

Diploma 1 Year (Common for all Branches of Engineering)
Automobile

Sr. No.	Code	Subjects
1	101	English & Communication Skills
2	102	Applied Physics
3	103	Applied Chemistry
4	104	Applied Mathematics
5	105	Computer & Information Technology Fundamental
6	106	Applied Mechanics
7	107	Engineering Drawing
8	108	Workshop Practice
9	109	Electrical & Electronics

(Diploma Detailed Syllabus for 1st Year)

Code 101 English and Communication Skills

1. Transformation of sentences, Determiners, Preposition.
2. Tense, Common errors (Noun, Pronoun, Articles, Adverb, Punctuation, etc.)
3. Modals, in conversational usage, prefix suffix idioms & phrasal Verbs.
4. Composition- 1. Unseen Passage, prefix suffix idioms & phrasal Verbs.
5. Letter Writing, Paragraph Writing, Report Writing.
6. Essay Writing

Code 102 Applied Physics

Units and dimensions, elasticity, Properties of Liquids, Gravitation and Satellites
Sound Waves, Transfer of Heat, Electrostatics, D.C. Circuits, A.C. Circuits Semi
conductor Physics, /modern Physics, Modern Physics, Nuclear Physics, Pollution
and its control.

Code 103 Applied Chemistry

Atomic Structure, Development of periodic Table, Electro Chemistry,
Kinetic theory of Gases, Carbon Chemistry, Metals and Alloys, Pollution,
Water, Fuels, Corrosion, Polymers. Cement and Glass, Lubricants, Miscellaneous
materials, New Engineering Materials.

Code 104 Applied Mathematics

Introduction of different type of expansion, complex Number, Trigonometry
Matrices and determinants, Numerical integration, Two Dimensional Coordinate
geometry Conic, Function, Different Calculus, Application of different calculus,
Integral Calculus.
Differential Equations, Vector algebra.

Code 105 Computer and Information Technology Fundamentals

Introduction to computer, Operating System, Introduction to windows xp
Information concept and processing, Computer and Communication Internet ,
Information Processing, Power Point.

Code 106 Engineering Mechanics

Force, Coplanar Forces, Moment, Application of principal of Force %
Movements
Center of Gravity, Friction, Simple Machines, Rectilinear Motion, Motion Under
Gravity Projectiles, Newton's laws of Motion, Impact and Collision, Circular
Motion, Work power and Energy.

Code 107 Engineering Drawing

Introduction of Drawing Instruments, Lines Lettering and Dimensioning,
Geometrical Construction and Engineering Curves, Scales, Theory of
Orthographic Projection of solids, Conversion of Practical View into orthographic
views, Section of solids and Development of Surfaces,
Isometric Projection, Section and Conventions, Rivets and Riveted Joints Screw
Threads and Fasteners, Foundation Bolt and locking Devices, Keys and Pulleys
Shaft Coupling, Veering Building Drawing.

Code 108 Workshop Practices

Carpentry Shop, Welding and Sheet Metal Shop, Sheet Metal Shop, Fitting and
Plumbing Shop.

Code 109 Electrical & Electronics Workshop

1. Identification of following resistors and finding their value
2. Identification of following capacitor and finding their value
3. Identification of following Switches and study of their working
Mechanism
4. Identification and testing of connectors
5. Study of different relays and their contacts
6. Measuring of voltage, current and resistance using analog & Digital
Millimeter
7. Testing of electronic component such as capacitor, inductor diode and
transistor.
8. Measurement of amplitude e& frequency of a signal using CRO.
9. Verification of Ohm's Law using resistive circuit and analog meter.
10. Soldering of different passive component combination on general purpose
PCB.
11. Sketching of different electronic components symbol on drawing sheet..

Electrical Workshop

1. Study of symbol, specification and approximate cost of common electrical accessories, tools and wires & cables required for domestic installation.
2. Study of
 - a) Basic electricity rules for a domestic consumer
 - b) Safety precaution & use of Fire fighting equipments.
3. Use of series of phase tester, series test lamp tong test and megger in testing of electrical installation.
4. a) Prepare of potential divider and measure resistance of a filament lamp using voltmeter and meter.
b) Measurement of power and energy consumption by and electric heater using wattmeter and energy meter.
5. Preparation of wiring diagram, wiring testing, fault finding & costing for
 - a) Control of one lamp by one switch (using batten and tumbler switch)
 - b) Control the staircase wiring (using batten and tumbler switch)
 - c) Control of one bell buzzer indicator by one switch (using conduit and flush type switch)
6. Prepare one Switchboard as per institutional requirement (using flush type switches. Sockets, MCB, ELCB, etc.)
7. Study Connecting testing and fault finding of
 - a) Fluorescent tube and its accessories
 - b) Ceiling fan with resistance type and electronic regulator
8. Study Connecting testing and fault finding of
 - a) Automatic electric Iron.
 - b) Air Cooler
 - c) Electric water pump
9. Design Draw and estimate the material required for installation for A small residential Building/ Office/ hall

Mechanical (Automobile) Engineering					
Sr. No.	Paper Code	Name of Paper	Weekly Teaching Load		
			Lec.	Tut.	Pra.
		Semester - III			
17	MA31	STRENGTH OF MATERIALS – I	2	1	2
18	MA32	FLUID MECHANICS – I	2	1	2
19	MA33	MANUFACTURING PROCESS–I	4	0	2
20	MA34	THERMAL ENGINEERING –I	3	0	2

21	MA35	MATERIALS AND MATERIAL SCIENCE	2	0	2
22	MA36	AUTO CHASSIS AND BODY	3	0	2
23	MA37	MACHINE DRAWING	0	0	6
		Semester - IV			
24	MA41	STRENGTH OF MATERIALS – II	2	1	2
25	MA42	FLUID MACHINES	2	1	2
26	MA43	AUTO ENGINE–COMPONENTS & PERFORMANCE	2	2	0
27	MA44	AUTO ENGINE	3	0	2
28	MA45	WORKSHOP TECHNOLOGY–I	2	0	6
29	MA46	METROLOGY	2	0	2
30	MA47	THEORY OF MACHINES	3	2	0
		Semester - V			
31	MA51	INDUSTRIAL ENGG. AND TRANSPORT MANAGEMENT	3	1	0
32	MA52	AUTO SHOP PRACTICE	0	0	6
33	MA53	AUTO ELECTRIC EQUIPMENTS	3	0	2
34	MA54	AUTO DESIGN –I	2	2	0
35	MA55	WORKSHOP TECHNOLOGY–II	3	0	6
		ELECTIVE – I	0	0	0
36	MA561	POWER PLANT ENGINEERING	3	1	0
37	MA562	ELECTRICAL AND ELECTRONICS ENGINEERING	2	0	2
38	MA563	AUTOMOBILE AIR CONDITIONING	2	0	2
		ELECTIVE – II	0	0	0
39	MA571	'C' PROGRAMMING	2	0	2
40	MA572	COMPUTER IN BUSINESS SYSTEM	2	0	2
		Semester - VI			
41	MA61	ADVANCE AUTO CHASSIS AND BODY	3	0	3
42	MA62	AUTO GARAGE PRACTICE	0	0	6
42	MA63	MANUFACTURING PROCESS – II	3	0	3
43	MA64	AUTO DESIGN – II	2	2	0
44	MA65	AUTO DRAWING AND COMPUTER AIDED DRAFTING	2	0	4
		ELECTIVE – III	0	0	0
45	MA661	MECHANICAL ESTIMATING AND COSTING	2	2	0
46	MA662	RENEWABLE ENGINEERING SOURCES	3	1	0
		ELECTIVE – IV	0	0	0
47	MA671	MANAGEMENT	2	2	0
48	MA672	ENTREPRENEURSHIP DEVELOPMENT	2	2	0
49	MA673	PRODUCTION SYSTEM MANAGEMENT	2	2	0
50	PRAC	PRACTICAL TRAINING	0	0	

Code	Name of Paper	Lecture	Tutorial	Practical
	STRENGTH OF MATERIALS - I	2	2/2	2

AR31 / CE31 / MA31 / ME31 / MP31

RATIONALE

In Engineering every structure or machine element is designed for a particular application. Then it is tested. A Diploma holder should be capable of designing the various elements for particular requirements. For this he must be able to calculate the stresses in an elements and their nature.

CONTENTS

1. Simple Stress and Strain :

1.1 Various mechanical properties

- 1.1.1 Elasticity
- 1.1.2 Plasticity
- 1.1.3 Ductility
- 1.1.4 Brittleness
- 1.1.5 Toughness
- 1.1.6 Hardness

1.2 Concept of stress and strain

- 1.2.1 Type of force - Direct, shear
- 1.2.2 Stress - Tensile, compressive, shear

1.3 Hook's law

- 1.3.1 Statement of Hook's law
- 1.3.2 Young's modulus of elasticity
- 1.3.3 Tensile test diagram
 - 1.3.3.1 Gauge length
 - 1.3.3.2 Limit of proportionality
 - 1.3.3.3 Elastic limit
 - 1.3.3.4 Yield point, Yield strength
 - 1.3.3.5 Ultimate stress
 - 1.3.3.6 Rupture strength
 - 1.3.3.7 Nominal stress
 - 1.3.3.8 Proof stress

1.4 Working stress and factor of safety

1.5 Stress and strain calculations

1.5.1 Principle of superposition

1.5.2 Bar of homogeneous section

1.5.2.1 Bar of uniform cross-section

1.5.2.2 Bar of stepped cross-section

1.5.3 Bar of composite section

1.6 Temperature stresses

1.6.1 Homogeneous section

1.6.2 Composite section

1.7 Shear stresses

1.7.1 Modulus of rigidity

1.7.2 Complementary shear stress

1.7.3 Concept of single shear and double shear

1.7.4 Shear strain

1.8 Poisson's ratio and volumetric strain

1.8.1 Lateral strain

1.8.2 Longitudinal strain

1.8.3 Volumetric strain

1.8.4 Bulk modulus

1.9 Relationship between elastic constants (Derivation)

1.9.1 $E=3K(1-2/m)$

1.9.2 $E=2N(1+1/m)$

1.9.3 $E=9KN/(3K+N)$

2. Compound Stress :

2.1 Introduction

2.2 Stress components on an inclined plane

2.2.1 Induced by direct stresses

2.2.2 Induced by simple shear

2.2.3 Induced by direct and simple shear stresses

2.3 Mohr's circle :

- 2.3.1 For like direct stresses
- 2.3.2 For unlike direct stresses
- 2.3.3 For two perpendicular direct stresses with state of simple shear

2.4 Principal stresses and planes

- 2.4.1 Major principal stress
- 2.4.2 Minor principal stress
- 2.4.3 Mohr's circle method for principal stresses

3. Strain Energy :

- 3.1 Introduction
- 3.2 Strain energy from stress - strain diagram
- 3.3 Proof resilience
- 3.4 Types of loading - gradual, sudden, impact

- 3.4.1 Stress in gradual loading
- 3.4.2 Stress in sudden loading
- 3.4.3 Stress in impact loading

4. Bending Moments and Shear Force :

4.1 Basic concept

4.1.1 Types of support

- 4.1.1.1 Movable hinge support (roller)
- 4.1.1.2 Immovable hinge support
- 4.1.1.3 Fixed support

4.1.2 Types of beam

- 4.1.2.1 Cantilever beam
- 4.1.2.2 Simply supported beam
- 4.1.2.3 Fixed beam
- 4.1.2.4 Continuous beam
- 4.1.2.5 Overhanging beam

4.1.3 Types of load

- 4.1.3.1 Point load
- 4.1.3.2 Distributed load - uniformly and non uniformly

4.2 Shear force and bending moment

4.2.1 Concept and calculation of shear force and bending moment

4.2.2 Sign convention for shear force and bending moment

4.3 Bending moment and shear force diagrams (for point loads, U.D.L. and their combinations)

4.3.1 Cantilever beam

4.3.2 Simply supported beam

4.3.3 Simply supported beam with over hang

5. Moment of Inertia :

5.1 Concept of moment of Inertia

5.2 Radius of gyration

5.2.1 Parallel axis theorem

5.2.2 Perpendicular axis theorem

5.3 Moment of Inertia of various section

5.3.1 Rectangle

5.3.2 Triangle

5.3.3 Circle

5.4 Moment of inertia of unsymmetrical section like : T-section, channel section, L-section etc.

6. Bending Stresses in Beams :

6.1 Concept of bending stress

6.2 Theory of simple bending

6.2.1 Assumptions in theory of simple bending

6.2.2 Use of equation (without proof)

6.3 Design criterion and section modulus

6.3.1 Section modulus

6.3.2 Calculation of max bending stress in beams of rectangular, circular, I and T section

7. Shear Stress in Beams :

7.1 Concept

7.2 Use of equation (without proof)

7.3 Shear stress distribution diagram of various sections

- 7.3.1 Rectangle
- 7.3.2 I section
- 7.3.3 T section
- 7.3.4 Channel section
- 7.3.5 H section
- 7.3.6 + section
- 7.3.7 Circular section

PRACTICALS

1. Study of extensometers
2. Study and operation of UTM
3. Tensile test on mild steel specimen and plotting stress strain curve.
4. Bending test on timber beams.
5. Compression test on common structural materials viz. timber, cast iron etc.
6. Determination of toughness of cast iron and mild steel specimen by Charpy and Izod test.
7. Hardness test by Brinell and Rockwell test.

REFERENCE BOOKS :

1. Strength of Materials & B.C.Punmia Theory of Structures (vol. I)
2. Strength of Materials Ramamurtham
3. Strength of Materials Junarkar
4. Strength of Materials R.S. Khurmi
5. Strength of Materials (Hindi) Gurcharan singh

Code	Name of Paper	Lecture	Tutorial	Practical
CE32 MA32 ME32	FLUID MECHANICS - I	2	2/2	2

**Play
Audio**

RATIONALE

Technicians have to deal with pressure measurement, transportation of fluids and the machines converting hydraulic power into mechanical power and vice versa, in the field/industries for that one has to have a basic knowledge of fluid mechanics. Topics such as

pressure measurement, laws governing the flow of liquids, measurement of discharge, production of power are included in this subject.

Although the major emphasis in this subject is on the study of liquids like water an incompressible fluid yet all the principles are applicable to all the fluids such as air, gas, steam etc.

CONTENTS

1. Introduction :

1.1 Introduction concepts

1.1.1 Fluids and solids

1.1.2 Liquid, gas and vapour

1.2 Fluid mechanics

1.2.1 Kinematics

1.2.2 Dynamics

1.3 Fluid properties

1.3.1 Density

1.3.2 Specific volume

1.3.3 Specific gravity

1.3.4 Viscosity

1.3.4.1 Newton's law of viscosity

1.3.4.2 Dynamic and Kinematic viscosity

1.3.5 Compressibility

1.3.6 Surface tension - soap bubble, drop

1.3.7 Capillarity

1.3.8 Vapour pressure and its importance

2. Fluid Pressure and its Measurement :

2.1 Definition and its units

2.2 Pascal's law

2.2.1 Intensity of pressure at a point in fluid at rest

2.2.2 Pressure head

2.3 Pressure

- 2.3.1 Atmospheric pressure
- 2.3.2 Gauge pressure
- 2.3.3 Vacuum pressure
- 2.3.4 Absolute pressure
- 2.3.5 Differentials pressure

- 2.4 Law of hydrostatic pressure
- 2.5 Brahma's press
- 2.6 Pressure measurement

2.6.1 Manometers

- 2.6.1.1 Piezometer - its limitation
- 2.6.1.2 U-tube - simple, differential, inverted
- 2.6.1.3 Micro-manometers
- 2.6.1.4 Inclined tube micro-manometers

2.6.2 Mechanical gauge

- 2.6.2.1 Bourdon gauge
- 2.6.2.2 Bellow gauge
- 2.6.2.3 Diaphragm gauge
- 2.6.2.4 Dead weight gauge

3. Hydrostatics :

- 3.1 Total pressure
- 3.2 Centre of pressure
- 3.3 Total pressure and center of pressure in following cases

- 3.3.1 Plane surface immersed horizontally
- 3.3.2 Plane surface immersed vertically
- 3.3.3 Plane surface immersed at an angle
- 3.3.4 Curved surface (no proof)

- 3.4 Working of lock gates, sluice gate
- 3.5 Pressure on masonry dams of rectangular and trapezoidal sections and their condition of stability

4. Hydrokinematics :

4.1 Description of fluid flow

- 4.1.1 Euler approach
- 4.1.2 Lagrangian approach

4.2 Definition of path line, stream line

4.3 Types of flow

4.3.1 Steady - Non steady

4.3.2 Uniform - Non uniform

4.3.3 Laminar - Turbulent

4.3.4 One, Two, Three dimensional flow

4.4 Continuity equation (no proof) :

4.4.1 Assumption

4.4.2 Rate of discharge

4.4.3 For one dimensional flow

5. Hydrodynamics and Measurement of Flow :

5.1 Energy of fluid - pressure, kinetic and potential

5.2 Bernoulli's theorem (no proof)

5.2.1 Assumptions and its limitation

5.2.2 Conversion of pressure into pressure head, velocity into kinetic head

5.3 Applications of Bernoulli's theorem

5.3.1 Pitot-tube

5.3.2 Venturimeter

5.3.3 Orificemeter

6. Orifices and Notches :

6.1 Definition and classification

6.2 Discharge through small orifices

6.2.1 Coefficient of contraction

6.2.2 Coefficient of velocity

6.2.3 Coefficient of discharge

6.2.4 Coefficient of resistance

6.3 Time of emptying a vessel of uniform cross section through an orifice at bottom.

6.4 Notches - Classification

6.4.1 Crest, Nappe

6.4.2 Difference between notch and weir

6.5 Flow over -

- 6.5.1 Triangular notch
- 6.5.2 Rectangular notch

[Simple numerical problems without velocity of approach]

PRACTICALS.

- 1. Study of different types of manometers and pressure gauges
 - 2. Verification of Bernoulli's theorem
 - 3. Determination of Cd for Venturimeter
 - 4. Determination of Cd for Orificemeter
 - 5. Determination of Cc,Cv and Cd of small orifice
 - 6. Visit of a near by dam
-

REFERENCE BOOKS :

- 1. Fluid Mechanics & Machines Dr. Jagdish Lal
- 2. Fluid Mechanics & Machines Dr. R.K.Bansal
- 3. Fluid Mechanics & Machines R.S.Khurmi.
- 4. Hydraulics & Pneumatics H.L. Stewart.

Code	Name of Paper	Lecture	Tutorial	Practical
MA33	MANUFACTURING PROCESS - I	4	-	2

ME 33/ MP 33

RATIONALE

This subject provides an opportunity to the student to learn about various welding processes and foundry work. Welding is very useful for fabrication work and Foundry for production of castings used for manufacturing of machines. This also gives knowledge of metal cutting mechanism to the student. Theory is to be supported by visits to industries and case studies. This will help in developing proper attitude and skill to the technicians. Hence the technicians will be in a position to help and solve the problems of industry.

CONTENTS

1. Welding Process :

1.1 Classification of welding process, Industrial applications of welding.

2. Gs Welding :

2.1 Principle of oxy-acetylene gas welding, Construction of oxy- acetylene cutting torch and gas welding torch

2.2 Blowpipes, single stage and double stage regulators.

2.3 Gas cutting (oxy-acetylene), lance cutting, flames gauging, grooving

3. Electric Welding Process :

3.1 Difference between A.C and D.C arc welding, Equipments and accessories of A.C and D.C welding plants

3.2 Effect of polarity, length of arc, penetration, crater, arc blow

3.3 Electrodes (Metal and Carbon), B.I.S specification for welding Symbols and electrodes, Flux and their functions

3.4 Resistance welding

3.4.1 Spot welding, butt welding, flash welding

3.4.2 Seam welding, percussion welding and projection welding

3.5 Atomic hydrogen welding

3.6 Shielded metal arc welding, Submerged arc welding

3.7 Pressure welding

3.8 Welding distortion, welding defects, method of controlling welding defects and inspection of welded joints

4. Modern Welding Methods :

4.1 Tungsten inert gas welding (TIG)

4.1.1 Principle of operation, advantage, disadvantages,application

4.2 Metal inert gas welding (MIG)

4.2.1 Principle of operation, advantage, disadvantages,application

4.3 Thermit welding

4.4 Electroslag welding, Electron beam welding

4.5 Ultrasonic welding, Laser beam welding

4.6 Robotic welding

5. Pattern Making :

- 5.1 Introduction to materials - timber, metal, plastics and plaster of Paris etc.
- 5.2 Allowances- shrinkage, draft, machining, distortion and shake

6. Types of Pattern :

- 6.1 Solid, Split loose piece, match plate
- 6.2 Sweep, Gated, Skeleton, segmental, follow board, colour code for patterns as per B.I.S.

7. Moulding Sand Ingredients :

- 7.1 Moulding sands-green, dry, loam, facing, baking, parting and core sands.
- 7.2 Silica grain, binders, additive, moisture
- 7.3 Properties of molding - sand, permeability, refractoriness, adhesiveness, cohesiveness, strength, flowability, collapsibility
- 7.4 Tempering, sand conditioning and sand muller.

8. Core and Core Making :

- 8.1 Core, core print and core boxes
- 8.2 Types of cores, functions, advantage of core, shrinkage of cores
- 8.3 Core sand and binders, core loams, oil and CO₂ cores, synthetic resin
- 8.4 Core Making procedure, core oven and core baking.

9. Testing of Moulding Sands :

- 9.1 Need for testing chemical analysis, moisture content test, clay content test, Grain fineness test
- 9.2 Permeability test and strength test.

10. Mould Making :

- 10.1 Moulding boxes, hand tools used for mould making
- 10.2 Steps involved in making a mould, gating system: definition and brief idea of basin, sprue, runner and gates
- 10.3 Moulding machines - Squeeze machine, jolt squeeze machine and sand slinger.
- 10.4 Moulding processes - Green sand, dry sand, loam, Co₂ moulding, skin dried, plaster, metal moulding

11. Special Casting Techniques :

- 11.1 Die casting - Hot chamber, cold chamber process
- 11.2 Investment or lost wax process
- 11.3 Centrifugal casting - True, Semi centrifugal, centrifugal
- 11.4 Shell moulding Advantages, Disadvantages and application of above processes

12. Melting Furnaces :

- 12.1 Cupola furnace - Construction, operation, preparation, charging
- 12.2 Crucible furnace of tilting types - construction, operation

13. Castings :

- 13.1 Different types of defects
 - 13.2 Testing of defects - Radiography, magnetic particle inspection, Ultrasonic inspection
-

PRACTICALS

1. Making following types of joints by gas welding :

- 1.1 Preliminary joining practice on gas welding
- 1.2 Vertical welding

2. Exercises of gas welding on the following

- 2.1 Aluminium welding
- 2.2 Brass welding
- 2.3 Copper welding
- 2.4 C.I. welding

3. Gas cutting of the following types

- 3.1 Preliminary gas cutting practice
- 3.2 Stock cutting by oxy acetylene
- 3.3 C.I. cutting

4. Making following types of joints by arc welding

- 4.1 Preliminary joining practice by arc welding
- 4.2 Butt and lap joint (in vertical position travel up and down)
- 4.3 Welding of outside corner joint

5. Exercise on spot welding

6. Exercise on brazing

7. Exercise on TIG/MIG/CO₂ welding

8. Pattern making :

- 8.1 Preparation of solid pattern (single piece)
- 8.2 Preparation of split pattern
- 8.3 Preparation of self cored pattern

9. Preparation of the following types of moulds .

- 9.1 Floor moulding
- 9.2 Turn over moulding.

10. Testing of moulding sand- moisture content

11. Moulding and casting of

- 11.1 A solid pattern
- 11.2 A split pattern

12. Testing and inspection of casting defects visually Foundry exercise can be shown in a nearby industry/ foundry.

REFERENCE BOOKS :

- 1. A Text Book of Welding Technology O.P. Khanna
- 2. Welding Technology Tahil Maghnani
- 3. A Text Book on Foundry Technology M.Lal & O.P.Khanna.
- 4. Foundry Engineering Tahil Meghnani
- 5. Manufacturing Process - I R.K. Yadav

Code	Name of Paper	Lecture	Tutorial	Practical
MA34	THERMAL ENGINEERING - I	3	-	2

ME 34

RATIONALE

For technical education in mechanical engineering field the subject of thermal engineering is very important for under standing the basic principles and concept of thermodynamics and its application.

CONTENTS

1. Basic Concept and Gas Laws :

- 1.1 Thermodynamics, property-Intensive and Extensive, system - open, closed and isolated
- 1.2 Energy - Internal energy, potential energy, kinetic energy, heat, work, specific heat, enthalpy
- 1.3 Boyle's law, Charle's law, Joule's law

1.4 Characteristics gas equation, gas constant, mol, universal gas constant and molar specific heats

1.5 Simple numerical problems

2. Laws of Thermodynamics :

2.1 Zeroth law of thermodynamics

2.2 First law of thermodynamics.

2.3 Second law of thermodynamics Concept of entropy

2.4 Constant volume, constant pressure, isothermal, adiabatic polytropic processes, throttling and free expansion, work done during these processes.

2.5 Simple numerical problems

3. Availability :

3.1 Available and unavailable energy

3.2 Effectiveness

3.3 Irreversibility in flow and non-flow process.

4. Formation of Steam and its Properties :

4.1 Generation of steam at constant pressure, various stage of steam- wet steam, dry steam saturated steam, dryness fraction, super heated steam, degree of super heat.

4.2 Critical point, triple point, thermodynamic properties of steam - specific volume, specific enthalpy, specific internal energy, specific entropy.

4.3 Steam property diagram: temperature - entropy diagram, enthalpy- entropy diagram, pressure - enthalpy diagram

4.4 Heating and expansion of steam during thermodynamic processes, Change of internal energy and entropy of steam during processes

4.5 Simple numerical problems Use of steam tables and Mollier charts.

5. Steam Generators :

5.1 Definition of boiler according to I.B.R., classification of boilers, description and working of Lancashire, Cochran and Babcock and Wilcox boilers, Comparison of water tube and fire tube boilers.

5.2 Brief description and working of boiler mountings and accessories used in common boilers.

5.3 Special characteristics of high-pressure boilers, Structural details and working of Lamont, Benson and Schmidt Hartmann boilers

5.4 Introduction to Indian Boiler Act.

6. Boiler Performance :

6.1 Actual evaporation, Equivalent evaporation, Factor of evaporation, Boiler efficiency

6.2 Heat losses in boiler plants, Boiler power, Energy balance sheet of boiler.

6.3 Simple numerical problems

7. Vapour Power Cycle :

7.1 Rankine cycle, modified rankine cycle, representation on p-v, t-s and h-s charts and efficiency

7.2 Simple numerical problems

PRACTICALS

1. Study by models/charts/actual units of the following:

1.1 Common type of fire tube and water tube boilers.

1.2 Boiler mountings

1.3 Boiler accessories

1.4 High pressure boilers

2. Determination of dryness fraction of steam by separating and throttling calorimeter

REFERENCE BOOKS :

1. Thermal Engineering (Hindi) Verma & Gulecha
2. Thermal Engineering Vol.1 Mathur & Mehta .
3. Thermal Engineering R.K.Purohit.
4. Thermal Engineering R.S. Khurmi
5. Elements of Heat Engines -Vol.1 Patel & Karam Chandani

Code	Name of Paper	Lecture	Tutorial	Practical
MA35	MATERIALS AND MATERIAL SCIENCE	2	-	2

ME 35

RATIONALE

Lot of development has taken place in the field of materials. New materials are being developed. It has become possible to change the properties of materials to suit the requirements. Diploma holders in mechanical engineering are required to make use of different materials for various applications. For this purpose, it is necessary to teach them basics of metal structure, properties, usage and testing of various ferrous and nonferrous

materials and various heat treatment processes. This subject aim at developing knowledge about characteristics, testing and usage of various types of materials used in mechanical engineering industry.

CONTENTS

1. Classification and Properties of Materials :

- 1.1 Introduction to engineering materials
- 1.2 Classification of materials
- 1.3 Thermal, chemical, electrical, mechanical properties of various materials
- 1.4 Selection criteria for use in industry

2. Structure of Metals and Their Deformation :

- 2.1 Metal structure
- 2.2 Arrangement of atoms in metals
- 2.3 Crystalline structure of metals
- 2.4 Crystal imperfections
- 2.5 Deformation of metal
- 2.6 Impact of cold and hot working on metal structure.

3. Ferrous Materials :

- 3.1 Classification of iron and steel
- 3.2 Sources of Iron ore and its availability
- 3.3 Manufacture of pig iron, wrought iron, cast iron and steel
- 3.4 Types of cast iron: white, malleable grey, mottled, nodular and alloy and their usage.
- 3.5 Classification of steels
- 3.6 Different manufacturing method of steel open hearth, bessemer, electric arc.
- 3.7 Specification as per BIS and equivalent standards
- 3.8 Effect of various alloying elements on steel
- 3.9 Use of alloy steel (high-speed steel, stainless steel, spring steel, silicon steel)

4. Non Ferrous Materials :

- 4.1 Important ores and properties of aluminium, copper, zinc, tin, lead
- 4.2 Properties and uses of nonferrous alloys

5. Engineering Plastics and Fibers :

- 5.1 Introduction of plastics
- 5.2 Classification - Thermoplastic and thermosetting
- 5.3 Various trade names of engineering plastics

5.4 Fibers and their classification : Inorganic and organic fibers

5.5 Uses of fiber

6. Insulating Materials :

6.1 Various heat insulating material and their usage like asbestos, glass, wool thermocole, cork, puf, china clay.

6.2 Various electrical insulating materials and their use.

7. Testing of Metals and Alloys :

7.1 Identification tests : appearance, sound, spark, weight, magnetic, band microstructure, filing

8. Fundamental of Heat Treatment :

8.1 Principles of heat treatment

8.2 Theory of solid solution

8.3 Iron-carbon diagram

8.4 TTT curve in steels and its importance

8.5 Basic idea about martensitic transformation

8.6 Various heat treatment processes - hardening, tempering, annealing, normalising, case hardening and surface hardening.

8.7 Types of heat treatment surfaces.

PRACTICALS

1. Classification of about 25 specimens of materials / parts into

1.1 Metals and non metals

1.2 Metals and alloys

1.3 Metals and non ferrous metals

1.4 Metals and non ferrous alloys

2. Given and set of specimen of metals and alloys (copper, brass, aluminium, cast iron HSS, Gun metal) : identify and indicate the various properties possesses by them

3. 3.1 Study of heat treatment furnace

3.2 Study of thermocouple / pyrometer

- 4. Study of a metallurgical microscope and a diamond-polishing machine.**
5. To prepare specimens of following materials for microscopic examination and to examine the microstructure of the specimens of the following materials :

- 5.1 Brass
- 5.2 Copper
- 5.3 Grey CI
- 5.4 Malleable CI
- 5.5 Low carbon steel
- 5.6 High carbon steel
- 5.7 HSS

- 6. To temper a given specimen and find out difference in hardness (with the help of hardness tester) as a result of tempering.**

REFERENCE BOOKS :

- 1. Engineering Material B.K. Agarwal
- 2. Elements of Metallurgy H.S. Bawa
- 3. Materials and Metallurgy Lab Manual Adithan & Bahl
- 4. Material Science R.K. Rajput

Code	Name of Paper	Lecture	Tutorial	Practical
MA36	AUTO CHASSIS AND BODY	3	-	2

RATIONALE

Knowledge of chassis layout, suspension system, braking system, wheel and tyres, frame and body, transmission, steering, steering gears and geometry is imparted in this syllabus.

CONTENTS

- 1. Introduction :**

- 1.1 Classification of Automobiles
- 1.2 Chassis and body
- 1.3 Components of vehicle - basic structure, power unit, transmission system, accessories, superstructure.
- 1.4 Layout of conventional type vehicle (front engine rear wheel drive)
- 1.5 Basic functions and arrangements of various components.
- 1.6 Vehicle dimensions - wheel base, wheel track, front & rear overhang, overall dimensions, ground clearance.

2. Suspension System :

- 2.1 Basic functions of suspension system
- 2.2 Types - Independent and rigid, coil, leaf, torsion bar, air, rubber suspension (Elementary idea)
- 2.3 Conventional leaf spring rigid beam suspension for light vehicle and with helper spring for heavy vehicles. Suspension for Tandem axle
- 2.4 Fitting of spring assembly, shackles
- 2.5 Functions and types of shock absorbers, construction and working of hydraulic telescopic type shock absorber.
- 2.6 Sprung and unsprung weight.

3. Braking Systems :

- 3.1 Purpose, principle of braking, Stopping distance, layout of braking system components, Braking efficiency.
- 3.2 Classification of brakes, requirements of a good braking
- 3.3 Hydraulic brakes
 - 3.3.1 Principle, layout of components
 - 3.3.2 Construction & working of single and tandem master cylinder, wheel cylinder
 - 3.3.3 Brake fluid and its characteristics
- 3.4 Brake drum, types materials
- 3.5 Brakes shoes, types and construction, steady ports, brake shoe adjuster.
- 3.6 Brakes lining - material, thickness, area brake pedal travel and clearance
- 3.7 Hand brakes

4. Wheels and Tyres :

- 4.1 Wheels
 - 4.1.1 Requirements of wheel
 - 4.1.2 Types- pressed steel disc, wire, light alloy cast wheels, advantages & disadvantages inset, outset, and zeroset, reversible and divided wheels
 - 4.1.3 Rim- flat base (two piece and three piece) and well base rims
- 4.2 Tyres

- 4.2.1 Functions of tyres
- 4.2.2 Classification - solid, pneumatic, high low and extra low-pressure tyre, tubed and tubeless tyre, cross ply, belted bias and radial ply tyre.
- 4.2.3 Cross section of a pneumatic tyre
- 4.2.4 Specification of tyres
- 4.2.5 Desirable tyre properties

5. Frame and Body :

5.1 Frame

- 5.1.1 Function of frame, loads on frame
- 5.1.2 Frame construction, sub-frame
- 5.1.3 Defects in frame chassis repair and alignment
- 5.1.4 Frame less construction

5.2 Body

- 5.2.1 Types and construction (parts of body)
- 5.2.2 Main features - strength, stiffness, space air drag, stream lining , weight, vibration, protection against weather, corrosion, safety and economy considerations.
- 5.2.3 Body alignment
- 5.2.4 Bumpers - types and functions
- 5.2.5 Denting and painting
- 5.2.6 Window regulators, doors, hood, dash board, glass work.

6. Clutch :

- 6.1 Purpose and requirements of clutch
- 6.2 Type - Single plate, multi plate, dry, wet, semi centrifugal, centrifugal
- 6.3 Constructional and operation of conventional coil spring type clutch.
- 6.4 Construction of clutch plate, lining material

7. Gear Box :

- 7.1 Functions and types of gear boxes
- 7.2 Constructional details and working of sliding mesh, constant mesh and synchronous mesh gear boxes
- 7.3 Different gear selector mechanism - constructions and working
- 7.4 Interlocking methods- constructions and working

8. Final Drive :

- 8.1 Function, types and constructional details of - Propeller shafts, Universal joints, Sliding joint
- 8.2 Differential - Principles, function, construction and working of conventional differential
- 8.3 Different types of rear axles according to methods of supporting.

9. Front axle and Steering System :

- 9.1 Front axle - types and construction, front wheel stub axle assembly
- 9.2 Purpose and requirements of steering system
- 9.3 General arrangement of steering systems steering gear ratio, variable steering ratio.
- 9.4 Steering system components - steering wheel, steering column, conventional steering linkage, steering and ignition lock
- 9.5 Construction and working details of different types of steering gear boxes

10. Upholstery :

- 10.1 Seats - location, mounting and adjustment
- 10.2 Seat belts - location fitting points and operation
- 10.3 Ceiling, side panels, door channels, beading and furnishing materials

PRACTICALS

- 1. Study of conventional layouts of vehicles.**
- 2. Study and inspection of suspension system of light and heavy vehicles.**
- 3 Study of hydraulic braking system and bleeding of hydraulic braking system**
- 4. Complete study of conventional transmission system**

- 4.1.1 Clutch
- 4.1.2 Gear box
- 4.1.3 Final drive

5. Study of frame and body of an automobile

- 5.1.1 Inspection of the frame and body
- 5.1.2 Repairing of the frame and body
- 5.1.3 Denting and painting practices

REFERENCE BOOKS :

- 1. Automotive Chassis & Body. P.L.Kohli.
- 2. Vehicle & Engine Technology Heinz Heisler. (Vol. I & II)
- 3. Basic Automobile Engineering C.P.Nakra.
- 4. Automobile Engineering. T.R.Banga & Nathu Singh.
- 5. Automobile Engineering H.S. Reyat

Code	Name of Paper	Lecture	Tutorial	Practical
MA37	MACHINE DRAWING	-	-	6

ME 37

RATIONALE

In order to produce a good product, a neat drawing is a must. There fore technicians must be well acquainted with the knowledge of machine drawing. Machine drawing is the universal language of engineers and student must be made familiar with all the relevant aspect topics of machine drawing.

Subject contents various drawings of machine and components to clarify the manufacturing and construction details for the students.

CONTENTS

1. Coupling :

- 1.1 Split muff coupling
- 1.2 Universal coupling
- 1.3 Flexible bushed pin type

2. Bearings :

- 2.1 Types of bearings
- 2.2 Plumber block
- 2.3 Foot step bearing

3. Machine Components :

- 3.1 Machine vice
- 3.2 Tail stock of lathe
- 3.3 Shaper tool head

4. Valves :

- 4.1 Classification of valves
- 4.2 Valve seats
- 4.3 Steam stop valve
- 4.4 Feed check valve

5. I. C. Engine Components :

5.1 Piston and connecting rod assembly

6. Jigs and Fixtures :

6.1 Definitions

6.2 Types of jig, bushes

6.3 Drilling jigs

6.4 Types of fixtures

PRACTICALS

Preparation of assembly drawing sheets from detailed drawings :

1. Couplings
2. Plummer block and foot step bearing
3. Machine vice
4. Tail stock
5. Shaper tool head
6. Steam stop valve
7. Feed check valve
8. I.C. Engine connecting rod and piston
9. Drilling jig

Exercises for sketch book :

1. Jigs, Bushes and fixtures
2. Pulleys : Straight arm pulley, loose and fast pulley
3. Pipe fittings and pipe joints - Pipe fittings and their symbols, flanged pipe joint and spigot and socket joint

REFERENCE BOOKS :

1. Machine Drawing Laxmi Narayanan & Mathur
2. Machine Drawing P.S Gill
3. Machine Drawing R.B.Gupta
4. Machine Drawing Sidheswar

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- 6.1 Definitions
- 6.2 Types of jig, bushes

- 6.3 Drilling jigs
- 6.4 Types of fixtures

PRACTICALS

Preparation of assembly drawing sheets from detailed drawings :

1. Couplings
2. Plummer block and foot step bearing
3. Machine vice
4. Tail stock
5. Shaper tool head
6. Steam stop valve
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2. Machine Drawing P.S Gill
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4. Machine Drawing Sidheswar

IV Sem.

Code	Name of Paper	Lecture	Tutorial	Practical
CE41 MA41 ME41	STRENGTH OF MATERIALS - II	2	2/2	2

MA41 ME41

In Engineering every structure or machine element is designed for a particular application. Then it is tested. A Diploma holder should be capable of designing the various elements for particular requirements. For this he must be able to calculate the stresses in an elements and their nature.

CONTENTS

1. Deflection :

1.1 Concept of deflection of a beam
1.2 Use of standard formula for calculating deflection (for point loads, U.D.L. and their combination)

1.2.1 Cantilever beam
1.2.2 Simply supported beam

2. Columns and Struts :

2.1 Concept of column and struts
2.2 Modes of failure
2.3 Types of column; long and short
2.4 Buckling loads
2.5 Slenderness ratio
2.6 Euler's formula (without proof)

2.6.1 Both ends hinged
2.6.2 One end fixed and other end free
2.6.3 Both ends fixed
2.6.4 One end fixed and other end hinged
2.6.5 Limitations of Euler's Formula
2.6.6 Equivalent length

2.7 Rankine's formula

3. Torsion of Shaft :

3.1 Concept of torsion

- 3.1.1 Angle of twist
- 3.1.2 Polar moment of Inertia
- 3.1.3 Assumptions in the theory of pure torsion

- 3.2 Derivation and use of
- 3.3 Relation between power and torque
- 3.4 Combined stress due to bending and torsion in solid and hollow shaft

4. Springs :

- 4.1 Introduction and classification of springs
- 4.2 Flat carriage springs
 - 4.2.1 Application of flat carriage springs
 - 4.2.2 Determination of number of leaves and their sections, deflection and radius of curvature
 - 4.2.3 Quarter elliptical spring
- 4.3 Closely coiled helical springs :
 - 4.3.1 Application of closely coiled helical springs
 - 4.3.2 Determination of deflection, angle of twist, number of coils and stiffness under axial loading in closely coiled helical springs.

5. Thin Cylindrical Shells :

- 5.1 Use of cylinders
- 5.2 Stresses due to internal pressure
 - 5.2.1 Circumferential stress or hoop stress
 - 5.2.2 Longitudinal stress
- 5.3 Design of thin cylinders - calculation of the various dimensions of a thin cylinder

6. Combined Direct and Bending Stress :

- 6.1 Effect of eccentricity
- 6.2 Stress due to eccentric load
- 6.3 Middle third rule

7. Frames :

- 7.1 Different types of frames
- 7.2 Calculation of forces in the members of determinate frames

- 7.2.1 Method of Joints
- 7.2.2 Method of section
- 7.2.3 Graphical method

PRACTICALS

- 1. Determination of deflection for various types of loading
- 2. Torsion test on brass and mild steel
- 3. Compression test on columns
- 4. Determination of stiffness of close coiled spring
- 5. Deflection test on leaf spring.

REFERENCE BOOKS :

- 1. Strength of Materials & B.C.Punmia Theory of Structures (Vol. I)
- 2. Strength of Materials Ramamurtham
- 3. Strength of Materials Junarkar
- 4. Strength of Materials R.S. Khurmi
- 5. Strength of Materials (Hindi) Gurcharan Singh

Code	Name of Paper	Lecture	Tutorial	Practical
MA42	FLUID MACHINES	2	2/2	2

ME 42

RATIONALE

A Diploma holder has to supervise the various machines working on the principles of hydraulics. Major among those machines are hydraulic turbines, pumps, hydraulic crane, presses etc. The aim of this subject is to impart the knowledge of working principles, construction and working of various machines.

CONTENTS

1. Flow Through Pipes :

- 1.1 Types of flow in pipes (Reynold's experiment)

- 1.1.1 Laminar flow
- 1.1.2 Turbulent flow
- 1.1.3 Transient flow

1.2 Law of fluid friction

- 1.2.1 Laminar flow
- 1.2.2 Turbulent flow

1.3 Loss of head due to friction (No. proof)

- 1.3.1 Darcy's Weisbach equations
- 1.3.2 Chezy's formula
- 1.3.3 Manning formula

1.4 Other energy losses in pipe (only expressions)

- 1.5 Total energy line and hydraulic gradient line
- 1.6 Pipe arrangement

- 1.6.1 Pipes in series
- 1.6.2 Pipes in parallel

1.7 Transmission of power through pipes

- 1.8 Siphon
- 1.9 Water hammer

2. Impact of Free Jet :

- 2.1 Impulse momentum equation (no proof)
- 2.2 Force exerted by a fluid jet on stationary flat plate

- 2.2.1 Plate normal to the jet
- 2.2.2 Plate inclined to the jet

2.3 Force exerted by fluid jet on moving flat plate

- 2.3.1 Plate normal to the jet
- 2.3.2 Plate inclined to the jet

2.4 Force exerted by fluid jet on stationary curved vane

- 2.4.1 Jet strikes at the centre of symmetrical curved vane
- 2.4.2 Jet strikes tangentially at one

2.5 Force exerted by a fluid jet on moving curved vane.

3. Hydraulic Turbines :

3.1 Classification of water turbines

3.2 Pelton turbine

3.2.1 Working principle

3.2.2 Constructional features

3.3 Francis turbine and Kaplan turbine

3.3.1 Working principle

3.3.2 Constructional features

3.4 Draft tube

3.5 Cavitation

3.6 Governing of Turbines

3.6.1 Need for governing

3.6.2 Simple governing mechanism

3.7 Surge tank

3.8 Turbine performance

3.8.1 Heads - gross, net

3.8.2 Efficiency - Hydraulic, Mechanical, Volumetric, Overall

3.8.3 Unit quantities

3.8.4 Specific speed

3.8.5 Introduction to characteristics curve (no numerical problems)

3.9 Numerical problems on turbines

4. Centrifugal Pump :

4.1 Introduction and working principles

4.2 Advantages over reciprocating pump

4.3 Classification

4.4 Constructional features

4.4.1 Mechanical manometric and overall efficiency

4.5 Head of a pump - static, manometric

4.5.1 Power required to drive the pump

4.6 Losses in pump and efficiency

4.7 Minimum starting speed

4.8 Pumps in series and parallel

- 4.9 Priming
- 4.10 Description and working of multistage centrifugal pump, submersible, deepwell pump and gear pump.
- 4.11 Numerical problems

5. Reciprocating Pump :

- 5.1 Types of pump
- 5.2 Main components and working
- 5.3 Slip
 - 5.3.1 Percentage slip
 - 5.3.2 Negative slip
- 5.4 Work done by a reciprocating pump
- 5.5 Acceleration of piston
 - 5.5.1 Its effect on velocity and pressure
- 5.6 Air vessel
- 5.7 Troubles in Reciprocating pump and their remedies.
- 5.8 Numerical problems

6. Miscellaneous Hydraulic Machines :

- 6.1 Description, working principle of following machines
 - 6.1.1 Hydraulic accumulator
 - 6.1.2 Hydraulic intensifier
 - 6.1.3 Hydraulic press
 - 6.1.4 Hydraulic coupling and torque converter

PRACTICALS

1. Determination of coefficient of friction for pipes
2. Determination of slip, coefficient of Discharge for a reciprocating pump
3. To draw characteristics curves and efficiency curves of
 - 3.1 Centrifugal pump
 - 3.2 Pelton wheel turbine
 - 3.3 Francis turbine
4. Study of model of Kaplan turbine
5. Study of submersible pump, jet pump, deepwell pump.

REFERENCE BOOKS :

1. Fluid Mech. & Machines Dr. Jagdish Lal
2. Fluid Mech. & Machines Dr. R.K.Bansal
3. Fluid Mechanics & machines R.S.Khurmi.
4. Hydraulics & Pneumatics H.L. Stewart
5. Fluid Machines S.S. Ratan

Code	Name of Paper	Lecture	Tutorial	Practical
MA43	AUTO ENGINE - COMPONENTS AND PERFORMANCE	2	2	-

RATIONALE

This subject imparts the basic knowledge of auto engine air compress and Gas Turbine. Constructional details, materials and detail study of piston, connecting rod, crank shaft, cylinder block, engine valves and bearing etc.

CONTENTS

1. Classification of Auto Engines :

1.1 Classification of Auto Engines :

- 1.1.1 Cycle
- 1.1.2 Strokes
- 1.1.3 Fuels
- 1.1.4 Ignition
- 1.1.5 Cooling
- 1.1.6 Speed
- 1.1.7 Number and arrangement of cylinders
- 1.1.8 Governing
- 1.1.9 Types of placement of valves etc.

2. Engine Components : Constructional details, specifications, qualities, functions, types, materials, working, defects and its rectifications of these parts.

2.1 Cylinder :

- 2.1.1 Cylinder and cylinder block
- 2.1.2 Dry and wet cylinder liners
- 2.1.3 Cylinder head, crank cases and oils pan or sump

2.2 Piston :

- 2.2.1 Cast iron piston,
- 2.2.2 Steel piston
- 2.2.3 Aluminium alloy piston
- 2.2.4 Slipper piston
- 2.2.5 Oval section piston
- 2.2.6 T-slot piston
- 2.2.7 Invar strut piston
- 2.2.8 Coating for aluminium piston
- 2.2.9 Piston slap
- 2.2.10 Major and minor thrust surfaces.

2.3 Piston Rings :

- 2.3.1 Compound rings
- 2.3.2 Oil scrapper ring
- 2.3.3 Compression ring
- 2.3.4 Chromium plated ring
- 2.3.5 Ring gap and Ring clearance

2.4 Piston Pin :

- 2.4.1 Floating piston pin
- 2.4.2 Fix pin
- 2.4.3 Offset piston pin

2.5 Connecting Rod :

- 2.5.1 Components of connecting rod
- 2.5.2 Cooling of big end small end of connecting rod
- 2.5.3 Lubrication of connecting rod bearing

2.6 Crank Shaft :

- 2.6.1 Single cylinder crank shaft
- 2.6.2 Multi cylinder crank shaft
- 2.6.3 Left hand crank shaft
- 2.6.4 Right hand crank shaft
- 2.6.5 Hardening of crank shafts
- 2.6.6 Balancing of crank shaft
- 2.6.7 Vibration damper

2.7 Flywheel :

2.7.1 Components

2.7.2 Ring gear

2.8 Cam Shaft :

2.8.1 Components of cam

2.8.2 Cam driving mechanism

2.8.2.1 Chain drive

2.8.2.2 Timing gear drive

2.8.2.3 Timing belt drive

2.8.3 Overhead cam shaft

2.8.4 Valve timing adjustment and fixing

2.9 Engine Valve :

2.9.1 Components and Dimensions

2.9.2 Poppet valves

2.9.3 Sodium cooled valves

2.9.4 Metal coated valves

2.9.5 Valve seating

2.9.6 Valve pocketing

2.9.7 Valve spring

2.9.8 Valve operating mechanisms

2.9.9 Valve tappet clearance and adjustment

2.10 Gasket :

2.10.1 Cylinder head gasket

2.10.2 Oil pan gasket

2.10.3 Manifold gasket

2.10.4 Pump gasket

2.11 Bearing :

2.11.1 Requirements of bearing

2.11.2 Main bearing

2.11.3 Big end bearing

2.11.4 Bearing failures and its causes

3. I.C. Engine Fundamentals :

3.1 Bore

3.2 Stroke

- 3.3 Clearance volume
- 3.4 Swept volume
- 3.5 Compression ratio
- 3.6 Crank throw
- 3.7 Dead centres
- 3.8 Piston displacement
- 3.9 Piston speed,
- 3.10 Concept of energy work heat and power
- 3.11 Working principal of 4 stroke and 2-stroke cycle and their comparison
- 3.12 Valve timing diagrams and firing order (power balancing)
- 3.13 Simple Numerical problems

4. Testing and Performance of I.C. Engines :

- 4.1 Basic Performance parameters,
- 4.2 Measurements of -
 - 4.2.1 Speed
 - 4.2.2 Air consumption
 - 4.2.3 Fuel consumption
 - 4.2.4 friction power, brake power, indicated power
 - 4.2.5 Heat going to cooling water exhaust etc.
- 4.3 Exhaust gas analysis
 - 4.3.1 Smoke density measurement
 - 4.3.2 Emission measurement (Indian emission norms)
 - 4.2.3 Euro I and Euro II
- 4.4 Performance Maps
- 4.5 Selection of engine - On basis of fuel used, two-stroke or four-stroke, air-cooled or water-cooled, super charging, number and arrangement of cylinders etc.
- 4.6 Simple numerical problems

5. Gas Turbine :

- 5.1 Classification and application of gas turbines
- 5.2 Description of constant pressure (open cycle and closed cycle) and constant volume gas turbines.
- 5.3 Comparison of gas turbine and reciprocating I.C. engine
- 5.4 Methods of increasing thermal efficiency of gas turbines, regeneration, inter cooling, re-heating.
- 5.5 Simple numerical problems

6. Air Compressors :

- 6.1 Classification of compressors, uses of compressed air
- 6.2 Description of single stage and multi stage reciprocating compressors

- 6.3 P.V. diagram of single and multi stage reciprocating compressor with inter cooling
- 6.4 Power required (without clearance volume) for single stage and multi stage compressors
- 6.5 Description of rotary and centrifugal compressors
- 6.6 Numerical problems on reciprocating compressors.

REFERENCE BOOKS :

- 1. High-Speed Combustion Engine P.M.Heldt
- 2. Automobile Engine Arthur W. Judge
- 3. Automobile Engg. Kirpal singh
- 4. Automobile Engg . R.B. Gupta
- 5. Automobile Engg. C.P.Nakra
- 6. Vehicle & Engine Technology (Vol. I & II) Heinz Heisler
- 7. Auto Design R.B. Gupta
- 8. Auto Engine Design Crouse, Anglin
- 9. Automotive Mechanics Joseph Heitner

Code	Name of Paper	Lecture	Tutorial	Practical
MA44	AUTO ENGINE	3	-	2

RATIONALE

The subject of auto engine is included in the curriculum to impart the knowledge of combustion, combustion chambers of various types and to understand the complete phenomenon of combustion air fuel system. Effect of environment on the performance of engines. This knowledge helps in understanding the subject of autoshop and garage practice and awareness with the latest trend in modern engines.

CONTENTS

1. Gas Power Cycles :

- 1.1 Otto cycle, Diesel cycle, Dual combustion cycle, Atkinson brayton cycle
- 1.2 Air standard efficiency
- 1.3 Comparison between theoretical and actual cycles
- 1.4 Effect of compression ratio on efficiency
- 1.5 Numerical Problems

2. Combustion in S.I. Engine :

- 2.1 General idea of combustion theory
- 2.2 Ignition limits of air / fuel mixture
- 2.3 Normal combustion stages
- 2.4 Effect of engine variables on ignition lag and flame propagation.
- 2.5 Rate of pressure rise
- 2.6 Abnormal combustion
- 2.7 Detonation and effects of detonation
- 2.8 Theories of detonation
- 2.9 Effect of engine variables on detonation
- 2.10 Control of detonation
- 2.11 Abnormal combustion knock
- 2.12 Surface ignition

3. S.I. Engine Combustion Chambers :

- 3.1 Basic requirements of a good combustion chamber
- 3.2 Combustion chamber design principles
- 3.3 Comparison of various types of combustion chambers with line sketches by only the position of valves and spark plugs.
- 3.4 Description of the combustion chamber namely
 - 3.4.1 Bathtub shape
 - 3.4.2 Wedge shape
 - 3.4.3 Ricardo turbulent head
 - 3.4.4 Hemispherical shape
 - 3.4.5 Recessed or cavity shapes

4. Combustion In C.I. Engines :

- 4.1 Stages of combustion
- 4.2 Air fuel ratio
- 4.3 Delay period or ignition lag
- 4.4 Variables effecting delay period
- 4.5 Diesel knock
- 4.6 Methods of controlling diesel knock

5. C.I. Engine Combustion Chambers :

- 5.1 C.I. engine combustion chambers
- 5.2 Methods of generating air swirl
- 5.3 Induction swirl and open combustion chambers
- 5.4 Compression swirl and divided or turbulent swirl chambers
- 5.5 Combustion induced swirl and divided chambers

6. I.C. Engine Fuels :

- 6.1 Petroleum and non petroleum base liquid fuels
- 6.2 Chemical structure of liquid petroleum fuel
- 6.3 Gaseous fuels
- 6.4 Heating value of fuels (concept only)
- 6.5 Rating of S.I. fuels
 - 6.5.1 Knock rating - octane no.
 - 6.5.2 Highest useful compression ratio (H.U.C.R.)
 - 6.5.3 sensitivity
 - 6.5.4 Performance number
- 6.6 Effect of chemical structure of fuel on knocking
- 6.7 Chemical control of knocking - Gasoline additives
- 6.8 Rating of C.I. fuel - cetane no
- 6.9 Effects of fuel structure on C.I. engine ignition quality additives for C.I. engine fuels
- 6.10 Important characteristic required for S.I., C.I. and gas turbine fuels gas turbine fuels.
- 6.11 Introduction to gaseous fuel such as natural gas, producer gas.
- 6.12 Introduction to alternative fuels for I.C. engines, elementary idea of petroleum refining.

7. Air Fuel System for S.I. Engine :

- 7.1 Types of fuel feed system :
 - 7.1.1 Gravity feed
 - 7.1.2 Pump feed
- 7.2 Fuel filters
- 7.3 Air cleaner - dry type, wet type
- 7.4 Carburation
 - 7.4.1 Purpose of carburation
 - 7.4.2 Theory of simple carburetor
 - 7.4.3 Carburetor classification
 - 7.4.4 Concept of constant choke and constant vacuum class of carburetors
 - 7.4.5 Engine air /fuel mixture requirements
 - 7.4.6 Transient and steady state requirements
 - 7.4.7 Typical performance curves of carburetor
 - 7.4.7.1 Air flow v/s air / fuel ratio
 - 7.4.7.2 Throttle opening v/s air / fuel ratio
- 7.5 Carburetor Systems :
 - 7.5.1 Float
 - 7.5.2 idling
 - 7.5.3 low speed
 - 7.5.4 high speed (main metering)

7.5.5 Power enrichment

7.5.6 acceleration

7.5.7 Choke system

7.6 Fuel injection system for gasoline engine :

7.6.1 Advantages and disadvantages of fuel injection

7.6.2 Type of fuel injection

7.6.2.1 Direct injection

7.6.2.2 Port injection

7.6.2.3 Manifold injection

7.7 Method of injection

7.7.1 Timed

7.7.2 Continuous type

7.8 Introduction to mechanical fuel injection

7.9 Electronic fuel injection

7.9.1 Multi point fuel injection (MPFI)

7.9.2 Single point fuel injection

7.10 Electronics control unit (E.C.U.)

7.11 Electronic fuel injection control sensors

7.12 Injection timing and duration

7.13 L.P.G. fuel system

7.14 C.N.G. System

8. Air - Fuel System for C.I. Engines :

8.1 Requirement of injection

8.2 Solid injection system

8.3 Air injection system

8.4 Component of diesel fuel system

8.5 Rotary fuel injection pump

8.6 Cold starting add for C.I. Engines

8.7 Quantity of fuel / cycle

8.8 Size of nozzle required

8.9 Spray formation

8.10 Spray direction

8.11 Injection timing

9. Super Charging :

- 9.1 Object
- 9.2 Super charging of C.I. and S.I. engine
- 9.3 Effect of super charging on performance engine
- 9.4 Method of super charging
- 9.5 Super chargers
- 9.6 Introduction to turbo charging

10. Cooling , Lubrication And Exhaust System :

- 10.1 Type of cooling system
- 10.2 Coolants
- 10.3 Basic requirements of lubricants
- 10.4 Properties of the lubricating oil
- 10.5 Service rating of oil
- 10.6 Classification of lubricating oil
- 10.7 Exhaust system
- 10.8 Exhaust manifold muffler
- 10.9 Catalytic converter

11. Miscellaneous :

- 11.1 Working principle of
 - 11.1.1 Striling engine
 - 11.1.2 Wankel rotary engine
 - 11.1.3 Turbojet
 - 11.1.4 Ram jet engine
 - 11.1.5 Free piston engine

PRACTICALS

1. Dismantling and assembling of petrol engine.
2. Dismantling and assembling of diesel engine.
3. Checking and preparing measurement sheet for petrol / diesel engine
4. Fault finding in following system
 - 4.1 Cooling system
 - 4.2 Lubrication system
 - 4.3 Fuel system
 - 4.4 Ignition system
 - 4.5 Exhaust system
5. Tune-up of engine by tuning equipment
6. Finding out the I.P, B.P and mechanical efficiency by Morse test.

7. Preparing heat balance sheet.
8. Emission measurement by smoke meter and exhaust gas analyser.

REFERENCE BOOKS :

1. Internal Combustion Engines M.L.Mathur & R.P.Sharma
2. Automobile Engines Dr. Kirpal singh
3. Automobile Engine Arthur W.Judge.
4. Automobile Engg. R.B. Gupta
5. Automobile Engg. H. Croure
6. I.C. Engines Lester C. Lichty.

Code	Name of Paper	Lecture	Tutorial	Practical
MA45	WORKSHOP TECHNOLOGY - I	2	-	6

ME 45

RATIONALE

This subject would impart the knowledge of various production machinery. The knowledge of metal cutting would help the student in acquiring requisite skills to open up his own workshop or in an industry.

CONTENTS

1. Cutting Tools and Materials :

1.1 Cutting tools

- 1.1.1 Standard shape of single point tool
- 1.1.2 Cutting angles, effect of rake angle, importance of clearance angle
- 1.1.3 Heat produced by cutting and its effect
- 1.1.4 Cutting speed, feed and depth of cut

1.2 Materials

- 1.2.1 Materials of cutting tools and their properties
- 1.2.2 High-speed steel, cobalt steel, tungsten carbide, cemented carbide, stellite, diamond, ceramics.

2. Lathe Machine :

- 2.1 Specifications, Classification of lathe machines
- 2.2 Constructional features of a centre lathe and its function
- 2.3 Functions of various parts of lathe
- 2.4 Different operations, which can be performed on the centre, lathe with and without attachments.
- 2.5 Calculation of gear trains for thread cuttings
- 2.6 Lathe attachments and lathe accessories.

3. Drilling Machines :

- 3.1 Description, working and uses of different drilling machines, Multi spindle drill, gang drill, deep hole drill and small diameter hole drill machines.
- 3.2 Specifications and constructional features of radial arm and upright drilling machines
- 3.3 Work holding devices, tool holding devices
- 3.4 Description and types of drills and reamers
- 3.5 Various operations of drilling machines e.g. drilling, reaming, boring, counter-boring, counter sinking, spot facing, tapping.
- 3.6 Selection of drill
- 3.7 Cutting speed and feed according to material of job.

4. Shaping, Planning and Slotting Machines :

- 4.1 Description, working and uses of various types of shapers, planers and slotters
- 4.2 Specification, constructional features of a shaper and planner in detail
- 4.3 Mechanism used in shaper - crank and slotted link, whitworth quick return and hydraulic mechanism, Feed mechanism
- 4.4 Mechanism of planner
- 4.5 Various work holding devices and clamping devices used on shaper and planner
- 4.6 Various shaper and planner operations
- 4.7 Shaper and planner tools
- 4.8 Cutting speed, feed and depth of cut on shaper and planner
- 4.9 Difference between shaper, planner and slotter

5. Cutting Fluids and Cooling Process :

- 5.1 Difference between cutting fluid and coolant
- 5.2 Functions of cutting fluid and its action
- 5.3 Requirements of good cutting fluid

5.4 Types of cutting fluids

5.5 Selection of cutting fluids for different material and operations.

PRACTICALS

1. Grinding of various types of single point cutting tool
2. Simple exercise on Lathe Machine involving following operation
 - 2.1 Simple turning, facing, step turning, Grooving and knurling and taper turning, by compound rest
 - 2.2 Facing, drilling, boring and step turning, parting off.
 - 2.3 Taper turning by tails tock off set method
 - 2.4 V threading, square threading and taper threading by attachment
 - 2.5 A utility job on lathe machine with an accuracy of ± 0.2 mm
3. Preparing a M.S. block with all faces finished and V grooved on shaper machine
4. Planning practice on a planner on a rectangular C.I plate.
5. Internal slot cutting on the slotter machine

REFERENCE BOOKS :

1. Workshop Technology (Hindi) - II Tahil Manghnani
2. Workshop Technology (Hindi) - II B.S.Raghuvanshi
3. Workshop Technology - II Hazra & Chaudhary.
4. Workshop Technology (Hindi) S.K.Bhatnagar
5. Production Technology R.K. Jain
6. All about M/C tools Gerling

Code	Name of Paper	Lecture	Tutorial	Practical
MA46	METROLOGY	2	-	2

ME 46

RATIONALE

Technicians have to carry out the job of measurement and inspection in the factories for controlling the quality of products. Therefore they must have the knowledge of science of measurements or metrology. They must be familiar with the concept and technique of inspection and quality control methods.

This subject i.e. Metrology has been designed to impart all the related and concerned knowledge to the student to fulfill the need.

The content of syllabus broadly includes linear and angular measurement of surfaces, measurements by comparators, light wave interferometry, gear, screw measurements and inspection.

Finally, to develop the skill in measurement a list of practicals is also given which should be carried out by the students in metrology laboratories.

CONTENTS

1. Introduction :

- 1.1 Units and standards of measurement
- 1.2 International, National and company standards
- 1.3 Line and end standards
- 1.4 Errors in measurement
- 1.5 Precision and accuracy

2. Linear and Angular Measurement :

- 2.1 Vernier calliper, micrometers, height and depth gauges
- 2.2 Bevel protractor, sine bar, slip gauges, angle gauges and clinometers
- 2.3 Auto collimator, angle dekkar,
- 2.4 Taper measurements
- 2.5 Cylinder bore gauge, Telescopic gauge, feeler and wire gauge

3. Measurement of Surface Finish :

- 3.1 Meaning of surface texture, primary and secondary texture
- 3.2 Terminology of surface roughness
- 3.3 Factors affecting surface finish
- 3.4 Representation of surface roughness parameters CLA and RMS values
- 3.5 Comparison and direct instrument methods of surface finish measurements.

4. Comparators :

- 4.1 Classification, advantages and working mechanism of dial indicators, passmeters
- 4.2 Mechanical, Electrical, Electronic and pneumatic comparators

5. Light Wave Interference :

- 5.1 Principle of interference
- 5.2 Interferometry applied to flatness testing
- 5.3 N.P.L. flatness interferometer

6. Gear and Screw Measurement :

- 6.1 Screw thread terminology, errors in threads
- 6.2 Effective diameter measurement by two wire and three wire methods
- 6.3 Major and minor diameter measurement, Thread micrometers
- 6.4 Gear tooth terminology
- 6.5 Gear tooth vernier calliper and its application
- 6.6 Measurement of gear pitch.

7. Limits, Fits and Tolerance :

- 7.1 Interchangeability - control and need
- 7.2 Definitions and Terminology of limits, fits and tolerances
- 7.3 Basis of limit system
- 7.4 Type of fits
- 7.5 Limit gauges

8. Machine Tool Metrology :

- 8.1 Alignment tests
- 8.2 Performance tests
- 8.3 Alignment test on lathe and drilling machine

9. Inspection :

- 9.1 Inspection - concept, need and methods
- 9.2 Types of inspection.

PRACTICALS

- 1. Internal and External measurement with the vernier calliper
- 2. Internal and External measurement with micrometer
- 3. Measurement with height and depth gauges.
- 4. Measurement with dial indicator using surface plate and accessories for -
 - 4.1 Flatness
 - 4.2 Concentricity
- 5. Measurement with combination set and bevels protractor
- 6. Measurement of thread characteristics
- 7. Study and use of slip gauges

8. Study of limit gauges.
9. Internal and External taper measurement.
10. Measurement of gear characteristics
11. Measurement of angle with sine bar and slip gauges
12. Study and use of comparators
13. Study and use of tool room microscopes.
14. Measurement of bore with cylinder dial gauge for ovality and taper.
15. Measurement of worn out I.C. Engine piston, clearance between cylinder and piston and between bearing and journal

Note : Industrial visit can be arranged to show these practicals to the students.

REFERENCE BOOKS :

1. Engineering Metrology R.K.Jain
2. Engineering Precision Metrology R.C.Gupta
3. Engineering Metrology (Hindi) Mittal
4. Engineering Metrology (Hindi) Bhatnagar.
5. Engineering Metrology R.K.Rajput
6. Metrology Lab Manual Adithen, Bahl
7. Metrology M. Mahajan

Code	Name of Paper	Lecture	Tutorial	Practical
MA47	THEORY OF MACHINES	3	2	-

ME 47

RATIONALE

An engineer should be well acquainted with the motion of mechanism of different machine element. With this view the study of Theory of machine is very much important. The contents of this subject include simple mechanism, kinematics of machine, dynamics of reciprocating parts, friction involved in the machine elements, power transmission, governors, balancing and vibrations in machine.

CONTENTS

1. Simple Mechanism :

- 1.1 Introduction to link, kinematic pair, kinematic chain, structure, mechanism, machine
- 1.2 Slider crank mechanism and its inversion
- 1.3 Double slider crank chain
- 1.4 Example of mechanism with higher pairs

2. Velocity and Acceleration in Mechanism :

- 2.1 Velocity diagrams of four bar and single slider crank mechanisms by relative velocity method and instantaneous centre method
- 2.2 Acceleration diagram of four bar chain and reciprocating engine mechanism

3. Dynamics of Reciprocating Parts :

- 3.1 Analytical method for velocity and acceleration of piston
- 3.2 Piston effort, crank pin effort, turning moment diagrams
- 3.3 Fluctuation of energy and speed
- 3.4 Energy of a flywheel
- 3.5 Calculating the weight of flywheel.

4. Friction :

- 4.1 Friction of collars and pivots
- 4.2 Friction clutches-plate clutch and centrifugal clutch
- 4.3 Friction in journal bearings
- 4.4 Rolling friction
- 4.5 Prony brake, Rope brake and Froude's hydraulic dynamometer.

5. Transmission of Power :

- 5.1 Flat and V-belt drives
- 5.2 Velocity ratio of belt drives, slip in belt, and creep in belt.
- 5.3 Length of open and cross belt drives
- 5.4 Power transmitted by a belt
- 5.5 Ratio of driving tension, centrifugal tension, Condition for the maximum power transmission, initial tension in the belt.
- 5.6 Chain drives - types of chain drives roller chain and inverted tooth chain.
- 5.7 Gear drives - Types of gear wheels, proportions of gear tooth
- 5.8 Gear trains - Simple gear train, compound gear train, reverted gear train and simple epicyclical gear train.

6. Balancing :

- 6.1 Static and dynamic balancing
- 6.2 Balancing of single rotating mass by a single mass in the same plane, by two masses rotating in different planes.
- 6.3 Partial primary balancing of a single cylinder reciprocating engine

7. Vibration :

- 7.1 Causes of vibrations in machine, their effects and method of reducing them
- 7.2 Free or natural vibration
- 7.3 Forced vibration
- 7.4 Damped vibration.

REFERENCE BOOKS :

- 1. Theory of Machines Jagdishlal
- 2. Theory of Machines R.S.Khurmi
- 3. Theory of Machines Abdullah Sharif
- 4. Theory of Machines Malhotra, Gupta
- 5. Theory of Machines S.S. Ratan

Ective

Code	Name of Paper	Lecture	Tutorial	Practical
CH571	'C' PROGRAMMING	2	-	2

Common for All Branches of Engineering except CS & IT

RATIONALE

'C' is computer programming language and also structured programming language. In 'C' programming language we consider various syntax used in programming. By having good knowledge of 'C', students can write modular application and system programs. 'C' can be used in the engineering applications. By acquiring a sound knowledge of 'C' students will be able to understand the concept of all the application areas. This course is specially designed for engineering students of all diploma streams.

CONTENTS

1. Introduction :

- 1.1 Scope of 'C' Language
- 1.2 Distinction and similarities with other HLLs
- 1.3 Special features and Application areas

2. Elements of 'C' :

- 2.1 Character set
- 2.2 Key words
- 2.3 Data types
- 2.4 Constants and Variables
- 2.5 Operators: unary, binary, ternary
- 2.6 Operator precedence

3. Console Input-Output :

- 3.1 Types of I-O
- 3.2 Console I-O
- 3.3 Unformatted console I-O: getchar(), putchar(), gets(), puts(), getch(), getche()
- 3.4 Formatted I-O: scanf(), printf()

4. Control Flow :

- 4.1 Statements and blocks
- 4.2 if
- 4.3 switch
- 4.4 Loops: for, while, do-while
- 4.5 goto and labels
- 4.6 break, continue, exit
- 4.7 Nesting control statements

5. Arrays :

- 5.1 Basic concepts
- 5.2 Memory representation
- 5.3 One dimensional array
- 5.4 Two dimensional array

6. Functions :

- 6.1 Basic concepts
- 6.2 Declaration and prototypes
- 6.3 Calling
- 6.4 Arguments
- 6.5 Scope rules
- 6.6 Recursion
- 6.7 Storage classes types
- 6.8 Library of functions: math, string, system

7. Pointers :

- 7.1 Basic concepts
- 7.2 &, * operator
- 7.3 Pointer expression: assignment, arithmetic, comparison
- 7.4 Dynamic memory allocation
- 7.5 Pointer v/s Arrays

8. Structure and Enumerated Data Types :

- 8.1 Basic concepts
- 8.2 Declaration and memory map
- 8.3 Elements of structures
- 8.4 Enumerated data types : typedef, enum
- 8.5 Union

PRACTICALS

- 1. Problems based on arithmetic expression, fixed mode arithmetic.
- 2. Problems based on conditional statements and control structures.
- 3. Problems based on arrays (1-D, 2-D), functions and pointers.
- 4. Problems based on Engineering applications.

REFERENCE BOOKS :

- 1. 'C' Programming Stephen Kochan
- 2. Programming with 'C' Schaum's Series
- 3. 'C' Programming V.Balguru Swami
- 4. 'C' Programming Kernighan & Ritchie
- 5. Let us 'C' Yashwant Kanetkar

Ective - II

Code	Name of Paper	Lecture	Tutorial	Practical
CH572	COMPUTER IN BUSINESS SYSTEMS	2	-	2

Common for All Branches of Engineering except CS & IT

RATIONALE

Computer is a tool, which can be applied to any field. It is not necessary to apply it in only engineering application but can be applied to various commercial applications equally. The student from engineering streams must have some knowledge about commercial application, as these are basic need for every one. This course is aimed to fulfil all the requirements of some one in commercial applications using FoxPro.

CONTENTS

1 Business Data Processing :

- 1.1 Business System
- 1.2 Management Functions
- 1.3 Levels of Management
- 1.4 Information Requirement
- 1.5 Basic tasks in business data processing
- 1.6 Examples of business data processing Payroll, Financial, Accounting, Inventory

2 Business Files :

- 2.1 Files, Records, Fields, Elements
- 2.2 Fixed and Variable Length Records
- 2.3 Master File, Transaction File
- 2.4 Record Updating in Sequential File and Direct File

3 Design, Analysis and Development of :

- 3.1 Computerized Invoicing
 - 3.1.1 Data Entry Screens
 - 3.1.2 Validations
 - 3.1.3 Receipt Data Entry
 - 3.1.4 Reports
- 3.2 Computerized Payroll
 - 3.2.1 Factors Involved in Payroll
 - 3.2.2 Exposure to structure, processing and reports
 - 3.2.3 File maintenance
- 3.3 Computerized Inventory Control
 - 3.3.1 Introduction and Aim of Inventory
 - 3.3.2 Inventory Costs
 - 3.3.3 Inventory Control Process

- 3.3.4 Inventory transactions
- 3.3.5 Inventory reports

4 FoxPro (A tool for Business System) :

- 4.1 Starting FoxPro
- 4.2 FoxPro Menus and Menu Options, Elementary Level
- 4.3 Creating Data Base File (DBF)
- 4.4 Adding and Editing Records : Browse, Append
- 4.5 Viewing Records
- 4.6 SET commands : Talk, Date, Century, Default, Printer, Deleted, Safety
- 4.7 Querying DBF : Simple and RQBE
- 4.8 Updating, Deleting and recalling records
- 4.9 Sorting, Indexing and Searching
- 4.10 Screen, Label, Menu, Report Generator

PRACTICALS

- 1. Hands on Experience with FoxPro
- 2. Creating Simple DBF, adding record, viewing data
- 3. Creating a simple DBF for Invoice
- 4. Querying Invoice DBF
- 5. Creating a simple DBF for Payroll
- 6. Report Generation for Payroll
- 7. Creating Inventory DBF
- 8. Inventory Report Generation

REFERENCE BOOKS :

- 1. FoxPro Made Simple R.K.Taxali
- 2. Business Systems Satish Jain
- 3. Computer Fundamentals V.K.Kapoor
- 4. FoxPro Programming Michael P.Antonovich, Galgotia Pub.

Elective IV

Code	Name of Paper	Lecture	Tutorial	Practical
CE671	MANAGEMENT	2	2	-

Common for All Branches of Engineering

RATIONALE

To achieve the target and goals in an organisation it is essential to co-ordinate the entire system. For this purpose the knowledge of principles of management, human resources development, material management and financial management is required.

CONTENTS

1. Principles of Management :

- 1.1 Management, administration and organisation, difference between them.
- 1.2 Scientific management : Meaning, characteristics, object and advantage : Taylor's scientific management - Fayol's principles of management, functions of management
- 1.3 Types of ownership, sole trading, partnership, joint stock, co-operative and public enterprise
- 1.4 Types of organisation, different types and their charts.
- 1.5 Importance of human relation professional ethics
- 1.6 Need for leadership, leadership qualities
- 1.7 Motivation

2. Human Resources Development :

- 2.1 Introduction, object and functions of human resource development department
- 2.2 Recruitment, sources and methods of selection, need for effective training, method of training, duties of supervisor / Foremen, role of HRD in industries.

3. Wages and Incentives :

- 3.1 Definition and requirements of a good wage system methods of wage payment
- 3.2 Wage incentives - type of incentive, difference in wage incentive and bonus, incentive to supervisor.

4. Material Management :

- 4.1 Purchasing Functions and duties of purchase department organisation of purchase department, methods of purchasing, purchase order contracts, legality of contracts types of contracts i.e. piece work contract, lumpsum contract, item rate contract, percentage contract, merits and limitation of each contract system, departmental execution of works, rate contract - D.G.S & D and C.S.P.O. tender, necessity, types of tenders, tendering procedure, earnest money and security money
- 4.2 Store and store keeping : Functions and duties of store department, location and layout of store, bin cards, store ledger, receipt and issue procedure of materials, physical verification of stores, disposal method of unserviceable articles and protection of stores.

4.3 Sales : function and duties of sales department sales promotion advertisement service after sales.

5. Financial Management :

5.1 Function and duties of finance department

5.2 Brief idea of journal, ledger, trial balance, trading account, profit and loss account, balance sheet.

5.3 Cheques (crossed and bearer), draft, promissory note, letter of credit, brief idea of cost accounting.

5.4 Numerical problems.

6. Marketing Management :

6.1 Concept of Marketing

6.2 Problems of Marketing

6.3 Pricing policy

6.4 Distribution channels and methods of marketing

7. Tax System and Insurance :

7.1 Idea of income tax, sales tax, excise duty and custom duty

7.2 Industrial and fire insurance, procedure for industrial insurance.

8. Labour Legislation and Pollution Control Acts :

8.1 Industrial acts : factory act 1948

8.2 Workmen's compensation act 1923

8.3 Apprentices act 1961

8.4 Water pollution contract act 1974 and 1981

8.5 Air pollution contract act 1981

8.6 Environmental protection act 1986

8.7 Forest (animal conservation act 1972)

8.8 Pollution control provisions in motor vehicle act.

9. Entrepreneurship Development :

9.1 Role of entrepreneurship and its advantages

9.2 Distinction between an entrepreneur and a manager

9.3 Project identification and selection

9.4 Project formulation

9.5 Project appraisal

REFERENCE BOOKS :

1. Industrial Management V.K. Sharma & O.P. Harkut
2. Industrial Engg. & Management O.P. Khanana
3. Industrial Engg. & Management T.R. Banga

Code	Name of Paper	Lecture	Tutorial	Practical
CE672	ENTREPRENEURSHIP DEVELOPMENT	2	2	-

Common for All Branches of Engineering

RATIONALE

This subject will introduce the students about how to set up a small-scale industry. The subject includes the procedure for how to select, proceed and start the SSI, which also involves a concrete market survey report and project formulation.

CONTENTS

1. Entrepreneurship :

- 1.1 Role of entrepreneurship and its advantage
- 1.2 Classification of industries (based on scale)
- 1.3 Classification of industries (based on type)

2. Industrial Policy :

- 2.1 New industrial policy
- 2.2 M.R.T.P. act.

3. Entrepreneurial Development :

- 3.1 Product identification/ selection
- 3.2 Site selection
- 3.3 Plant layout
- 3.4 Institutional support needed
- 3.5 Pre-market survey

4. Entrepreneurship Support System:

- 4.1 Role of District Industries Centre in setting up industry
- 4.2 Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMDC
- 4.3 Role of state finance corporation, state electricity board, pollution control board, RAJCON, BIS, I.S.O. etc.

5. Setting up SSI :

- 5.1 Registration of SSI
- 5.2 Allotment of land by RIICO
- 5.3 Preparation of project report
- 5.4 Structure of organisation
- 5.5 Building construction
- 5.6 Establishment of machines

6. Raw Material Management :

- 6.1 Allotment of iron and steel, coke/ coal
- 6.2 Allotment of other indigenous raw material from NSIC
- 6.3 Allotment of imported raw material and parts

7. Marketing Facilities :

- 7.1 Supply of product to state govt, to defence, to railways, to CSPO, to CSD
- 7.2 Participation in international exhibition and fairs, trade centres, state emporium and departmental stores
- 7.3 Quality consciousness and its effect on product sales

8. Financial Sources for SSI :

- 8.1 Various institutions providing loans for industries
- 8.2 Various types of loans
- 8.3 Subsidies

9. Contracts and Tenders :

- 9.1 Type of contracts
- 9.2 Necessity of contract and tenders
- 9.3 Type of tenders
- 9.4 Tendering procedure

10. Project Report :

- 10.1 Procedure of preparing a project report
- 10.2 Format of project report
- 10.3 Preparation of project report for some SSI items

11. ISO : 9000 Series of Quality System :

- 11.1 Definition of few important terms related to ISO quality system
- 11.2 Various models for quality assurance in ISO : 9000 series
- 11.3 Various elements of ISO : 9001 model (20 points)

- 11.4 Benefits by becoming an ISO : 9000 company
 - 11.5 Introduction to total quality management (TQM)
-

REFERENCE BOOKS :

- 1. Hand Book of Small Scale Industry P.M. Bhandari
- 2. Hand Book on Entrepreneurship Development O.P. Harkut
- 3. Entrepreneurial Development S.S. Khanka
- 4. Statistical Quality Control Mahohar Mahajan
- 5. ISO : 9000 Quality System S. Dalela

Code	Name of Paper	Lecture	Tutorial	Practical
CE672	ENTREPRENEURSHIP DEVELOPMENT	2	2	-

Common for All Branches of Engineering

RATIONALE

This subject will introduce the students about how to set up a small-scale industry. The subject includes the procedure for how to select, proceed and start the SSI, which also involves a concrete market survey report and project formulation.

CONTENTS

1. Entrepreneurship :

- 1.1 Role of entrepreneurship and its advantage
- 1.2 Classification of industries (based on scale)
- 1.3 Classification of industries (based on type)

2. Industrial Policy :

- 2.1 New industrial policy
- 2.2 M.R.T.P. act.

3. Entrepreneurial Development :

- 3.1 Product identification/ selection
- 3.2 Site selection
- 3.3 Plant layout
- 3.4 Institutional support needed
- 3.5 Pre-market survey

4. Entrepreneurship Support System:

- 4.1 Role of District Industries Centre in setting up industry
- 4.2 Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMDC
- 4.3 Role of state finance corporation, state electricity board, pollution control board, RAJCON, BIS, I.S.O. etc.

5. Setting up SSI :

- 5.1 Registration of SSI
- 5.2 Allotment of land by RIICO
- 5.3 Preparation of project report
- 5.4 Structure of organisation
- 5.5 Building construction
- 5.6 Establishment of machines

6. Raw Material Management :

- 6.1 Allotment of iron and steel, coke/ coal
- 6.2 Allotment of other indigenous raw material from NSIC
- 6.3 Allotment of imported raw material and parts

7. Marketing Facilities :

- 7.1 Supply of product to state govt, to defence, to railways, to CSPO, to CSD
- 7.2 Participation in international exhibition and fairs, trade centres, state emporium and departmental stores
- 7.3 Quality consciousness and its effect on product sales

8. Financial Sources for SSI :

- 8.1 Various institutions providing loans for industries
- 8.2 Various types of loans
- 8.3 Subsidies

9. Contracts and Tenders :

- 9.1 Type of contracts
- 9.2 Necessity of contract and tenders
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10. Project Report :

- 10.1 Procedure of preparing a project report
- 10.2 Format of project report
- 10.3 Preparation of project report for some SSI items

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- 11.1 Definition of few important terms related to ISO quality system
- 11.2 Various models for quality assurance in ISO : 9000 series
- 11.3 Various elements of ISO : 9001 model (20 points)
- 11.4 Benefits by becoming an ISO : 9000 company
- 11.5 Introduction to total quality management (TQM)

REFERENCE BOOKS :

- 1. Hand Book of Small Scale Industry P.M. Bhandari
- 2. Hand Book on Entrepreneurship Development O.P. Harkut
- 3. Entrepreneurial Development S.S. Khanka
- 4. Statistical Quality Control Mahohar Mahajan
- 5. ISO : 9000 Quality System S. Dalela

Code	Name of Paper	Lecture	Tutorial	Practical
CE673	PRODUCTION SYSTEM MANAGEMENT	2	2	-

Common for All Branches of Engineering

RATIONALE

Diploma holders are responsible for controlling various production activities, which are not directly related to shop floor. These activities are new product design, Demand forecasting, capacity planning, material requirement planning etc. A diploma engineer should also be

aware about new techniques used for manufacturing like group technology and JIT manufacturing.

CONTENTS

1. Introduction :

- 1.1 Production and production management
- 1.2 Objectives of production management
- 1.3 Functions and scope of production management

2. New Product Design :

- 2.1 Product life cycle
- 2.2 Product policy of an organisation
- 2.3 Selection of a profitable product
- 2.4 Product design process and product analysis

3. Demand Forecasting :

- 3.1 Need for demand forecasting
- 3.2 Long term and short term forecasts
- 3.3 Classification of forecasting methods
- 3.4 Various forecasting methods

4. Production Planning and Control :

- 4.1 Objective and function of PPC
- 4.2 Comparison between production planning and production control
- 4.3 Information requirement of PPC
- 4.4 Organisation for PPC
- 4.5 Manufacturing method and PPC
- 4.6 Problems of PPC

5. Capacity Planning :

- 5.1 Measurement of capacity
- 5.2 Capacity planning
- 5.3 Estimating future capacity needs
- 5.4 Aggregate planning
- 5.5 Master production schedule

6. Material Requirement Planning :

- 6.1 Objectives and functions of MRP
- 6.2 MRP system
- 6.3 Management information from MRP
- 6.4 Lot sizing consideration
- 6.5 Manufacturing resource planning (MRP - II)

7. Process Planning :

- 7.1 Process and equipment selection
- 7.2 Machine requirement
- 7.3 Machine output
- 7.4 Manpower planning
- 7.5 Line balancing
- 7.6 Process planning

8. Production Control :

- 8.1 Loading
- 8.2 Sequencing
- 8.3 Assignment model
- 8.4 Scheduling
- 8.5 Despatching

9. Make or Buy Decision :

- 9.1 Make or buy decision making
- 9.2 Factors influencing make or buy decision
- 9.3 Functional aspects of make or buy decision

10. Application of LPP in Production Management :

- 10.1 Product mix decision
- 10.2 Standard form of linear programming problem
- 10.3 Formulation of L.P. problem
- 10.4 Graphical method (only) for solving problems

11. Group Technology :

- 11.1 Concept of group technology
- 11.2 Group layout
- 11.3 Stages in group technology manufacturing
- 11.4 Benefits of G.T.

12. Just in Time Manufacturing :

- 12.1 Concept of JIT
- 12.2 Seven wastes

- 12.3 Basic element of JIT
 - 12.4 Benefits of JIT
-

REFERENCE BOOKS :

1. Industrial Engg. & Production Management Martand Telsang,
2. Production Management Jain & Agarwal
3. Production Management System S.C. Sharma

Branch: Automobile Engineering V Semester

Course: BTAE 501 Automobile Engineering - I

Unit I

Historical Development of Automobiles classification of Automobiles, Type of Automobile Engines, Principle of engine operation, classification of engine, engine parts and their function, cylinder head, piston, piston rings, piston pin, connecting rod, crank shaft, flywheel, camshaft, valve and valve mechanism and crank case.

Unit II

Fuel system in petrol engine, carburetion, petrol injection system.

Unit III

Fuel system in Diesel Engine – Diesel fuel pump principle, fuel pump, simple and multiple unit pumps, C. A. V. Bosch pump, modern distributors type fuel pumps.

Unit IV

Cooling system in Automobile- Lubricants system – ignition system and super charging.

Unit V

Dual Fuel & Multi Fuel Engine: Combustion in Dual Fuel engines factors affecting combustion in dual fuel engines performance of dual fuel engines, advantages of dual fuel engines.

Multifuel engines, characteristics of Multifuel engines, modification of fuel system, performance of multifuel engines. Brief introduction to working of stratified charged engine, Stirling engine, wank engine, variable compression engine, Air Cleaners & Silencers.

Text Book:

1. A Course in IC Engine by M. L. Mathur & R. P. Sharma, (Dhanpat Rai Publications)
2. Automotive mechanics by William H. Crouse, Donald L. Anglin, Tata McGraw Hill Publications.

Note: Practicals of the subject will be based on above contents.

Branch: Automobile Engineering, V Semester

Course: BTAE 502 Automotive Transmission

Unit I

TRANSMISSION REQUIREMENTS:

Requirements of transmission system - General arrangement of power transmission - General arrangement of rear-engined vehicle with live axles - General arrangement of dead- axle and axleless transmission - Four wheel drive transmission.

Unit- II

CLUTCHES:

Requirements of clutches - Principle of friction clutch - Types: Cone clutch, Single-plate clutch, Diaphragm spring clutch, Multi-plate clutch, Centrifugal clutches, Ferlec Electromagnetic clutch - Materials used - over running clutch - Principle of construction and design details of roller and sprag types of clutches.

Unit- III

GEAR BOX:

Requirements of Gear boxes - Different types of gear boxes: Sliding mesh, Constant mesh gear boxes, Epicyclic gear box - Synchronizers: Principle, Early Warner Synchronizer, Later Warner Synchronizer, Vauxhall Synchronizer - Gear materials - Lubrication and design of Gear box.

Unit- IV

HYDRDYNAMIC DRIVE:

Advantages and limitations - Fluid coupling - Principle of operation of fluid coupling - constructional details of a typical fluid coupling - torque capacity - performance characteristics - Drag torque - Methods of minimizing drag torque.

Unit-V

TORQUE CONVERTER:

Principle of operation - Performance characteristics - Single and multistage and polyphase torque converters - Converter - couplings - Performance characteristics of converter - coupling - Blade angles and fluid flow - Design of converter blade ngles - Constructional details of typical torque converter - Converter fluids.

Unit - VI**AUTOMATIC TRANSMISSION:**

Chevrolet "Turboglide" Transmission - Powerglide Transmission - Hydraulic control systems of automatic transmission.

Unit- VII**HYDROSTATIC DRIVE:**

Advantages and limitations - Various types of hydrostatic systems - principles of hydrostatic drive systems - Comparison of hydrostatic drive with hydrodynamic drive - Construction and working of typical Jahn Hydrostatic drive.

Unit- VIII**ELECTRIC DRIVE:**

Advantages and limitations - Principles of early and modified Ward Leonard control systems - Modern electric drives for buses. Performance Characteristics.

TEXT:

1. Heldt, P.M., Torque converters, Chilton Book Co.

REFERENCE:

1. Newton, Steeds & Garrot, Motor Vehicles, Iliffe Publishers.
2. Judge, A.W., Modern Transmission Systems, Chapman & Hall Ltd.
3. Check Chart, Automatic Transmission, A Harper & Row Publication.

Course Contents

Category of Course	Course Title	Course Code	Credits-6C			Theory Papers (ES)
			L	T	P	
Departmental	Instrumentation & Metrology	BTAE 503	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
Core			3	1	2	

Branch: Automobile Engineering, V Semester

Course: BTAE 503 Instrumentation & Metrology**Unit I****UNITS AND STANDARDS:**

Fundamental units, supplementary units, derived units, Micrometer, Vernier type instruments, Comparators, Limits, Fits, Tolerances, Slip gauges, Ring gauges, Snap gauges, Go and No Go gauges.

Unit - II**SCREW THREAD AND GEAR MEASUREMENT:**

Thread gauges, Three wire and two wire method of thread measurement, Gear tooth vernier caliper, Gear checking methods, Angle measurement, Vernier protractor, Sine bar, Spirit Level, Surface finish measurement.

Unit - III**PRESSURE MEASUREMENT:**

Bourdon's pressure gauge, Diaphragms & Bellows as pressure sensors, Inductive, Resistive capacitive and piezo electric transducers for pressure measurement, Farnboro Engine

indicator, High speed engine indicators using piezo electric transducers, low pressure measurement using Pirani gauge, Thermocouple thermal conductivity gauges.

Unit - IV

TEMPERATURE MEASUREMENT:

Physical change measuring thermometers, Liquid expansion, Vapour pressure and bimetal thermometers, Resistance thermometers and their measuring circuits, Thermistors, Thermocouple, Thermocouple laws, Different types of thermocouples, Optical pyrometers.

Unit - V

FLOW MEASUREMENT:

Orifice plate, venturimeter, Flow nozzles, Pitot tubes, Rotameters, Alcock viscous flow meters, Hot wire anemometers, Ultrasonic flowmeters.

Unit - VI

LOAD AND TORQUE MEASUREMENT:

Force measuring devices, Balances, Platform scale weight bridges, Load cell, Torque measurement, Prony brake, Water brake, Hydraulic dynamometers, Transmission Dynamometers, Chassis Dynamometers.

TEXT :

1. Patnabis D. Principles of Industrial Instrumentation, Tata McGraw Hill, Publishing Co. New Delhi.

REFERENCE BOOKS :

1. Rangan, Sarma & Mani, Instrumentation Devices and Systems, Tata McGraw Hill Publishing Co. Ltd., New Delhi.
2. Beckwith, T.G. & Buck, N.L. Mechanical Measurements, Oxford and IBH Publishing House, New Delhi.
3. Judge, A. W. Engineering Precision Measurements, Chapman & Hall Ltd. 37, Essex Street, W.C.2.
4. Jain.R.K. Mechanical & Industrial Measurements, Khanna Publishers, New Delhi.

Branch: Automobile Engineering, V Semester

Course: BTAE 504 Engineering Design

Unit I

INTRODUCTION:

Classification of Design-National and International Symbols- Engineering materials and their physical properties as applied to design-Selection of materials - Factor of safety in design- Dimensioning and detailing- Elementary concepts of functional, aesthetic and form design- Principles of design optimization - Future trends- CAD. Euler's formula. End fixity co-efficient - Radius of gyration and plane of buckling. Rankine's formula- Tetmajer's formula- Johnson formula. Design of push rods and eccentrically loaded columns.

Unit II

STATIC AND VARIABLE STRESSES:

Static and variable loading in machine elements-Stress concentration- Goodman and Soderberg method for design- Design of power transmission shafts- subjected to torsion, bending and axial loads- design of closely coiled helical springs.

Unit III

GEAR DESIGN:

Design considerations- Strength of gear teeth. Lewis equation- Dynamic tooth load. Design of helical gears, Herringbone gears, Bevel Gears and worm gears.

Unit - IV

FLYWHEELS:

Determination of the mass of a flywheel for a given coefficient of speed fluctuation. Engine flywheels stresses in rim of flywheels. Design of hubs and arms of flywheel.

Unit - V

BEARING DESIGN:

Theory of lubrication - Bearing area - Sliding bearing and rolling bearings. Bearing materials. Design of bearing caps and bolts. Anti friction bearings. Radial ball bearings. Roller bearings. Selection of bearings. Bearing load. Temperature influence of bearings.

TEXT

1. R.S.Khurmi and J.K.Gupta, A text book of machine design.

REFERENCES:

1. R.K.Jain, Machine Design
2. J.E.Shigley, Mechanical Engineering Design, McGraw- Hill Book Co.
3. N.F.Spotts, Design of Machine Elements, Prentice Hall of India
4. PSG Design Data Handbook, Kalaikathir Publications, Coimbatore.
5. W.H.Mayall, Industrial Design for Engineers, Illiffe Books, London.
6. N.C. Pandya and C.S. Shah, Elements of machine design.

Branch: Automobile Engineering, V Semester

Course: BTAE 505 Production Technology**Unit I****THEORY OF METAL CUTTING:**

Cutting forces, Chip formation and types, tool wear and life, tool materials, cutting fluids, machinability index.

Unit -II**ADVANCE WELDING PROCESSES:**

Tungsten inert gas welding, MIG welding, Submerge arc welding, Friction and electro slag welding, Electron beam welding, Laser welding.

Unit -III**CONVENTIONAL MACHINING:**

General principles (with schematic diagrams only) of working, Types and commonly performed operations in the following Machines: Lathe, Shaper, Planner, Milling Machine and Gear cutting Grinding Machine, Concept of NC Machines.

Unit-IV**UNCONVENTIONAL MACHINING PROCESSES:**

Need for unconventional machining processes - classification - Principles (with schematic diagrams only) and applications of the following processes: Abrasive Jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Electro chemical grinding, Chemical machining, Laser beam machining, Electron beam machining, Plasma arc machining.

Unit - V**METAL FORMING AND POWDER METALLURGY:**

Basic concepts and classification of forming processes, Principles, Equipment used and application of following processes: Forging, Rolling, Extrusion, Wire drawing, Deep drawing, Spinning- Powder metallurgy- Procedural steps involved, merits and limitations, Applications.

REFERENCES~~

1. Choudhary, H. Elements of workshop technology, Vol-I, Vol-II

2. Pandey, P.C. & Shah, H.S. Modern Machining Processes, Tata McGraw Hill Publication.
3. Ghosh, R. & Mallik, A.K. Manufacturing Sciences.
4. Jain, R.K. Production Technology
5. Martin, S.J. Numerical Control of Machine Tools, The English Language Book Society, London.
6. Richard L. Little, Welding & Welding Technology, Tata McGraw Hill

Course: BTAE 601 Automotive Chassis - I

Unit I

Introduction:

Types of chassis layout with reference to power plant locations and drive. Vehicle frames. Various types of frames. Constructional details. Materials. Testing of vehicle frames. Unitised frame body construction; Loads acting on vehicle frame.

Unit II

Front Axle and Steering System:

Types of front axles, Construction details, Materials, Front wheel geometry viz. Castor. Camber, King and pin inclination, Toe-in Conditions for true rolling motion of wheels during steering. Steering geometry, Ackermans and Davis Steering System. Constructional details of steering linkages, Different types of steering gear boxes, Steering linkages and layouts, Power and power assisted steering.

Unit III

Drive Line:

Effect of driving thrust and torque reactions, Hotch Kiss drive, torque tube drive and radius rods, Propeller shaft, Universal Joints, Constant velocity universal joints, Front wheel drive.

Unit IV

Final Drive Differential:

Different types of final drive. Worm wheel, straight bevel gear, Spiral bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential Principles, Construction details of differential Unit, Non-slip differential, Differential locks, Differential housings.

Unit V

Rear Axles:

Construction of rear axles, Types of loads acting on rear axles, Full floating, Three quarter floating and semifloating rear axles, Rear axle housing, Construction of different types of axle housings: Multi axled vehicles. Construction details of multi drive axle vehicle.

Text : Heldt, P.M. Automotive chassis, Chilton Co., New York, 1990

Reference Books:

1. Steed, W. Mechanics of Road vehicles, Llliffe Books Ltd., London, 1960
2. Newton, Steeds & Garrot, Motor Vehicles, Butter worths., London, 1983
3. Judge, A.W. Mechanism of the car, Chapman and Halls Ltd., London, 1986
4. Giles, J.G. Steering, Suspension and tyres, Llliffe Book Co., London, 1988
5. Kripal Sing, Automobile Engineering. Standard Publishing Distributor. New Delhi, 1983

Note: Practical of the subject will be based on above contents

Course: BTAE 602 Automotive Electrical & Electronics

Unit I

Storage Batteries:

Principles, Construction & operation of Lead Acid Battery, Capacity, Efficiency, Rating of battery, Determination of size Electrolyte, test on Batteries, Charging methods, Battery Faults.

Unit II

Starter & charging System:

Requirements of starting system, Characteristics of starter motor, types of starting motor drive mechanisms, starter switch, Starting system faults. Working principle of DC generator & AC alternator, Armature reaction, cut-out, voltage & current regulator systems.

Unit III

Auxiliary Systems:

Lightening systems such as Head light, tails Lighths, Trafficator lights, Principle of Automobile illumination, speedometer, Electric Horn, Wind screen Wipers, Signaling device, Different type of gauges.

Unit IV

Engine Vehicle Sensors:

Introduction, Basic sensors arrangements, types of sensors such as oxygen sensors, Fuel metering/ Vehicle speed sensors & detonation sensors.

Unit V

Electronic Fuel Injection System :

Introduction, Fuel Back Carburetor system,(FBC), Trouble Body injection & multiport or point fuel injection, Robert Bosch, Gasoline Fuel Injection system, Ford Electronic Gasoline Fuel Injection system, Injection system controls.

Unit VI

Electronic Ignition System:

Advantages of electronic ignition systems, Types of solid state ignition system & their principle of operations, Contact less electronic ignition system, Electronic spark timing – control.

Unit VII

Microprocessors:

Architecture Intel 8085, Instruction set, Assembly Language Programming, Data Transfer Schemes, Interfacing devices, Automotive applications, Development of high speed, High precision learning control system for the engine control.

Text

1. Judge, A.W. Modern Electrical Equipment of Automobiles, Chapman and Hall, London

Reference:

1. Young A.P. and Griffiths, L., Automobile Electrical Equipment, English Language Book Society and New Press.
2. Course, W.H. Automobile Electrical Equipment, McGraw Hill Book Co., Inc., New York.
3. Robert N. Brady, Automotive Computers and Digital Instrumentation, A Reston Book, Prentice Hall, Eagle Wood Cliffs, New Jersey.

Course Contents

Category of Course	Course Title	Course Code	Credits- 4			Theory Papers (ES)
			L	T	P	
Automobile Engineering	Automotive Air Conditioning	BTAE 603				Max.Marks-80 Min.Marks-28 Duration-3hrs.
			3	1	0	

Branch: Automobile Engineering VI semester

Course: BTAE 603 Automotive Air Conditioning

Unit I

Air Conditioning Fundamentals:

Basic Air conditioning system – Location of air conditioning components in a car – schematic layout of a refrigeration system, compressor components – Condenser and high pressure service ports. Thermostatic expansion valve – Expansion valve calibration – Controlling evaporator temperature – evaporator pressure regulator evaporator temperature regulator.

Unit II

Air Conditioner Heating System:

Automotive heaters – Manually controlled air conditioners – heater systems – Ford automatically controlled air conditioners & heater systems – automatic temperature control – air conditioning protection – engine protection.

Unit III

Refrigerant:

Containers – Handling Refrigerant – Tapping into refrigerant container – refrigeration system diagnosis – diagnostic procedure – ambient conditions affecting system pressure.

Unit IV

Air Routing and Temperature Control:

Objective – Evaporator care airglow – through – the Dash Re-circulating Unit – Automatic temperature control – Duct system-controlling controlling flow – vacuum reserve – testing the air control & handling system.

Unit V

Air Conditioning Servicing:

Air conditioning maintenance & service – servicing heater system removing & replacing components – Troubleshooting of Air conditioning systems – compressor service.

Text

1. William H. Crouse & D.L. Anglin, Automotive air Conditioning, McGraw Hill, Inc.

Reference:

4. Mitchell Information services, Inc., Mitchell automatic heating & air conditioning systems, Prentice – Hall, Inc.
5. Paul Weisler, Automotive air conditioning, Reston Publishing Co. Inc.

Course Contents

Category of Course	Course Title	Course Code	Credits- 6			Theory Papers (ES)
			L	T	P	
Automobile	Automotive	BTAE 604				Max.Marks-80

Engineering	Design		3	1	2	Min.Marks-28 Duration-3hrs.
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Branch: Automobile Engineering VI semester

Course: BTAE 604 Automotive Design

Unit I

Introduction:

Auto Design: Definition, Various aspects, Classification, Requirements, general Procedure of design.

Unit II

Design of Engine Parts:

Design of Piston ring, Piston Pin – Crank shaft, crank pin – Constructing Rod small end & big end.

Unit III

Clutches:

Types of friction clutches, Requirement of clutch. Design the equation for the power transmitted through single plate & Multi plate clutch for (a) Uniform wear (b) Uniform pressure. Design for Dimensions of clutch. Equation of centrifugal clutch.

Unit IV

Frame:

Shear force & bending Moment diagrams for Different types of frames.

Unit V

Front Axle:

Design of front axle Beam

Unit VI

Suspension Springs:

Types of suspension system, Types of suspension springs, Design of leaf spring, Coil spring.

Text

- Heldt, P.M., Automotive Chassis, Chilton Book Co.

Reference:

- Heldt, P.M. Torque Converters, Chilton Book Co.
- Dean Avern, Automobile Chassis Design, Illiffe Book Co.
- Giri, N.K. Automobile Mechanics, Khanna Publishers, New Delhi.

Course Contents

Category of Course	Course Title	Course Code	Credits- 6			Theory Papers (ES)
			L	T	P	
Automobile Engineering	Vehicle Body Engineering	BTAE 605	3	1	2	Max.Marks-80 Min.Marks-28 Duration-3hrs.

Branch: Automobile Engineering VI semester

Course: BTAE 605 Vehicle Body Engineering

Unit I

Car Body Details:

Types: Saloon, Convertibles, Limousine, Estate Van, Racing & Sports Car Visibility, Regulation, driver's visibility, test for visibility – method of improving visibility & space in cars – safety design equipments for car. Car body construction.

Unit II

Vehicle Aerodynamics:

Objectives – Vehicles drag and types – various types of forces & moments – effect of force & moments – side wind effects on force & moments – various body optimization, technique for minimum drag- Wind tunnel testing: flow visualization techniques, Scale model testing, component balance to measure force & moments.

Unit III

Bus Body Details:

Types: Mini bus, Single Decker, Double Decker, Spirit Level & Articulated bus- bus body Layout – floor height – Engine location – Entrance & Exit location - Sitting dimensions – Construction details: Frame construction, Double skin construction - Types metals sections used – Regulation – Conventional & integral type construction.

Unit IV

Commercial Vehicle Details:

Types of body: Flat platform, Drop side, Fixed Side, Tipper body, tanker body – light commercial vehicle body types – dimension of driver seat in relation to control – Driver’s cab design.

Unit V

Body Materials, Trim & Mechanism:

Steel sheet, timber, plastic, GRP, Properties of materials – corrosion – anticorrosion methods – scapulation of paint & painting process – Body trim items – body mechanisms.

Unit VI

Body Loads:

Idealized structure – Structural surface – shear panel method – Symmetric & assymetrical vertical loads in a car – longitudinal loads – Different Loading situations.

Text:

1. Powloski, J., Vehicle Body Engg. Business books Ltd.

Reference:

9. Giles J.C. Body construction & Design, Iliffe books, Butter worth & Co.
10. John Fenton, Vehicle Body Layouts & analysis, Mechanical Engg. Publication ltd. London.
11. Braithwaite, J.V., Vehicle Body building & Drawing, Heinemanm Edn. Books Ltd. London.

Sno.	COURSE CODE	VII th SEM
1	BTAE 701	Automotive Chassis –II
2	BTAE 702	CAD/CAM
3	BTAE 703	Combustion and Heat Transfer
4	BTAE 704	Total Quality Management
5	BTAE 705	Vehicle Vibration & Noise Control
6	BTAE 706	Industrial Training
7	BTAE 707	Computer Aided Drafting -II

Course Contents

Category of	Course Title	Course Code	Credits-6C	Theory Papers
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Course					(ES)	
Departmental	Automotive Chassis - II	BTAE 701	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
Core			3	1	2	

Branch: Automobile Engineering, V Semester

Course: BTAE 701 Automotive Chassis - II

Unit I

VEHICLE SUSPENSION SYSTEM:

Need of suspension system. Types of suspension. Factors influencing ride comfort. Suspension springs. Constructional details & characteristics of leaf spring, Coil Springs & Torsion bar spring used for suspension. Spring materials. Independent suspension. Rubber suspension, Pneumatic suspension. Closed loop suspension system. Shock absorbers. Liquid filled, Gas filled absorbers.

Unit-II

BRAKING SYSTEM:

Classification of brakes: Principle of drum brakes. Constructional details. Materials, braking torque by leading & trailing shoes. Disc brake theory. Constructional details. Brake actuating systems. Mechanical, hydraulic, pneumatic brakes. Factors affecting brake performance. Operating temperature, area of brake lining, clearance. Exhaust brakes. Vacuum brakes, power & power assisted brakes.

Unit- III

RETARDERS & BRAKE PERFORMANCE EVALUATIONS:

Eddy current retarders, permanent magnet retarders, hydraulic retarders. Hill holding devices: testing of brakes, road test, garage test & laboratory test.

Unit- IV

WHEELS & TYRES:

Types of wheels, construction of wheel assembly. Spoked wheel, disc wheel & built up wheel. Tubes of tyres and their constructional details. Static & rolling properties of pneumatic tyres. Wheel balancing: tyre rotation. Types of tyre wear and their causes.

Unit-V

AUTOMOTIVE BEARING AND CHASIS LUBRICATION:

Bearings: bush, shell, and anti friction bearings. Ball & roller bearings. Thrust bearings and radial bearings. Types of lubricants: liquid, gaseous and solid lubricants. Properties of lubricants- grease lubrication.

TEXT

1. Heldt, P.M. Automotive chassis, Chilton co., New York

REFERENCES

1. Steed, W., Mechanics of Road vehicles, Illiffe Books Ltd., London.
2. Newton, Steeds & Garrot, Motor Vehicles, Butterworths, London.

3. Judge, A.W., Mechanism of the car., Chapman and Hall Ltd. London.
4. Giles, J.G., Steering, Suspension and tyres, Illiffe book Co. London.
5. Kripal Singh, Automobile Engineering, Standard Publishing Distributor, New Delhi.
6. Narang, G.B.S., Automobile Engineering, Khanna Publishers, New Delhi.
7. William Crouse, Automotive Mechanics, McGraw Hill publishers.
8. George Wills, J., Lubrication Fundamentals, Marcel Dekker Inc., Newyork.

Course: BTAE 702 CAD/CAM

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 6C			THEORY PAPERS
			L	T	P	
Departmental Core	CAD/CAM	BTAE 702	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

COURSE CONTENTS

Unit-I

Introduction: An overview of CAD-Computer Fundaments, Classification of computer-Data communication - Configuration of computer system for design, design work stations. Interactive display device input devices, Output devices, Computer software.

Unit-II

CAD/CAM definitions, the product cycle and CAD/CAM automation and CAD/CAM computer technology. Computer configuration for CAD applications. Three dimensional transformations and projections. Solid modeling-Representation of 3D objects.

Unit-III

Fundamentals of CAD, CAD hardware, Computer graphics software and data base introduction to auto CAD, Drawing commands in Auto CAD- working with different units and grids, Isometric view- Working with modify commands Hatching and dimensioning and drawing, Working with texts, Drawing and objects.

Unit-IV

Design of automobile engine parts such as piston. Piston ring, Piston pin, Connecting rods, Engine cylinders, Crankshafts, Gears with the help of Auto CAD.

Unit-V

Conventional Numerical control-Developments in CNC controllers and machine tool Robots-FMS design, Simulation and control methods. Part programming through Numerical control computer controls in Numeric Control, Introduction to CIM.

References:

- Radhakrishnan, P. and Kothandarman, C.P. Computer Graphics and Design, Dhanpat Rai and Sons, New Delhi.
- D. Radhakrishnan., CAD/CAM/CIM.
- V. Ramamurthi, V., Computer Aided Design in Mechanical Engineering, TMH.

Course: BTAE 704 Total Quality Management

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDIT-4C			THEORY PAPER
Departmental Electives	Total Quality Management	BTAE 704	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

COURSE CONTENTS

Unit-I

Quality Concepts And Management

Evolution of quality control, Quality journey : Inspection to TQM, Quality of design, conformance, performance, functions, Global scenario, concept of Quality costs.

Unit-II

Standardization and Quality Assurance

Quality assurance: Concept, need; ISO 9000 systems, ISO 14000; Quality audit, documentation.

Unit-III

Statistical Quality Control

Basic statistical concepts, Probability distribution-Binomial, Poisson and Normal, control charts for variables and attributes, CUSUM charts, Multivariate charts, Process capability, Tolerances and selective assembly, Acceptance sampling.

Unit-IV

Diagnosis and Prevention of Defects

Defect study, Identification and analysis of defects, Corrective measure, Factors affecting reliability, MTBF, MTTR, Calculation of reliability, Building reliability in the product, Evaluation of reliability, Interpretation of test results, Reliability control, Maintainability, FMEA, Guarantee, Warranty and claims.

Unit-V

Quality Awards

Break through in quality management, Quality gurus: Deming, Crosby, Ishikawa, Juran etc., Seven quality tools, Quality circle, Kaizen, Concepts of poka yoke, 5 S campaign, Six sigma, Quality function deployment, Benchmarking, National quality award model; Malcom Balbridge, National Quality Awards, Quality in service sector, Administration etc., Case Studies.

References:

- Lt. Gen. H. Lal, "Total Quality Management", Wiley Eastern Limited.
- Greg Bounds, : "Beyond Total Quality Management", McGraw Hill.
- Besterfield, Total Quality Management, Pearson Education, Asia.
- Menon, H.G., "TQM in New Product Manufacturing", McGraw Hill.
- Mitra, Total Quality Control, Pearson Publication.
- Quality assurance and TQM by K.C. Jain and A.K. Chitale.

Course: BTAE 705 Vehicle Vibration & Noise Control

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 6C			THEORY PAPERS
Departmental Core	Vehicle Vibration & Noise Control	BTAE 705	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	2	

COURSE CONTENTS

Unit-I

Undamped free vibration

Introduction, Single degree of freedom System, Undamped free vibration, Natural frequency of free vibration. Raleigh Method stiffness of spring elements, Effect of Spring mass.

Unit-II

Damped Free Vibration

Introduction, Single degree of freedom system, Different type of damping. Concepts of critical damping and its importance, response study of viscous damped system for case of under damping. Critical damping and over damping Logarithmic decrement.

Unit-III

Forced Vibrations

Single degree of freedom system, Steady state solution with viscous damping due to harmonic force. Solution by complex algebra, Concept of response reciprocating and rotating unbalance vibration Isolation, Transmissibility ration, Energy dissipated by damping, Equivalent viscous damping, Structural damping, Sharpness of resonance, Base excitation.

Vibration measuring instruments, Accelerometer and vibrometer, Whirling of shafts with and without damping, discussion of speeds above and below critical speeds.

Unit-IV

System with Two degree of freedom System

Introduction, Principle modes and normal modes coordinate coupling, generalized and principle coordinates. Free vibrations in terms of initial conditions, geared systems.

Forced oscillations- Harmonic excitation. Applications-Vehicle suspension. Dynamic vibration absorber, Dynamics of reciprocating engines.

Unit-V

Continuous Systems

Introduction, Vibration of spring, Longitudinal vibrations of rods, Torsional vibrations of rods, Euler equations for beams, Simple problems.

Unit-VI

Noise Control

Noise and Noise Control-Sound, Noise Decibel scale, Pressure and density level, addition of levels, Overall Noise from different frequency Ranges, Sound Level meters, Perceived Noise level, Traffic Noise Index, NC curves, Building Acoustics, Effect of Noise on people, Noise reduction, Noise due to industrial equipments, Important I.S. Codes related to Noise.

References:

- Prof. G.K. Grover, Mechanical Vibration
- V.P. Singh, Mechanical Vibrations.
- Kewal Pujara, Vibration and Noise for engineers
- William I Thomson, Vibration Theory and Application.
- William. W. Theory and Problems of Mechanical Vibration, Schaum's Outline Series.
- Timoshenko, Vibration Problems in Engineering
- Church, Mechanical Vibrations
- Den Hartog, Mechanical Vibrations.

Sno.	COURSE CODE	VIII th SEM
1	BTAE 801	Major Project
2	BTAE 802	Road Transportation & Economics
3	BTAE 803	Alternative Fuel and Automotive Pollution Control
4	BTAE 804	Seminar / Group Discussion

Course: BTAE 802 Road Transportation & Economics

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
Departmental Elective	Road Transportation & Economics	BTAE 802	L	T	P	Max.Marks-100 Min.Marks-35 Duration-3hrs.
			3	1	0	

COURSE CONTENTS

Unit-I

Signification of Road Transportation- Road transportation as an agent of change and development, the national scene, transport policy and co-ordination.

Operating characteristics in transportation, Engineering flexibility, speed and acceleration, dependability and safety, performance criteria etc.

Transportation planning : Need, Steps, Guiding principles.

Transport terminology- Important terms used in road, transportation like HMV, LMV, Fleet utilization, vehicle utilization, break down rate, accident rate, route, seat kilometer, load factor,

Unit-II

Cost of service – Capital costs and operating costs, fixed cost and variable cost, Direct and indirect costs, variable cost and variable cost carriers, excess capacity and effect on routes.

Infrastructure in road transportation organisation : Garages, essential requirement of garages, fleet maintenance, staffing general layout of a garage, vehicle maintenance records, bust station, bus shelter, bus stops, essential requirements staffing, Management of transport organisation, its objectives, organisation all structure, motivation.

Unit-III

Operational productivity and efficiency – Productivity in road transportation organisations, the environment of a road transport system, optimizing fleet and vehicle utilization, conservation of fuel and oil economy, control of breakdowns, effective traffic operations.

Vehicle legislation in India and abroad- Introduction to Motor vehicle act 1989, national and international safety standards regarding automobile emission, noise brakes, drivers restraints, crash test, energy absorbing bumpers, lighting visibility.

Road safety and health, Driving and age, driving in comfort, avoiding fatigue, the road to exhaustion, poisonous car fumes, car sickness, drugs and driving first aid for motorist, first aid kits, braking and stopping, interpreting the signs, rain, floods, fog, mist-care and precautions, ice, snow skidding, emergencies and road observations.

Unit-IV

Accidents-Definition of accident, legal obligation, causes of road accidents, analysis and prevention of road accidents, insurance documentation and investigation, road safety and driver's role, a defensive driver, driver selection test and driver's training.

Security devices- Seat belts, Child's safety chair, carrycot restraint, dog restraint, fog rear guard lamp, reversing light, bonnet and brake locks, vibrator alarm, fog lamps and tyre chains, demisters, tow-bar, roof racks and luggage containers, emergency equipments, auxiliary instruments.

Unit-V

Future requirements of road transportation-Future requirements of national road transportation development, fund raising, road improvement and fuel consumption saving, remedial measures to road transportation problems, fuel conservation and alternate fuels, hybrid vehicle, intermediate public transport (IPT), Urban transport development, environmental impact, planning perspectives for tomorrow.

References:

- P.G. Patankar, Road Passenger transport in India, CIRT Publication
- Santosh Sharma, Productivity in road transportation, (ASRTV Publication)
- Motor Vehicle Act, 1989.
- Compendum of Transport terms, CIRT, Pune.
- Kitchin, L.D., Bus Operation, Illiffe and sons Ltd., London.
- Kandiyali L.R. Traffic Engineering and Transport Planning.

Course: BTAE 803 Alternative Fuels and Automotive Pollution Control

CATEGORY OF COURSE	COURSE TITLE	COURSE CODE	CREDITS - 4C			THEORY PAPERS
			L	T	P	
Departmental Elective	Alternative Fuels and Automotive Pollution Control	BTAE 803	3	1	0	Max.Marks-100 Min.Marks-35 Duration-3hrs.

COURSE CONTENTS**Unit-I**

Introduction about the alternate fuels and renewable sources of energy in automobile field- availabilities, Storage, Handling and Safety aspects- Costs and other factors.

Unit-II**Alternate Fuels:**

Alcohols-CNG-LPG vegetable oils- Hydrogen and Biogas properties performance and Emission characteristics. Solid fuels coal and wood Ash fusibility test.

Modification required use of Alternate fuels in SI and CI engines- Combustion equation. Conversion of gravimetric to volumetric analysis flue gas analysis.

Unit-III**Renewable sources of energies**

Introduction about the solar energy collectors- Concentrating, Flat plate collectors- application wind energy-Bio energy, Geo thermal energy- Chemical energy: Fuel cells, Batteries. Hydrogen energies- Energy conservations in sterling and heat pumps.

Unit-IV

Pollutants

Pollutants- Sources of SI and CI Engines, Two Stroke (SI and CI) engine pollution formation. Indian Emission Standards for SI and CI engines- European Emission Standards Comparison with alternate fuel emissions.

Unit-V

Pollution control Techniques

Control Techniques and Test procedures, Optimization of operating factor-EGR- Fumigation-Air injection-PCV system (open Closed) Catalytic Converters- Catalyst use of unleaded petrol.

Gas Analyzers-Different Smoke meters-Different test methods.

Electric Vehicles

Simple layout-Traction batteries-Re Charging methods-rating pollution factors, Fuel Cells.

References:

- V. Ganesan, Internal Combustion Engines.
- P.M. Held, High speed Combustion Engines
- Alcohols as Motor Fuels.
- GD Rai, Non Conventional sources of Energy.

- PM Heldt., Internal Combustion Engines.
- E.F. Obert, Internal Combustion Engines.
- SAE Transaction-Vehicle emission.
- John. H. Jhonson, Diesel Particulate Emissions Landmark Research

