabrication cost, Preparation cost, Welding cost and Finishing cost, Over head cost, Cumulative effect of poor practices on cost, Calculation of cost of welding gas consumption and welding electrodes.

2. FOUNDRY PRACTICE:

(A) PATTERN AND MOULDING: The pattern materials used, Types of patterns, Allowances and pattern layout, Colour scheme pattern defects, Types of cores and their utility. Moulding Processes: Classification of mould materials according to characteristics, Types of sands and their important test, parting powders and liquids. Sand mixing and preparation, Moulding defects.

(B) MELTING AND POURING:

Fuels and metallic materials used in foundry. Melting furnaces used in foundry such as pit furnace, Tilting and cupola furnaces, metals and alloys. Additions to molten metal, Closing and pouring of the moulds. Coring-up, venting and closing, use of ladles, spruing and risers, Defects due to closing and spruing. Basic idea of fettling operations. Surface treatment, Salvaging of castings, Factors determining soundness of casting. Handling of molten metal from furnace to mould.

(C) SPECIAL CASTING: Elementary idea of special casting processes-Shell mould casting, die casting, investment mould casting, centrifugal and continuous casting full mould casting. Elementary idea of mechanisation of foundries.

(D) ESTIMATING AND COSTING : Calculation of material cost for casting and Forging.

3. POWDER METALLURGY:

Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing. Self lubricated bearings. Advantages of the process and its limitations. (Elementary concept only).

4. MODERN MACHINING PROCESS: Ultrasonic Machining (USM), Electro Chemical Machining (ECM), Electro Chemical Grinding (ECG), Electrical Discharging Machining (EDM), Laser Beam Machining (LBM), Electro Beam Machining (EBM), Plasma Arc Machining (PAM)

[DCS-31P] COMPUTER APPLICATION FOR ENGINEERING LAB

1. Introduction to Computer: Block Diagram of Computer, Types Of Computer Central Processing unit (Control unit, A.L.U.) & memory Unit. Types of Input and Output devices and memories. Visual Display Unit, Keyboard, Floppy disk drive, Hard disk drive, CD-ROM Drive, Magnetic & Tape Drive. Number system (Conversion) Binary, Octal, Hexa decimal number system, Conversion from Decimal to Other System and vice-versa Bit, Byte and Word.
2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:) What is operating system, its significance, Commands of DOS, Features/Application of window.
3. MS WORD: File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup. Edit : Cut, Copy, Paste, Office Clipboard, Select All, Find, replace, Goto, etc. View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc. Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc. Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc. Tools : Spelling & Grammar, Language, Word Count, Letters & Mailing, Options, Customize, etc. Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc.
4. MS EXCEL: Introduction, Use of Tools/Icons for preparing simple applications.
5. MS POWER POINT : Introduction, Use of Tools/Icons for preparing simple presentation on Power Point.
6. MS ACCESS : Introduction, Use of Tools/Icons for preparing simple applications.
7. Introduction to Internet: What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.
8. Concept of Programming : Flowcharting, Algorithm techniques, etc.

List Of Practicals

1. Practice on utility commands in DOS.
2. Composing, Correcting, Formatting and Article (Letter/Essay/Report) on MS Word and taking its print out.
3. Creating, editing, modifying tables in MS ACCESS.
4. Creating labels, report, generation of simple forms in MS-ACCESS.
5. Creating simple spread sheet, using in built functions in MS-EXCELL.
6. Creating simple presentation on Power Point.
7. Creating mail ID, Checking mail box, sending/replying emails.
8. Surfing web sites, using search engines.

[DME-32P] THERMAL ENGINEERING LAB

1. Determination of temperature by
 - i. Thermo couple
 - ii. Pyrometer
2. Study of constructional details and specification of high pressure boiler and sketch (through field visit)
3. Demonstration of mounting and accessories on a boiler for study and sketch (field visit).
4. Performance testing of steam boiler.
5. Study of steam turbines through models and visits.
6. Determination of dryness fraction of wet steam sample.
7. Study and sketching of various hand tools, Lifting tacks, Gadgets used in plant.
8. Study of fuel supply and lubrication system in I.C. engine.
9. Study of battery ignition system of a multi-cylinder petrol engine stressing on ignition timing, setting firing order and contact breaker gap adjustment.
10. Determination of B.H.P. for diesel and petrol engine by dynamometer.
11. Morse test on multi-cylinder petrol engine
12. To prepare heat balance sheet for diesel/petrol engine.

13. Demonstration & study of air conditioning system and domestic refrigerating system

[DME-33P] MANUFACTURING PROCESSES LAB

I. FOUNDRY PRACTICE (WORKSHOP):

Minimum work in each section is indicated against that

1. PATTERN MAKING:

(a) Making Patterns (At least two).

(i) Solid one piece pattern.

(ii) Split two piece pattern.

(iii) Split three piece pattern.

(iv) Gated pattern.

(v) Four Piece pattern.

(vi) Sweep pattern.

(vii) Skeleton pattern.

(viii) Segmental pattern.

(b) MAKING CORE BOXES (At Least 2) For:

(i) Straight Core Box.

(ii) Bent Core Box.

(iii) Unbalanced Cores.

2. SAND PREPARATION AND TESTING:

(a) Sand Testing (At Least 2 Experiments).

(i) Grading (Grain Size).

(ii) Determination of Moisture content

(iii) Determination of Clay content.

(iv) Determination of Permeability for gases.

(b) Preparation of :

(i) Green Sand Composition.

(ii) Dry Sand Composition.

(iii) Loam Sand Composition.

(iv) Oil Sand For Cores.

3. MOULDING:

(a) Making at least 8 sand moulds of different forms with different types of pattern using.

(i) Floor Moulding.

(ii) Two Box Moulding.

(iii) Three Box (or more) Moulding.

(b) At least one of the following :

(i) Making and setting of cores of different types.

(ii) Making one shell mould apparatus.

4. MELTING AND POURING: (Each to be Demonstrated at least once in the session).

(a) Demonstration of Melting of cast iron in

(i) Pit Furnace.

(ii) Cupola.

(b) Demonstration of melting a Non-Ferrous metal in :

(i) Pit Furnace.

(ii) Tilting Furnace.

(c) Pouring of Metals in Moulds (Ferrous and Non-Ferrous).

5. CLEANING, INSPECTION AND NON DESTRUCTIVE TESTING:

(a) Shaking, cleaning and fettling of casting (At least 2 Casting).

(b) (i) Inspection of cast component (visual) and preparing inspection report (At least one report).

(ii) Establishing cause of Defects seen (At least one cause).

(iii) Dye penetration test for casting

(iv) Magnetic flow detection test/Ultra sound flaw detection test for castings.

6. CASE STUDY OF:

At least 2 sand casting products from sand preparation, pattern layout to final finished casting by shell moulding, centrifugal casting, investment casting and continuous casting.

7. ADVANCE WELDING SHOP :

(a) Study of various Gas cutting and welding equipment's :- Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., Various electrodes and filler metals and fluxes. Practice of welding and cutting of different metals by making suitable jobs by different methods:-

1. Arc Welding practice of mild steel (M.S.) and Spot welding on stainless steel jobs.
2. Tig Welding practice of Non-Ferrous metals, like Copper, Brass and Aluminium.
3. Practice of Gas cutting manually.
4. Practice of Gas cutting by cutting machine.
5. Practice of Arc cutting.
6. Study of Welding defects.
7. Inspection and Tests of welded joints.
8. Practice of Spot and Seam welding.
9. Practice of Welding pipe joints, Pipes and Pressure vessels.
10. Exercise on EDM Machine

DME-41 MECHANICS OF SOLIDS

The treatment of subject is limited to simple numerical problems. This subject previously known as "Strength of Materials" has been renamed as "Mechanics of Solids" .

1. STRESS STRAIN AND PROPERTIES OF MATERIALS:

Mechanical properties of materials Ductility, Tenacity, Brittleness, Toughness, Hardness, Factor of safety. Different types of loads and stresses, strain in a stepped bar. Determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only, stresses in compound bars and columns. Equivalent modulus of a compound bar, temperature stresses. Shrinkage of a tyre on a wheel. Temperature stress in compound bar, stress-strain curves for mild steel, Aluminum, cast iron & rubber.

2. COMPLEX STRESSES:

Stresses on an oblique plane in a body subjected to direct load, concept of compound stresses. Principal stress and Principle planes under direct and shear stresses. Graphical determination by Mohr's circle.

3. SHEAR FORCE AND BENDING MOMENT:

Shear force and bending moment for concentrated and uniformly distributed loads on simply supported beams, cantilever and overhanging beam. Shear force and bending moment diagrams. Relationship between shear force and bending moment. Point of contra flexure, calculations for finding the position of contra flexure. Condition for maximum bending moment.

4. THEORY OF SIMPLE BENDING:

Simple bending, examples of components subjected to bending such as beam, axle, carriage spring etc.. Assumptions made in the theory of simple bending in the derivation of bending formula. Section Modulus Definition of neutral surface and neutral axis and calculation of bending stresses at different layers from the neutral surface for beam of different sections, Pure bending, Concept of Moment of Inertia and case study

5. STRAIN ENERGY:

Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension. Proof resilience, modulus of resilience, suddenly applied load, Impact or shock load. Strain energy in a material subjected to uniaxial tension and uniform shear stress. General expression for total strain energy of simple beam subjected to simple bending.

6. TORSION:

Strength of solid and hollow circular shafts. Derivation of torsion equation. Polar modulus of section. Advantages of a hollow shafts over solid shaft. Comparison of weights of solid and hollow shafts for same strength. Horse power transmitted. Calculation of shaft diameter for a given horse power.

7. Slopes and Deflections of Beams:

Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum

slope and deflection for the following standard cases by double integration or moment area method.

- (1) Cantilever having point load at the free end. Cantilever having point load at any point of the span. Cantilever with uniformly distributed load over the entire span. Cantilever having U.D.L. over part of the span from free end. Cantilever having U.D.L. over a part of span from fixed end
- (2) Simply supported beam with point load at centre of the span. Simply supported beam with U.D. load over entire span. NOTE: All examples will be for constant moment of inertia without derivation of formula.

DCE-45 HYDRAULICS & HYDRAULIC MACHINES

1. INTRODUCTION:

Fluid, Fluid Mechanics, Hydraulics, Hydro-statics, Hydrodynamics, Ideal fluid.

2. HYDROSTATICS:

Properties of fluids, Pressure and depth relationship, Hydrostatic pressure, pascal's law, total pressure on flat surfaces, Centre of pressure on flat surfaces. (Simple Numerical Problems)

3. BUOYANCY :

Bouyancy, Condition of equilibrium of a floating body, Meta centre and Meta centric height. (Simple Numerical Problems)

4. FLUID FLOW:

Different types of flow, Reynold's number, Equation of continuity and its applications. (Simple Numerical Problems)

5. ENERGY AND MOMENTUM EQUATION:

Types of energies, Energy equation and its application. Bernoulli's theorem flow measurement instruments where energy equation is used e.g. Venturimeter, Orifice meter, Flow nozzle, pitot tube, Prandtl tube. (Simple Numerical Problems)

6. ORIFICES:

Flow through orifices, Co-efficient of contraction, Coefficient of velocity, Co-efficient of discharge, Large vertical orifices, Drowned orifice, time of emptying a rectangular and circular tanks with flat bottoms. (Simple Numerical Problems)

7. NOTCHES & WEIRS:

Different types of notches, Measurement of discharge over rectangular notch, V-notch, Francis and Bazin's formula for rectangular weirs. Submerged weirs, Broad crested weirs. (Simple Numerical Problems)

8. FLOW THROUGH PIPES:

Losses in pipe flow due to friction, sudden enlargement, contraction and bends, Elbow & Tee. (Simple Numerical Problems)

9. CHANNELS:

Characteristics of flow, Uniform flow through channels. Rectangular and Trapezoidal channels, Application of Chezy's, Manning and Kutter's formula. Most economical channel sections of rectangular and trapezoidal shapes. (Simple Numerical Problems)

10. HYDRAULIC MACHINES:

Impulse and reaction turbines, Principle of working of Pelton wheel, Francis and Kaplan turbines with simple line diagrams, their classification, construction, working, operational problems. Centrifugal and reciprocating pumps, Hydraulic press and Hydraulic Jack

DME-42 MECHANICAL ENGINEERING DRAWING

1. GENERAL CONCEPT OF MACHINE DRAWING

(a) Views and sections (Full and half), dimensioning Technique -Unidirection and aligned practice conventions as per latest code of practice for general engineering drawing.

(b) General concept of IS working drawing symbols for

- (i) Welding & Rivetting
- (ii) Serews & Screw threads
- (iii) Surface Finish Marks
- (iv) Limits, Fits & Tolerances

2. FAMILIARIZATION WITH AUTO CAD COMMOANDS:

- What is CAD, Different type of CAD software available,Advantages of using CAD, AUTOCAD graphical user interface.- Setting up drawing environment : Setting units, Drawing limits, Snap, Opening and Saving a drawing, Setting drafting properties, Different co-ordinate system used.
- Commands and their aliases, Different methods to start a command.
- Selecting object, removing object from selection set,Editing with grips, Editing object properties.
- Use of draw commands - Line, Arc, Circle, Polygon, Polygon,Polyline, rectangle, Ellipse, construction line, Spline.
- Use of modify commands - erase offset, Move, Copy, Mirror,Fillet, Chamfer, Array, Scale, Stretch, rotate, Explode,Lengthen.
- Creating 2D objects using Draw and Modify commands, Use of Hatch commands.
- Controlling the drawings display; Zoom, PAN, view ports,Aerial view.
- Drawing with precision : Adjusting snap and Grid alignment.
- Use of Tools Menu bar for calculating distance, angle, area,ID points, Mass using inquiry command, Quick select.
- Adding text to drawing, Creating dimension.
- Use of UCS, Alignment of UCS, Move UCS, Orthographic UCS.
- Creating 3 D objects using region, boundary, 3D Polyline,Extrude, revolve feature.- Use of solid 3D edit features, Shell, Imprint, Separate,Section, Boolean functions like Union, Subtract and Intersect, Extrude faces, Move faces, Delete face, Offset faces, Copy faces and colour faces commands.
- To show the section - Use of slice, Section commands.
- Rendering and imaging, Produce hard copies.

3. Sectioned View of

- (i)) Foundation bolts
- (ii) Pipe Joints - Flanged, Socket, Hydraulic joint and Union joint.

4. Assembly Drawing of

- (i) Knuckle joint- Part drawing, Solid Modeling, Assembly and Sectioning.
- (ii) Protective type flange coupling- Part drawing, Solid Modeling, Assembly and Sectioning.
- (iii) Bench vice - Part drawing, Solid Modeling, Assembly and Sectioning.

5. Assembly drawing from detail and vice versa.

- (i) Tail stock of Lathe machine
- (ii) Screw jack
- (iii) Drilling Jig

6. Spur gear profile drawing from given data

7. Free hand sketching of

- (i) Pipe fittings-Such as-Elbows-Reducers, T-Cross and Bibcock.
- (ii) I. C. engine piston, Simple bearing, Cottor and Knuckle joint, pulleys and flywheel-Sectioned views.
- (iii)Cutting tools of Lathe machine, shaper and common milling cutters.
- (iv) Gear puller and C-clamp
- (v) Sketching of ortho graphics views from isometric views be practiced.

NOTE :

All the sheets should be working drawing complete with tolerances, type of fits and surface finish symbols and material list according to I.S.I. code. 25% drawing sheet should be drawn in first angle projection and rest 75% drawing sheet should be in third angle projection.

ELECTRICAL TECHNOLOGY & ELECTRONICS

1. ELECTRIC INDUCTION:

Faraday's Laws of electromagnetic induction. Self and mutual induction. Statically and Dynamically induced e.m.f., Lenz's law. Fleming's left hand and right hand rule.

2. A. C. THEORY:

Production of alternating e.m.f. Definition of cycle, Frequency, Amplitude, Time period, Instantaneous, Average, R.M.S. maximum values of sinusoidal wave. Form factor, peak factor.

Representation of a sinusoidal quantity by a mathematical expression and phasors, phase and phase difference, Relationship of voltage and current for pure resistance, pure inductance and pure capacitive reactance, impedance. Solution and phasor diagrams of simple R.L.C. series

3. THREE PHASE CIRCUITS:

Production of Three phase voltage, advantages of three phase supply. Concept of star and delta connections. Relationship between phase and line values of currents and voltages, Power in three phase circuits, simple numerical problems.

4. MEASUREMENT & MEASURING INSTRUMENTS:

(i) Primary and secondary instruments-Indicating, Recording and Integrated instruments.

(ii) Working principle and construction of the following instruments. (a) Ammeter & Voltmeter (Moving coil & Moving Iron). Extension of their ranges.

(b) Dynamometer type wattmeter.

(c) Single Phase A. C. Energy Meter.

(iii) Measurement of power in a single phase and three phase circuits by wattmeter, Use of digital multimeter for measurement of voltage, Current and testing of devices.

5. ELECTRONICS:

Basic idea of semi conductors P & N type. Semi conductor diodes, Zener diodes and their applications in rectifiers. Transistors-PNP and NPN-their characteristics and uses as an amplifier (Brief description only). Principle characteristics and application of SCR. Devices like UJT, FET, DIAC, TRIAC (Brief introduction, Introduction to operational amplifier, Introduction to basic logic gates and microprocessors.

6. D. C. MACHINES:

D. C. Generator: Working principle, Constructional details, e.m.f. equation, Types of generators and their applications.

D. C. Motor:

Working principle, Back e.m.f., Types of D. C. motor and elementary idea of their characteristics. Torque equation, Methods of speed control (Description Only).

7. TRANSFORMERS:

Working principle and constructional details of a single phase and 3 phase transformers, e.m.f. equation, Losses and efficiency, Cooling of transformers, Elementary idea of auto transformers and welding transformers.

8. SYNCHRONOUS MACHINES:

(a) Alternators:

Working principle, Types of alternators, Constructional details, E.M.F. equation, Condition for parallel operation.

(b) Synchronous Motors:

Working principle, Constructional details, Vector diagram, Effect of excitation on armature current and power factor, Synchronous condenser.

9. INDUCTION MOTORS:

(a) Three Phase Induction Motors: Working principle and constructional details-Types of induction motors-Slipping and Squirrel cage. Slip in induction motors. Speed torque characteristic, Starting and speed control. Application of induction motors in industry. General faults and their remedies.

(b) Single Phase Induction Motors:

Working principle and constructional details and Hp application of single phase motors (Split phase, Capacitor start and Run Motor). A. C. series motors, General faults and their remedies.

10. ELECTRO HEATING:

Types of electro heating. Brief description of resistance ovens and induction furnace and core furnaces.

11. ELECTROPLATING:

Importance of electroplating, Principle of electroplating and equipment used. Processes used in electroplating, Anodising.

ELECTRICAL TECHNOLOGY & ELECTRONICS LAB

1. To change the speed and direction of rotation of d.c. shunt motor by
 - (a) Armature control method.
 - (b) Field control method.
2. To change the speed and direction of rotation of d.c. compound motor by
 - (a) Armature control method.
 - (b) Field control method.
3. To measure the terminal voltage with variation of load current of
 - (a) D.C. shunt generator.
 - (b) D.C. compound generator.
4. To perform load test on a single phase transformer and determine its efficiency.
5. To start and run a induction motor by
 - (a) Star Delta Starter.
 - (b) Auto Transformer Starter.
6. To measure slip of an induction motor by direct loading.
7. To start and change the direction of rotation of an induction motor.
8. To measure transformation ratio of a single phase transformer.
9. To measure power and P.F. in a single phase circuit by Ammeter, Voltmeter and Wattmeter.
10. To measure power and P.F. in a 3 phase/A.C. circuit by two wattmeter method.
11. To calibrate a single phase energy meter at different P.F.'s and different loads.
12. To locate the faults in an electrical machine by a megger.
13. To connect a fluorescent tube and note its starting and running current.
14. To draw characteristics of Silicon Controlled Rectifier (SCR).
15. Testing of electrical devices - Zener, Diode, Transistor, FET, UJT, SCR.
16. Use of operational amplifier as adder, subtractor, comparator, differentiator and integrators

DME-41P MECHANICS OF SOLID LAB

1. To find the shear force at a given section of simply supported beam for different loading.
2. To find the value of 'E' for a steel beam by method of deflection for different loads.
3. To determine the Max-Fibre stress in X-section of simply supported beam with concentrated loads and to find the neutral axis of the section.
4. To determine the ultimate tensile strength, its modulus of Elasticity, Stress at yield point, % Elongation and contraction in x-sectional area of a specimen by U.T.M. through necking phenomenon.
5. To determine the ultimate crushing strength of materials like steel and copper and compare their strength.
6. To determine Rock Well Hardness No. Brinell Hardness No. of a sample.

7. To estimate the Shock Resistance of different qualities of materials by Izod's test and charpy test.
8. To determine the bending moment at a given section of a simply supported beam for different loading.
9. To determine the various parameters of Helical coil spring
10. To determine the angle of twist for a given torque by Torsion apparatus and to plot a graph between torque and angle of twist.
11. Study of diamond polishing apparatus.
12. Study metallurgical microscope.
13. (a) To prepare specimens for microscope examination (For Polishing and etching).
- (b) To examine the microstructure of the above specimens under metallurgical microscope.
- (c) To know composition of alloy steel by speller steelscope
- (d) To know carbon in steel by carbon steel estimation apparatus
14. Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.
 - i. Brass.
 - ii. Bronze.
 - iii. Grey Cast Iron.
 - iv. Malleable Cast Iron.
 - v. Low Carbon Steel.
 - vi. High Carbon Steel.
 - vii. High Speed Steel.
 - viii. Bearing Steel.
15. To perform heat treatment process on materials of known carbon percentage -
 1. Annealing 2. Normalising 3. Case Hardening
16. Mini Project
 - i. Collect samples of heat insulating materials
 - ii. Collect samples of various steels and cast iron.
 - iii. Collect sample of Non-Ferrous alloys.
 - iv. Collect samples of Non-Metallic engineering materials

DCE-45P HYDRAULICS LAB

A. Demonstration of the following for study & sketch.

1. Piezometer tube, Mechanical flow meter, Manometers, Pressure gauge.
2. Hydraulic ram, press and jack.
3. Pelton wheel and Francis turbine or their model.
4. Centrifugal and Reciprocating pumps.

B. Performance Experiments :-

5. Measurement of discharge over notches and its verification.
6. To verify Bernoulli's theorem.
7. To determine coefficient of discharge of a Venturimeter.
9. To determine coefficient of contraction, coefficient of velocity and coefficient of discharge for a given orifice.
9. To determine the loss of head of water due to friction in a water pipe line.
10. To study performance
 - i. Pelton Wheel
 - ii. Francis Turbine.
11. To study the performance of a
 - i. Centrifugal Pump
 - ii. Reciprocating Pump.
 - iii. Gear Pump

12. To measure the velocity of water flow in a open channel by a current meter

THIRD YEAR

DIM-51 INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

1. PRINCIPLES OF MANAGEMENT :

Definition of management, Administration organisation, Functions management, Planning, Organizing, Co-ordination and control, Structure and function of industrial organisations, Leadership- Need for leadership, Factors to be considered for accomplishing effective leadership, Communication - Importance, Processes, Barriers to communication, Making communication, Effective, formal and informal communication, Motivation - Factors determining motivation, Positive and negative motivation, Methods for improving motivation, Incentives, Pay promotion and rewards, Controlling - Just in time, Total quality management, Quality circle, Zero defect concept. Concept of Stress Management.

2. HUMAN RESOURCE DEVELOPMENT :

Introduction, Staff development and career development, Training strategies and methods.

3. HUMAN AND INDUSTRIAL RELATIONS :

Human relations and performance in organisation, Understand self and others for effective behaviour, Industrial relations and disputes, Characteristics of group behaviour and Trade unionism, Mob psychology, Labour welfare, Workers participation in management.

4. PERSONNEL MANAGEMENT :

Responsibilities of human resource management - Policies and functions, Selection - Mode of selection - Procedure - training of workers, Job evaluation and Merit rating - Objectives and importance wage and salary administration - Classification of wage, Payment schemes, Components of wage, Wage fixation.

5. FINANCIAL MANAGEMENT :

Fixed and working capital - resource of capital, Shares, types preference and equity shares, Debenture types, Public deposits, Factory costing, Direct cost, Indirect cost, Factory overhead, Fixation of selling price of product, Depreciation- Causes, Methods.

6. MATERIAL MANAGEMENT :

Objective of a good stock control system - ABC analysis of inventory, Procurement and consumption cycle, Reorder level, Lead time, Economic order quantity, Purchasing procedure, Stock keeping, Bin card.

7. LABOUR, INDUSTRIAL AND TAX LAWS :

Importance and necessity of industrial legislation, Types of labour laws and dispute, Factory Act 1948, Payment of Wages Act 1947, Employee State Insurance Act 1948, Various types of taxes - Production Tax, Local Tax, Trade tax, Excise duty, Income Tax.

8. ENTREPRENEURSHIP DEVELOPMENT :

Concept of entrepreneurship, need of entrepreneurship in context of prevailing employment conditions of the country. Successful entrepreneurship and training for entrepreneurship development. Idea of project report preparation.

DME-51 THEORY OF MACHINES:

1. MECHANISMS AND MACHINES :

Definition, Kinematic pairs, types of mechanism, Special types of mechanism, Space mechanisms.

2. KINEMATIC ANALYSIS & SYNTHESIS :

Displacement, Velocity and Acceleration of plane mechanism, Graphical and analytical techniques, Synthesis of mechanisms - Crank Rockers, Four Bar Mechanisms, Slider Crank Mechanisms.

3. DYNAMICS OF MACHINES :

Static and dynamic force analysis, Graphical and analytical approaches, Engine mechanisms, Turning moment diagram,

Flywheel analysis, Gyroscopic action in machines.

4. GOVERNORS :

Types and classification, Principle of working of gravity controlled and spring controlled governors, Stability, Isochronism, Sensitivity and capacity.

5. UNBALANCE IN MACHINES, ENGINES AND BALANCING :

Origin of unbalanced forces and moments and effects of unbalance, Unbalance in rotating bodies and balancing of discs and rotors, Balancing machines, Field balancing of discs and rotors, Unbalance in reciprocating machines - engine, Compressor, Presses. Unbalance force and moment in a single cylinder engine and balancing, Multi cylinder engine balancing in Line engine, V and Radial engines, Lanchester balancing techniques.

6. CAMS AND CAM FOLLOWER MECHANISMS :

Purpose of using cam- Follower mechanisms, types of cams and cam follower mechanisms, Nomenclature synthesis of disc cam profiles for prescribed follower motion, determination of basic dimension, Graphical and analytical approaches for different types of followers, Dynamics of cam – follower systems - Jump and crossover stock.

7. GEARS AND GEAR DRIVES :

Power transmission by gears and fundamental law of gearing, Involute profile and conjugate action, Characteristics of involute tooth gear - Pinion to system, Under cutting and interference, Minimum number teeth, types of gears, Various gear drives - Spur, Helical, worm and Bevel gear, Gear train - Simple compound and epicyclic gear trains, Differential gears.

8. VIBRATION AND NOISE CONTROL:

Introduction to single DOF-2, DOF and Multi Degree Freedom System, Free and Forced response, Vibration of Continuous System : Strings, bars, beams and plates. Force Transmissibility, Design of Vibration Isolators and Absorber. Torsional Vibration, Basic of Acoustics, Solution of 1-D and 3-D wave equation, Sound Field Characterization, Principles of Noise Control, Sound Control Materials : Absorbers, Barriers and Damping, Materials, Silencers, Introduction to Active Noise and Vibration Control.

DME-52 MACHINE TOOL TECHNOLOGY & MAINTENANCE

1. BASIC FEATURES AND KINEMATICS:

Various types of machining operations and machine tools. Common features of all basic machine tools, work holding and tool holding devices, Drive systems, sources of power, Bed, body or frame. Mechanical drive system for providing reciprocating, oscillating and rotational movement. Systems of stepped and stepless, friction and positive drives. Principle of setting up, Lower and Intermediate speeds. Mechanical methods of providing automaticity in machine

tools.

2. CENTRE LATHE:

The centre lathe and its principle of working. Types of lathes, Lathe specification and size, Features of lathe bed. Head stock and tail stock. Feed mechanism and change-gears, carriage saddle, Cross slide, Compound rest, Tools post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe dogs, mandrils, Steady rest, Lathe attachments. Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling, Boring, reaming, Knurling, Parting off, Under cutting, Relieving. Types of lathe tools and their uses. Brief description of semi automatic and automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe.

3. SHAPING, PLANING & SLOTTING MACHINES:

Working principles of planer, shaper and slotter. Differences and similarities among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry. General and periodic maintenance of a shaper.

4. DRILLING & BORING MACHINES:

Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring, tapering.

5. MILLING MACHINES:

Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rack milling, cutting speed and speed for different tools in up and down milling. Simple compound and Differential indexing, milling of spur gears and racks. General and periodic maintenance of milling machine.

6. GRINDING MACHINES:

Common abrasive grinding wheel materials, Bonds, Grain or grits of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding. Types of grinding machines, precision finishing operations like honing.

7. BROACHING MACHINES:

Broaching- internal and external surface Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines. Comparisons of broaching with other processes.

8. JIGS AND FIXTURES:

Object of Jigs and Fixture. Difference between jigs and fixtures. Principle of location. Principle of clamping. Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs- Bushes (Fixed liner, Renewal slip). Template. Plate jigs. Channel jigs, Leaf jigs. Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures. Welding fixtures. devices.

9. COOLING PROCESS:

Coolants and cutting fluids difference between coolant and cutting fluid, Function and action of cutting fluids. Requirement of good cutting fluids, their selection for different materials and operations.

10. AUTOMATION OF MACHINING CENTRES :

Introduction to CNC Machine tools (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

6. PLANT MAINTENANCE

(A) Maintenance: maintenance definition, scope of maintenance, maintenance strategies, economics and performance measures, objective of maintenance, concepts of general approach to eliminate Losses, classification of maintenance- corrective, scheduled, preventive, predictive and productive maintenance. common techniques to monitor the conditions of systems- vibration based, radiographic, thermo graphic, ferro graphic, computer based diagnosis etc, forms of wear, wear on guide surfaces, breakdown and remedies of machine tools, repair cycle, installation and maintenance of machine tools, PERT in maintenance.

DME-53 DESIGN AND ESTIMATION

PART A:

1. INTRODUCTION TO DESIGN:

General design consideration in machine parts. Mechanical properties of materials of construction, steps in machine design. Factor of safety, Selection of materials.

2. MACHINE PARTS SUBJECTED TO DIRECT LOADS AND SHEAR LOADS:

Threaded connections, core and nominal diameter of screw, boiler-Stay. Design for number of studs or bolts and their diameter for cylinder covers due to external forces. Punching and shearing. Design of cotter and Knuckle joints.

3. RIVETED AND WELDED JOINTS:

Types of riveted joints, possible failure of riveted joints. Strength and efficiency of riveted joint. Unwins formula. Determination of safe load and pitch of rivets. Design of lap and butt joints. Common type of welded joints, definition of leg length, throat thickness and size of weld. Simple design for 'V' butt welded joint, Transverse fillet and parallel fillet welded joints.

4. MACHINE PARTS SUBJECTED TO BENDING MOMENT:

Design for the diameter of railway-Wagon axle, axle used in road-vehicles. Semi-elliptic Laminated spring-Proof load and proof stress stiffness. Expression for max. stress and deflection. determination of different dimensions number of Laminations, Central deflection in a Laminated spring.

5. MACHINE PARTS SUBJECTED TO TWISTING MOMENT:

Design of solid and hollow shafts. Close-coiled helical spring. Maximum shear stress induced for given axial load. Expression for axial deflection, spring index, solid length and stiffness. Calculation for number of coils, mean coil dia and dia of spring wire for axial gradual loads. Simple cases of composite springs. Design of keys and coupling bolts for a rigid flanged coupling.

6. MACHINE PARTS SUBJECTED TO COMBINED BENDING AND TWISTING MOMENT:

Theory of failures

(i) Maxm. Principal stress theory.

(ii) Maxm. shear stress theory concept of equivalent bending moment, equivalent torque, Design of over hung crank pin. Design of shaft dia for over hung pulley in a belt drive.

7. MACHINE PARTS SUBJECTED TO COMBINED DIRECT AND BENDING STRESS:

Eccentric load and eccentricity. Max. and minimum stress intensities. Reversal of stress. Design for safe load on small columns. Design of brackets and clamps for eccentric loading.

8. DESIGN OF GEAR:

Selection of material, Design analysing, Lewis equation, Stress concentration, Dynamic load, Surface compressive stress, Beam strength, Bending stress, check for plastic deformation, Design procedure for Spur gear and Helical gear.

PART-B:

1. ESTIMATION OF MATERIAL REQUIREMENT:

Estimation of weight of simple machine parts. Review of the area/volume of triangle, equilateral triangle, Hexagon, rectangle, Square rhomboid, parallelogram, Octagon, circle, Hollow circle, Sector of circle, Sector of Hollow circle circular, Semi circle, Cube prism, Square prism, general prism, Cylinders, Sphere, Hollow sphere segment of sphere, Zone of a sphere, Cones pyramids, Frustum of a pyramid, Frustum of a cone.

2. ESTIMATION OF TIME FOR DIFFERENT MACHINING OPERATIONS:

Turning, Facing, Chamfering, Knurling, Taper Turning, Threading, Drilling, Boring, Shaping and planing, Milling, Broaching, Simple problems pertaining to above.

DME-55 PRODUCTION TECHNOLOGY-I

1. INTRODUCTION:

Concept of manufacturing processes, classification and application.

2. METAL FORMING PROCESSES:

(a) FORGING: Hammer forging, drop-forging, dies for drop-forging, drop hammers, press forging, forging machines or up setters, forging tools, forging defects and remedies. Concept of losses in forging operation, estimation of stock required for hand forging considering scale and shear losses

(b) ROLLING:

Elementary theory of rolling, hot and cold rolling, types of rolling mills, rolling defects and remedies.

(c) PRESS FORMING:

Types of presses, working, selection of press dies, die-material. Press operation- Shearing, piercing trimming, shaving, notching guering or rubber forming, embossing, stamping, punching.

(d) Drawing, extrusion, pipe and tube drawing.

(e) Energy forming technique - Explosive forming, electromagnetic forming.

3. CONVENTIONAL METAL CUTTING PROCESSES:

(a) Gear manufacturing process- Gear hobbing, gear shaping gear shaving, gear generating, gear burnishing, forming 'V' generator, straight bevel gear manufacturing, spiral bevel gear manufacturing. (b) External threading process- Roll threads, thread milling, thread grinding, thread rolling, thread chasing, Die heads.

(c) Machining of cylindrical holes - Multiple spindle drill press, gang drill press, drilling deep holes and small diameter holes, boring, coordinate method of locating holes, Jig boring machine.

4. METAL FINISHING PROCESS:

Grinding Process, Diamond machining, Honing, Lapping, Super finishing, Polishing and buffing.

5. SURFACE TREATMENT & FINISHING:

Meaning of the terms surface treatment and its purpose. Elements of surface treatment cleaning protecting, Colouring, Altering surface properties. Surface Treatment Processes- Wire brushing. Belt sanding. Alkaline cleaning, Vapour degreasing. Pickling. Ultrasonic cleaning. Solvent cleaning. Painting application by dipping. Hand spraying. Automatic spraying. Electrostatic spray finishing. Electrocoating. Hot dip coating. Phosphate coating- Passivating and Bondersing. Buffing. Blackening, Anodising. Electro Nickel Plating. Nickel carbide plating. Sputtering.

DME-54 AUTOMOBILE ENGINE

1. GENERAL CONCEPT OF AUTOMOBILES:

Their classification name and make of some India made automobiles. Layout of chassis. Meaning of the terms : Front wheel drive, Rear wheel drive, Four wheel drive, Front and Rear wheeled vehicles. Basic requirements of an automobile. Study of specifications of different engines used in Indian vehicles.

2. CHOICE OF POWER UNIT FOR AN AUTOMOBILE:

Torque and power requirements of an automobile in various conditions. Torque characteristics of some power units such

as Gas turbine, Electric motor and I.C. engine; their suitability to automobile needs. Draw back of I.C. engine to meet these needs. Measures taken to make it suitable to these needs.

3. I.C. ENGINE:

Multicylinder engine, Construction and material of its Piston and Connecting rod Assembly; Crank shaft, Fly wheel and Bearings; Engine valve and Valve operating mechanism (Cam shaft, Valve timing gears, Tappet, Push rod, Rocker and Valve springs). Advantage of multicylinder engine for automobile use, Firing order, Arrangement of cylinders. Valve positions and design of combustion chamber cylinder head and gasket. Wankle rotary engine. Idea of super charging, its advantages phenomenon of knocking or detonation, its cause and effect on engine. Octane number and cetane number.

4. FUEL SUPPLY AND IGNITION SYSTEM:

(i) PETROL ENGINE:

Fuel supply circuit components (fuel tank to engine), their function. Exhaust pipe and silencer. Construction and working of mechanical and electrical fuel pumps, carburettor, its function. Simple carburettor, its limitations. Modified carburettor-Zenith, Carter, Solex and S.U. carburettors, their construction and working. Carburettor Controls-Throttle, Choke (Conventional, Automatic). Air/fuel ratio, its variation with speed. Magneto and Coil Ignition Systems-Working of coil ignition system for multicylinder engine and electronic ignition system, Ignition timing, Ignition advance and retard-Their need and factors on which they depend. Spark Plugs-their types as used in automobile engines. Location of spark plug.

(ii) DIESEL ENGINE:

Fuel supply circuit for Diesel engine, Primary and secondary fuel filter, their positioning in the circuit. Construction and working of fuel pump and fuel injection pump. Governor and injector, Solid and Air injection in Diesel engine. Distributor types of diesel injection pump. Turbulence in filters wet and dry types. Inlet and exhaust manifold arrangement. Exhaust pipe and silencer. Concept of fuel energy saving.

(iii) MULTI POINT FUEL SUPPLY FOR PETROL ENGINE :Construction, Fuel Supply system and working

(iv) Introduction to other fuels - CNG, Battery, etc.

5. COOLING SYSTEM:

Necessity for cooling the engine Air cooling, Shapes of cooling fins. Field of application for air cooling. Water Cooling- Thermosiphon system, Pump circulated water cooling system. Details of water cooling system-Water jackets, Hose, radiators and fans. Thermostat, Water pump and pressure type radiator cap, Anti freeze and anti corrosive additives. Engine cooling liquids other than water and their characteristics.

6. LUBRICATION SYSTEM OF AUTOMOBILE ENGINES:

Principle of lubrication on multicylinder petrol/diesel engine. Types of lubrication systems-Splash type, Pressure type and Combined. Types of lubrication pumps, pump drive, Relief valves, Oil pressure, Oil filters and their location in lubrication system, Crank case ventilation, Crank case dilution.

DME-53PMECHANICAL WORKSHOP (WORKSHOP PRACTICE)

ONLY FOR SPECIALIZATION IN PRODUCTION, REPAIR AND MAINTENANCE, REFRIGERATION AND AIR CONDITIONING AND COMPUTER AIDED DESIGN

NOTE: At least Four jobs against jobs at No. 1. Two jobs against jobs at No. 2A and 2 jobs against jobs at No 2B. Four jobs against at No. 3.

1. MAKING UTILITY JOBS ON LATHE INVOLVING:

(a) Step turning, Parallel Turning, Taper turning 2 jobs and Knurling

- (b) Drilling, Boring, Counter boring and Internal 2 jobs taper turning under cutting, Chamfering & Facing.
- (c) V. thread cutting (Internal and External) 2 jobs
- (d) Square thread Cutting (internal and external) 1 jobs
- (e) Multistart thread cutting 1 jobs
- (f) Eccentric Turning. 2 jobs
- (g) Study & Operate CNC trainer lathe & prepare 1 job a stud of given specification.
- (h) Study & operate Turret/Capstan lathe to 2 jobs prepare a plug gauge & finish it to given specification on cylindrical grinder.

Note:

Students be giving opportunity to try their hands for these exercises on capstan/turret & CNC trainer lathe also.

2A. MAKING UTILITY JOBS ON :

- (i) Planer - Planing of C.I Block 1 job & finish it on surface grinder to given specification.
- (ii) Shaper - 'V' Block of different size 1 job
- (iii) Slotter- Key Way Cutting 1 job
- (iv) Tool & Cutter Grinder
- (a) To Grind Lathe Tools (All Angles) 1 job
- (b) To Grind A Shaper/Planer Tools 1 job
- (c) To Grind A Drill Bit 1 job

B. GROUP WORK ON MILLING MACHINE INVOLVING DOWN AND CLIMB MILLING:

- (a) Slab Milling
- (b) Straddle Milling 2 job.
- (c) Gang Milling. 1 job.
- (d) Spur Gear Cutting 1 job.
- (e) Groove Cutting(Dovetail,Square,T-slot and 1 Job Radiious)

3. FITTING SHOP:

- (a) To make different types of keys 3 job.
- (b) To make template gauge 2 job.
- (c) To make limit gauge (Plate shape) 2 job.
- (d) Making male and female fitting jobs 3 job.

NOTE:

For examination student should be allowed to pickup a job from any of the three groups by lottery system and be examined orally for all the three groups

DME-52P AUTOMOBILE SHOP

ONLY FOR SPECILIZATION IN AUTOMOBILE ENGINEERING

1. Study and sketch of hand tools different gauges and their use.
2. Automobile engine cylinder boring practice.
3. Valve face grinding, tapping and reaming of valve guide.
4. Light vechile brake drum turning practice.

5. Nozzle cleaning, testing and adjustment.
6. Assemble and disassemble of petrol and diesel engine of an automobile vehicle.
7. Setting a regulator of cut out and testing of dynamo and rectify its minor repairs.
8. Phasing and calibration of diesel fuel injection pump.
9. Engine tuning of an automobile engine.
10. Checking and adjusting a clutch pedal play and brake pedal play, tightness of fan belt and brake shoe.
11. Checking and overhauling of car radiator.
12. Automobile engine cylinder honing practice.
13. Overhauling of hydraulic brake system.
14. Measuring spark plug gap, valve clearance and ring clearance, grinding and lapping operation for adjustment.
15. Care and servicing of following Air conditioning components for automobile vehicle
 - i. Autocontrol unit
 - ii. Temperature control unit
 - iii. Solenoid valve
 - iv. Expansion valve
 - v. Relays
16. Study & Sketch of wheel alignment and wheel balancing equipments and pollution control equipment with fuel analyzer.

DDM-61 Environmental Education and Disaster Management

1. INTRODUCTION :

- Basics of ecology, Ecosystem, Biodiversity Human activities and its effect on ecology and eco system, different development i.e. irrigation, urbanization, road development and other engineering activities and their effects on ecology and eco system, Mining and deforestation and their effects.
- Lowering of water level , Urbanization.
- Biodegradation and Biodegradability, composting, bio remediation, Microbes .Use of biopesticides and biofungicides.
- Global warning concerns, Ozone layer depletion, Green house effect, Acid rain,etc.

2. POLLUTION :

Sources of pollution, natural and man made, their effects on living environments and related legislation.

2.1 WATER POLLUTION :

- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal.
- Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION :

Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, CO, CO₂, NH₃, F, CL, causes and its effects on the environment.

- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

- A. Settling chambers
- B. Cyclones
- C. Scrubbers (Dry and Wet)
- D. Multi Clones
- E. Electro Static Precipitations
- F. Bag Filters.

- Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.

2.3 NOISE POLLUTION :

Sources of noise pollution, its effect and control.

2.4 RADIOACTIVE POLLUTION :

Sources and its effect on human, animal, plant and material, means to control and preventive measures.

2.5 SOLID WASTE MANAGEMENT :

Municipal solid waste, Biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

3. LEGISLATION :

Preliminary knowledge of the following Acts and rules made thereunder-

- The Water (Prevention and Control of Pollution) Act - 1974.
- The Air (Prevention and Control of Pollution) Act - 1981.
- The Environmental Protection (Prevention and Control of Pollution) Act -1986. Rules notified under EP Act - 1986 Viz.
- # The Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000
- # The Hazardous Wastes (Management and Handling) Amendment Rules, 2003.
- # Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003.
- # The Noise Pollution (Regulation and Control) (Amendment) Rules, 2002.
- # Municipal Solid Wastes (Management and Handling) Rules, 2000.
- # The Recycled Plastics Manufacture and Usage (Amendment) rules, 2003.

4. ENVIRONMENTAL IMPACT ASSESSMENT (EIA) :

- Basic concepts, objective and methodology of EIA.
- Objectives and requirement of Environmental Management System (ISO-14000) (An Introduction).

5. DISASTER MANAGEMENT :

Definition of disaster - Natural and Manmade, Type of disaster management, How disaster forms, Destructive power, Causes and Hazards, Case study of Tsunami Disaster, National policy- Its objective and main features, National Environment Policy, Need for central intervention, State Disaster Authority- Duties and powers, Case studies of various Disaster in the country, Meaning and benefit of vulnerability reduction, Factor promoting vulnerability reduction and mitigation, Emergency support function plan. Main feature and function of National Disaster Management Frame Work, Disaster mitigation and prevention, Legal Policy Frame Work, Early warning system, Human Resource Development and Function, Information dissemination and communication.

DME-61 INDUSTRIAL ENGINEERING AND SAFETY

1. INSPECTION :

Inspection, Need and its planning, objective. Types of inspection. Inspection standards. Duties of inspector in inspection. Inspection needs.

2. WORK STUDY:

Method Study-Process chart, Flow process chart, Flow diagram, Man and Machine chart, Gang process Chart. Work Measurement-Time study, Tools used in time study, Performance rating, Allowance and use of time standard, Time and Motion study. Principle of human motion economy, Micromotion study, Memomotion study, Therbligs, left hand and right hand chart.

3. PRODUCTION, PLANNING AND CONTROL:

Methods of production-Unit, Batch, mass. Sales forecasting and its use. Planning-Products, process parts, materials, Optimum Batch quantity for production and Inventory, Theory and Analysis of M/C capacity, Batch quantity, Loading and balancing-Scheduling M/C loading. Preplanning activities, Routing, Despatching, Follow up activities.

4. MATERIAL HANDLING AND MATERIAL HANDLING EQUIPMENT:

Factors in material handling problems, Cost reduction through improved material handling, Reduction in time of material handling, Material handling equipments -Lifting lowering devices, Transporting devices, Combination devices, Maintenance of material handling equipments.

5. PLANT LAYOUT:

General plant location factors, Influence of location on plant layout, selection of plant site, Product layout, Process layout. Advantages and disadvantage of process layout

6. STANDARD AND CODE:

National and International code, value of standardisation. Standardisation programme, Role of Standardisation department, standardisation techniques and problems.ISO-9000
- Concept and its evolution and implications

7. QUALITY CONTROL:

Concept of quality control, Quality assurance elements of quality control, Statistical quality control, Acceptance sampling, control chart for variable and attributes, Uses of X, R, "P" and "C" chart - O.C. curve, Concept of Total Quality Management

8. COST ESTIMATION :

Introduction and function of cost estimation, estimation procedure, elements of cost, depreciation - methods of calculating depreciation, overhead expenses, distribution of overhead expenses, calculation of cost for machining and metal forming process and break even analyzer.

9. VALUE ENGINEERING :

Concept of value engineering and technique.

10. ACCIDENTS AND SAFETY :

Classification of accidents, causes of accidents, Effects of accidents, Action to be taken in case different types of accidents, Safety - needs, consciousness, procedures, measures. General safety devices used on machines, Safe working condition and productivity.

DME-62 METROLOGY AND MEASURING INSTRUMENTS

1. INTRODUCTION:

Meaning and scope of metrology in field of engineering. standards and types of measurements (Line and Wave length, Primary, Secondary and Tertiary measurement concept only). Limits, Fits and Tolerances. Interchangeability, precision and accuracy, Sources of error.

2. PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:

(A) Principle of Mechanical Measuring Instruments: Lever method, vernier method, screw and screwnut method, compound gearing and helical spring methods.

(B) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarisation, Optical prisms, Lenses and Optical projection (Magnification)

(C) Principle of Electrical measuring instruments

(D) Principle of Hydraulic and Pneumatic Instruments.

3. TRANSDUCERS:

Definition, various types of transducers such as resistive, capacitive, inductive, electromagnetic, photo electric, piezo electric and their use in instrumentation.

4. COMPARATORS:

General principles of constructions, balancing and graduation of measuring instruments, characteristics of comparators, use of comparators, difference between comparators, limit gauges and measuring instruments. Classification of comparators, construction and working of dial indicator, Johansson "Mikrokator", read type mechanical comparator, mechanical-optical, Zeiss optotest, electro limit, electromechanical, electronics, pneumatic comparators, gauges, tool makers microscope.

5. SURFACE FINISH:

Geometrical characteristics of surface roughness- Waviness. Lay, flaws. Effect of surface quality on its functional properties. Factor affecting the surface finish. Drafting symbols for surface roughness. Evaluation of surface finish. RMS and CLA values. Methods of measuring surface roughness. Qualitative and quantitative methods. Comparison of surfaces produced by common production methods.

6 VARIOUS TYPES OF INSTRUMENTS USED FOR:

(i) (a) Physical Measurements such as - Length, Depth height, Thickness, Gaps, Curvature, Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement.

(b) Liquid Level & Viscosity - Liquid level measuring methods and devices Viscometer - Plate and Cone viscometer, Two float viscometer, Rheo viscometer.

(ii) Mechanical Quantities :

(a) Displacement, velocity, acceleration, speed, torque-Use of transducers and electronic counters, stroboscope, vibrating reeds and tachometers.

(b) Pressure and Vacuum - Idea of atmospheric pressure, Gauge pressure and vacuum - Use of instruments such as manometers and pressure gauge using elastic elements such as diaphragm, Capsule, Bellows, Bourdon tube and various transducers and thermocouple, vacuum gauges.

(c) Strain Gauge - Use of strain gauge and loadcells.

7. TEMPERATURE MEASUREMENT:

Various types of thermometers, thermocouples, pyrometers (Radiation and optical type both).

8. SPECIAL MEASURING DEVICES:

Computerised 3-D measuring machine (Working Only).

9. MEASUREMENT OF VIBRATIONS:

Use of seismic Accelerometer, Potentiometric type and L. V. D. T. type, Piezoelectric type accelerometer.

10. INSPECTION OF GEOMETRICAL ERRORS: Construction and working of auto collimator, checking of straightness, flatness, squareness and parallelism, circularity (By dial gauge and telerod).

DME-65 PRODUCTION TECHNOLOGY-II

1. PRODUCTION MACHINE TOOLS:

Machine tools used for quantity production. Semi automatic multitools centre lathe. Autolathes: Single spindle automatics. Sliding head types. Single spindle automatics. Multispindle automatics, Ultra high speed machining. External centreless grinding. Internal centerless grinding. Mechanical copying systems. Hydraulic servo copying systems for lathe. Electric copying systems, special purpose machines - Brake Drum Turning Lathe

2. PRODUCTION OF PLASTICS:

Polymers. Thermoplastics. Moulding of thermoplastic. Extrusion process. Sheet forming process. Machining of thermoplastics. Thermosetting Plastics. Moulding of Thermosetting plastics. Machining of thermosetting plastics. Other processing methods for plastics. Plastic component design. Mould design.

3. CUTTING TOOLS FOR MACHINING:

Elementary theory of metal cutting, Single point tools- Basic angles. Chip formation and their classification, basic mechanism of chip formation, geometry of chip formation, forces on chip. Effect of manipulating factors such as velocity, size of cut, effect of tool geometry, Specific power consumption. Tool material. Tool wear and Tool life. Taylor's tool life equation. Machining economics. Properties of tool materials. Tool materials. Tool steels. High speed steel. Cast cobalt alloys. Carbides or sintered carbide. Ceramics. UCON. Surface treatment of cutting tools- Its advantage. Tin coated high speed steel, diamonds, Cubic boron nitrides.

4. PRESS TOOLS:

Elements of Press tools, Factors affecting press tool design. Shearing. Bending. and Drawing operation. Combination. Progression and compound die. Rubber die forming.

5. MODERN CONCEPT OF QUALITY CONTROL :

Do it right first time, Just in time (JIT), Process Control, ZD production (Zero Defect Production).

6. INTRODUCTION TO COMPUTER INTEGRATED MANUFACTURING:

Fundamental of manufacturing, CAD-CAM meaning, Activities of a CAD/CAM system, Manufacturing components of CAD/CAM integration system approach in manufacturing, Introduction of Automation and Computer Integrated Manufacturing, Concept of CIM. Introduction to Rapid Prototyping (RP) definition, various RP technologies. Advantages of RP. Reverse Engineering - Definition, reverse engineering tools : CMM (Coordinate Measuring Machine), White light scanner, Laser scanners. Introduction to Robotics.

DME-66 PRODUCTION AUTOMATION

1. FUNDAMENTALS OF MANUFACTURING AND AUTOMATION:

Types of Industries- Manufacturing, Processing; Basic producers, Converter, Fabricators. Manufacturing-Functions- Processing- Basic processing, Secondary processing; Operations enhancing physical properties and finishing operations; Assembly, Material handling and Storage; Inspection and test and control, their meaning with automation point of view. Manufacturing Process Inputs- Raw materials, Equipments (Machine tools), Tooling and fixtures, Energy and Labour. Outputs- Finished product and Scrap/Waste. Plant Layout- Its meaning and concept of fixed position layout, Process layout, Product layout and Group technology layout. Organisation and Information Processing Business functions, Product design, Manufacturing planning and Manufacturing control. Production Concept- Such as- Manufacturing Lead Time (MLT), Production rate, Components of Operation Time, Production Capacity (PC), Utilisation and availability, Work in Process (WIP), Time in Plant (Tip), WIP Ratio, Tip ratio, their meaning and significance. Simple numerical problems. Automation Strategies and Their Effect- Specification of operation, Combined operations, Simultaneous operations, Integration operations, Increase flexibility, Improved material handling and storage, on-line inspection, process control and optimization, Plant operation control, Computer integrated manufacturing.

2. PRODUCTION ECONOMICS:

Methods evaluating investment alternatives, Constraints in manufacturing, Break Even Analysis, Unit Cost of Production, Cost of manufacturing lead time and work in process.

3. HIGH VOLUME PRODUCTION SYSTEMS:

Type of production, types of layout, economic justification of transfer machines, Detroit type automation meaning, concepts of different flow lines for automatic loading and transferring, buffer storage, automatic inspection, tools servicing, design and fabrication considerations, auto sizing, mechanical calipers for turning operation, pneumatic sizing of external cylindrical ground work, in process gauging of internal cylindrical ground work, pneumatic slide position measuring device, digital slide position measuring device, autosizing for centre less grinding, friction roller, optical measurement. Methods of work part transport, Transfer mechanism, Buffer storage, Automation for manufacturing operations, Design of fabrication considerations.

4. ASSEMBLY SYSTEM AND LINE BALANCING:

The assembly process, Assembly system, Manual assembly lines, Line balancing problems. Computerised line balancing methods. Other ways to improve the line balancing, flexible manual assembly line, Partial Automation.

5. AUTOMATED ASSEMBLY SYSTEMS:

Design for automated assembly, Types of automated assembly systems, Parts feeding devices, Part orienting devices, Feed tracks, Escapements and Part placing mechanism, Role of industrial robot in automatic assembly.

6. NUMERICAL CONTROL PRODUCTION SYSTEM:

Numerical machine Tool, Binary System, Coordinate system and Machine motions, Types of N.C. systems, Machine tool applications, Economics of NCS.

7. INTRODUCTION TO MECHATRONICS:

Introduction to Mechatronics, Mechatronic system, Measurement system, Control system- open loop, Close loop and sequential, Microprocessor based controllers, The mechatronics approach.

DME-63 AUTOMOBILE TECHNOLOGY

1. AUTO TRANSMISSION SYSTEM:

(a) CLUTCH: Function of clutch in an auto mobile, Construction detail of single plate and multi plate friction clutches, Centrifugal and semicentrifugal clutch. Construction and working of fluid flywheel.
(b) GEAR BOX: Its function, Assembly detail and working of sliding Mesh, constant mesh, Synchromesh and epicyclic gear boxes. Simple concept of over drive, overrunning clutch, transfer case and torque converter.
(c) PROPELLER SHAFT: Its function, Universal joint and slip joint, Hotchkiss drive and Torque tube drive.
(d) FINAL DRIVES: Concept of tail pinion, Crown wheel, Differential type rear axle.
(e) WHEELS AND TYRES: Sizes of tyres used in Indian vehicles, over inflation, under inflation and their effect. Causes of tyre wear, Tyre retreading, idea of Toe in, Toe out, Camber, Caster, King pin inclination. Advantages of tube less tyres over tyres with tubes. Wheel alignment and balancing, Tyre rotation, Difference between radial and cross ply.

2. STEERING SYSTEM:

Its function, Principle of steering. Ackerman and Davis steering gears, Steering gear types, Worm and nut, Worm and wheel, Worm and roller, Rack and pinion type. Concept of steering system commonly used in Indian Vehicles. Concept of steering locking assembly, introduction to power steering.

3. BRAKING SYSTEM:

Construction details and working of mechanical, Hydraulic and Vacuum brakes, disc brake, air brake, Introduction to power brake. Details of master cylinder, Wheel cylinders, Concept of brake drum and brake linings and brake adjustment.

4. SUSPENSION SYSTEM:

Function of suspension system. Types of suspension systems, Working of leaf springs, Coil springs. Shock absorbers, Torsion bar suspension and stabilisers. Macpherson system.

5. Storage Battery:

Storage Battery constructional detail of lead acid cell battery. Specific gravity preparation of electrolyte, effect of temperature, Charging and discharging on specific gravity of electrolyte. Capacity and efficiency of battery. Battery charging from D.C. mains, A.C. mains, Battery charger-Charging circuit, care and maintenance of batteries. Checking of cells for voltage and specific gravity of electrolyte.

6. DYNAMO AND ALTERNATOR:

Introduction to Dynamo and its details, Regulators- Voltage, current and compensated types. Cutout Construction

working and their adjustment. Alternators-Construction and working, charging of battery from alternator. Use of battery, dynamo/alternator in an automobile.

7. ENGINE STARTING:

Engine starting circuit, Drive motor and its characteristics, Conditions of starting and behaviour of motor at starting. Starter Drive-Bendix pinion, Torsion, compression, Clutch and sliding armature type. Starter Switch-Manual, over running, solenoid and vacuum switches. Turbo charging and inter-cooling.

8. AUTOMOBILE WIRING & LIGHTING SYSTEM:

Earth return and insulated return systems-6 volts, 12 volts and 24 volts systems, Positive and negative earthing, Fuse in circuit, Automobile cables-Specifications and colour code. Diagram of a typical wiring systems.

Principle of auto illumination, Lighting requirement-Head lamp mounting and construction, sealed beam lamp, Asymmetrical head lights, dip and full beam type bulb, auxiliary type lights. Polarised head light, Flesher unit, Warning lights and panel lights. Fore head lamp systems. Other lamps-Pass lamps, Fog lamp, reversing lamps. Switching of lamps. Parking brake, Direction indicators. Electric horns, Revolution counter, Speedometer, Fuel gauge, Pressure gauge, Temperature gauge, Wind screen wipers, stereo system and speaker, introduction to remote sensing devices. Microprocessor control of automobile.

9. Vehicle Airconditioning

Meaning of airconditioning and its applications, brief idea of various type heat loads in vehicles, concepts of room air conditioner, fundamental of comfort air conditioning and its conditions, brief idea of airconditioning cycle and its layout, fundamental and working of compressor magnet clutch, condenser, evaporator, expansion valve, thermo switch, three way solenoid valve, check valve, fan assembly and air conditioners relay, H.V.A.C.

10. STUDY OF SPECIFICATION FOR DIFFERENT UNITS :

Clutch, Gear Box, Propeller Shaft, Final Drive, Wheel and tyre manufactured in India

DME-64 AUTOMOBILE MAINTENANCE, SERVICING & REPAIR

1. ENGINE MAINTENANCE & REPAIRING : Maintenance, Maintenance schedule, Routine Maintenance schedule for petrol engine and diesel engine, lubricating chart, cleaning and adjustment, preventive maintenance, trouble shooting for faults in engines. Overhauling of engines, Adjusting the engine timing, Maintenance and adjustment of carburettor and fuel injection pump. Checking the valve clearance and adjustment, valve grinding and lapping, engine tuning, detection and rectification of faults using compression gauge and vacuum gauge, general methods of predelivery inspection of vehicle.

2. REPAIRING PROCESSES : Cylinder reboring and resleeving, Removal of liners and fitting, inspection; Repair and fitting of valve and valve guides, checking the connecting rod for bending and connecting rod alignment, inspection of crank shaft for ovality and regrinding, Phasing and calibration of fuel injection pump, nozzle testing, cleaning and grinding.

3. REPAIR AND MAINTENANCE OF RADIATOR AND LUBRICATING SYSTEM: Radiator repair and maintenance, Maintenance of lubricating system, Flushing the lubricating system, Change of used lubricating oils, clearing and fitting of oil filter lubrication of water pump, grades of oils, multi grade oil, additives for improving the quality of oil.

4. CHASSIS REPAIR AND MAINTENANCE : Grease and greasing points requiring greasing, specifications of greases to be used for different parts, repair of tyres and tubes, greasing of wheel bearing, rotating schedule for front and rear tyres, bleeding of brakes, pedal play adjustment in clutch and brakes, adjustment, change of brake lining, testing of brakes, disassembly greasing and recambering of leaf spring.

5. ELECTRICAL SYSTEM REPAIR AND MAINTENANCE :

Starter trouble, shooting and suggesting remedies, removal of starter from engine, repairing the starter, bushes and bushes replacement, checking of armature for short circuit, cleaning of commutators, checking, repairing of starter drive reassembly and testing of starter, dynamo, lubricating the dynamo, changing the bushes, checking and turning the electrical horn.

6. ACCESSORIES OF ELECTRICAL SYSTEM AND THEIR SERVICE :

Wind screen, wiper, electrical horn and relay, cigarette lighter, growler, spark plug cleaner and tester, electrical test bench.

7. TOOLS AND EQUIPMENTS :

Cylinder reboring machine, surface grinder, arbor press, valve seat cutter and grinder, valve refacer crank shaft grinder, engine tune up instruments, feeler gauge, Timing light (Neon light), Tachometer, Spark Plug cleaner micrometer, vernier callipers, cylinder gauge, dial gauge, hydraulic hoist specification and working, car washer specification and working, air compressor specification and utility, screw jack, bearing puller, fuel pump testing and calibration machine, nozzle testing machine, grease guns.

8. AUTOMOBILE POLLUTION & CONTROL :

Source and control of automobile air pollution, causes of automobile pollution and their remedies monitoring and analysis of autoexhaust emission, legislative action, judicial response. Introduction to energy conservation.

9. REPAIR AND MAINTENANCE OF VEHICLE AIR CONDITIONING SYSTEM :

Testing and Charging of Air Conditioner, care & maintenance- electrical components, noise level system, fresh air allowance, primary & secondary circuit, heat exchanger, cooling & dehumidifying coil. Care & servicing-Air control unit, temperature control unit, magnet clutch, condenser, fan assembly, Evaporator, relays, expansion valve, filters and three way solenoid valve. Checking of harness of air conditioning.

DME-62P METROLOGY LAB

1. Measurement of angle with the help of sine bar/vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Use of comparators for measurement
4. To measure the diameter of a hole with the help of precision balls.
5. Measurement of Taper by standard balls and rollers.
6. To test the squareness of a component with autocollimator.
7. To measure the pitch, angle and form of thread of a screw.
8. Measurement of gear elements by using gear tooth vernier.
9. To measure the straightness of the edge of a component with the help of autocollimator.
10. Use of linear measuring instrument such as vernier calliper and micrometer.
11. Use of height gauge and vernier callipers.
12. Calibration of vernier callipers/micrometers with slip gauge.
13. Calibration of height gauge/depth gauge with slip gauge.
14. Measurement of Thread Parameter by using tool maker's microscope.
15. Calibration of Sensors like LVDT
16. Torque Measurement using strain gauges.
17. Checking of accuracy of a plug gauge with micrometer.
18. Measurement of surface roughness of a surface.
19. Use of feeler, wire, radius and fillet gauges for checking of standard parameters.

DME-61P PROJECT

The project paper will be of two parts. Part-A will contain the problems to evaluate students learning. The Part-B will be regarding students awareness of the plans and programmes running for rural development, Ecological balance and environmental pollution control.

PART-A(For Spl. in Production Engineering Only): Four problems on design and drawing of simple machine/machine parts and preparing project report for loan to establish small scale industry to fabricate the item designed. A few examples of such items are given below. Bench Vice, Small centrifugal pump, Screw jack, Hand Shearing Machine, Hand blower, Main Switch outer casing (Cast Iron), Stepped Motor Pulley, Biogas Plant, Smoke Less Chulha, Hand Operated Grinder/Juicer, Agricultural Implements, Material Handling Equipments for small scale industry. Solar Cooker or any other simple items of general utility or industrial use.

PART-B:

The student Will survey a village and prepare a report giving details of population, Means of livelihood, Health and hygienic conditions, Education facilities and various programmes/projects running for the development and the personnels and agencies involved in the work. He will also make observation on environmental pollution and ecological disturbances and will make a mention of that in his report with its reason, suggesting remedies or ways to minimise it. Without it the project will not be taken as complete. The student will also do some constructive work for pollution control as advised by the guiding teacher. Student will choose any one of the problems from Part(A) and Part(B) is compulsory for all students. The students can be divided into groups of threes to do one problem. The students will be examined for 100 marks by an examiner appointed by J.S.U., U.P.

DFE-51P FIELD EXPOSURE- II

Industrial Training

After second exam. in the summer vacation students of mechanical Engg. will have a four week Industrial Training in units not less than small scale industries. It should preferably be arranged in manufacturing (producing machines, equipments or their parts), structural or processing organisations. They will work and focus their attention there on following points to incorporate them in their reports.

1. Name & Address of the unit
2. Date of
 - i. Joining.
 - ii. Leaving.
3. Nature of Industry
 - i. Product.
 - ii. Services.
 - iii. Working Hrs.
4. Sections of the unit visited and activities there in.

5. Details of machines/Tools & instruments used in working in the section of the unit visited.
6. Work procedure in the section visited.
7. Specifications of the product of the section and materials used.
8. Work of repair and maintenance cell.
9. Details of the shops (welding, Foundry, Machines shop etc) related to repair and maintenance work.
10. Name of checking and Inspecting Instruments and their details. Quality controls measures taken.
11. Details of hadraulics/pneumatic/ thermal units or appliances used if any.
12. Discription of any breakdown and its restoring.
13. Use of computer - if any.
14. Visit of units store, Manner of keeping store items, Their receiving & distribution.
15. Safety measures on work place & working conditions in general - comfortable, convenient & hygeini

DME-64P PRODUCTION TECHNOLOGY LAB

1. Inspection of casting
 - (a) Flange of pipe
 - (b) Pulley
 - (c) Gear blank
 - (d) Bush
2. Turning, boring, internal threading of cost iron flange.
3. Marking and drilling holes in cost iron flange 75 mm. size pipe.
4. Boring hole in cast iron pully and cutting key way slot.
5. Turning bottom shaft of cycle and milling cotter slot.
6. Turning hub axle of cycles.
7. Turning and internal threading of cone of cycle.
8. Turning bearing races and cups of cycle.
9. Turning plug gauge.
10. Case hardening of
 - (a) Plug gauge
 - (b) Bottom saft of cycle
 - (c) Gear
11. Gear milling, internal hole boring, key way slot cutting for auto (scooter/jeep/truck/gear box).
12. Milling of snap gauge plate.
13. Inspection practices
 - (a) Flange after each operation.
 - (b) Pully after each operation.
 - (c) Gear after each operation.
 - (d) Gauges after each operation.
 - (e) Cycle parts after each operation.
14. Hardness testing.
15. Cr, Plating.
16. Packing practices.
17. Few examples as case study such as schedule for complete overhaul of centre lathe,reciprocal or centrifugal pumps and compressor etc giving work distribution,planning repair estimate.
18. Heat treatment of small tools, coining tools and forging dies.

DME-63P AUTOMOBILE ENGINEERING LAB

1. Study and sketch of
 - i. Battery Ignition System
 - ii. Magnetic Ignition System
2. Study and sketch of
 - i. Head Light Model
 - ii. Wiper and Indicator
3. Study and Sketch of
 - i. Radiator
 - ii. Water Pump
 - iii. Oil Pump
 - iv. Shock Absorber
4. Study and sketch of
 - i. A. C. Pump
 - ii. S. V. Pump
 - iii. Master Cylinder
5. Study and sketch of
 - i. Rear axle
 - ii. Differential
 - iii. Steering System
 - iv. Bendix Drive
6. Checking and setting of ignition on timing using timing light for advance and retard
7. Fault finding practice of an automobile vehicle for wheelers (Petrol and Diesel vehicle)
8. Driving practice of four wheeler
9. Charging of Automobile battery and measuring cell voltage and specific gravity of electrolyte.
10. Determination of gear ratio of an auto engine tachometer/stroboscope
11. Cleaning and adjustment of a carburettor
12. Changing of wheels and checking the alignment of wheels.

AUTOMOBILE SHOP

1. Study and sketch of hand tools different gauges and their use.
2. Automobile engine cylinder boring practice.
3. Valve face grinding, tapping and reaming of valve guide.
4. Light vehicle brake drum turning practice.
5. Nozzle cleaning, testing and adjustment.
6. Assemble and disassemble of petrol and diesel engine of an automobile vehicle.
7. Setting a regulator of cut out and testing of dynamo and rectify its minor repairs.
8. Phasing and calibration of diesel fuel injection pump.
9. Engine tuning of an automobile engine.
10. Checking and adjusting a clutch pedal play and brake pedal play, tightness of fan belt and brake shoe.
11. Checking and overhauling of car radiator.
12. Automobile engine cylinder honing practice.
13. Overhauling of hydraulic brake system.
14. Measuring spark plug gap, valve clearance and ring clearance, grinding and lapping operation for adjustment.
15. Care and servicing of following Air conditioning components for automobile vehicle
 - i. Autocontrol unit
 - ii. Temperature control unit
 - iii. Solenoid valve
 - iv. Expansion valve

