Faculty of Engineering & Technology

P.K.University

Shivpuri (MP)

Evaluation Scheme & Syllabus for
Department Of Automobile Engineering

Diploma- Automobile Engineering

(I to VI Semester)

(Effective from session 2019

EVALUATION SCHEME

SEMESTER I						
SUBJECT CODE	**SUBJECT NAME**	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DAU-101	FOUNDATIONAL COMMUNICATION	30	70	25	25	150
DAU-102	APPLIED MATHEMATICS I(A)	30	70	NA	NA	NA
DAU-103	APPLIED PHYSICS-I	30	70	25	25	150
DAU-104	APPLIED CHEMISTRY	30	70	25	25	150
DAU-105	ENGINEERING DRAWING	30	70	NA	NA	NA

SEMESTER II						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	**SUBJECT NAME**	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DAU-201	APPLIED MATHEMATICS I(B)	30	70	NA	NA	100
DAU-202	APPLIED PHYSICS-II	30	70	25	25	150
DAU-203	APPLIED MECHANICS	30	70	NA	NA	100
DAU-204	BASICS OF MECHANICAL & CIVIL ENGG.	30	70	25	25	150
DAU-205	ELEMENTARY WORKSHOP TECHNOLOGY	30	70	25	25	150

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I Year I Semester

DAU-101 FOUNDATIONAL COMMUNICATION

DETAILED CONTENTS

1. PARTS OF SPEECH :

a. Noun
b. The pronoun : Kinds and Usage
c. The adjective : Kinds and Degree
d. Determiner : Articles
e. The verb : Kinds
f. The Adverb : Kinds, Degree and Usage
g. Prepositions
h. Conjunctions
i. The Interjections
j. Subject: Verb Agreement (Concord)

2. **VOCABULARY BUILDING :**

a. Antonyms and Synonyms
b. Homophones
c. One word substitutions
d. Idioms and Phrases
e. Abbreviations

3. **Grammar**

a. Sentence & its types
a. Tenses
b. Punctuations
c. Active and Passive voice
d. Transformation of Sentences
e Synthesis of Sentences
f. Direct and Indirect Narrations

4. **DEVELOPMENT OF EXPRESSION (Composition) :**

a. Paragraph Writing
b. Essay Writing
c. Proposal Writing
d. Letter Writing (Formal, Informal, Business, official etc.)
f. Report Writing
g. Note Making

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I Year I Semester
DAU-102 APPLIED MATHEMATICS I(A)

1. ALGEBRA-I :

1.1 Series : AP and GP; Sum, nth term, Mean

1.2 Binomial theorem for positive, negative and fractional index (without proof). Application of Binomial theorem.

1.3 Determinants : Elementary properties of determinant of order 2 and 3, Multiplication system of algebraic equation, Consistency of equation, Crammer's rule

2. ALGEBRA-II:

2.1 Vector algebra : Dot and Cross product, Scaler and vector triple product.

2.2 Complex number : Complex numbers, Representation, Modulus and amplitud Demoivre theorem, its application in solving algebraic equations, Mod. function and its properties..

3. TRIGONOMETRY :

3.1 Relation between sides and angles of a triangle : Statement of various formulae showing relationship between sides and angle of a triangle.

3.2 Inverse circular functions : Simple case only

4. DIFFERENTIAL CALCULUS - I :

4.1 Functions, limits, continuity, - functions and their graphs, range and domain, elementary methods of finding limits (right and left), elementary test for continuity and differentiability.

4.2 Methods of finding derivative, - Function of a function, Logaritimic differentiation, Differentiation of implicit functions.

5. DIFFERENTIAL CALCULUS -II :

5.1 Higher order derivatives, Leibnitz theorem.

5.2 Special functions (Exponential, Logarithmic, Inverse circular and function), Definition, Graphs, range and Domain and Derivations of each of these functions.

5.3 Application - Finding Tangants, Normal, Points of Maxima/Minima, Increasing/Decreasing functions, Rate, Measure, velocity, Acceleration, Errors and approximation.

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I Year I Semester
103 APPLIED PHYSICS-I

1. UNITS AND DIMENSIONS (4 MARKS)

S.I. Units & Dimensions of physical quantities, Dimensional formula and dimensional equation. Principle of homogeneity of dimensions and applications of homogeneity principle to: (i) Checking the correctness of physical equations, (ii) Deriving relations among various physical quantities, (iii) Conversion of numerical values of physical quantities From one system of units into another. Limitations of dimensional analysis.

2. ERRORS AND MEASUREMENT (4 Marks)

Errors in measurements, accuracy and precision, random and systematic errors, estimation of probable errors in the results of measurement(Combination of errors in addition, subtraction, multiplication and powers). Significant figures, and order of accuracy in respect to instruments,

3. CIRCULAR MOTION (5 MARKS)

Central forces. Uniform Circular motion (Horizontal and Vertical cases),angular velocity, angular acceleration and centripetal acceleration. Relationship between linear and angular velocity and acceleration. Centripetal and centrifugal forces. Practical applications of centripetal forces. Principle of centrifuge.

4. MOTION OF PLANETS AND SATELLITES :(5 Marks)

Gravitational force, Acceleration due to gravity and its variation w..r. to height and depth from earth, Kapler's Law, Escope and orbital velocity, Time period of satellite, Geo- stationary, Polar satellites.

DYNAMICS OF RIGID BODY (ROTATIONAL MOTION) (6 MARKS)

Rigid body, Rotational motion, Moment of inertia, Theorems(Perpendicular and Parallel axis) of moment of inertia (Statement). Expression of M.I. of regular bodies (Lamina, Sphere, Disc, Cylindercal),Concept of Radius of gyration, angular momentum, Conservation of angular momentum, Torque, Rotational kinetic energy. Rolling of sphere on the slant plane . Concept of Fly wheel.

6. FLUID MECHANICS :(5 MARKS)

Surface tension, Capillary action and determination of surface tension from capilary rise method, Equation of continuity (A1V1=A2V2), Bernoulli's theorem, and its application stream line and Turbulent flow, Reynold's number.

7. FRICTION :(4 MARKS)

Introduction, Physical significance of friction, Advantage and disadvantage of friction and its role in every day life. Coefficients of static and dynamic friction and their measurements. viscosity, coeff. of viscosity, & its determination by stoke's method.

8. HARMONIC MOTION (6 MARKS)

Periodic Motion , characteristics of simple harmonic motion; equation of S.H.M. and determination of velocity and acceleration. Graphical representation. Spring-mass system. Simple pendulum. Derivation of its periodic time. Energy conservation in S.H.M.. Concept of phase, phase difference, Definition of free, forced, undamped and damped vibrations, Resonance and its sharpness, Q-factor.

9. HEAT & THERMODYNAMICS: (6 MARKS)

Modes of heat transfer (Conduction, Convection and Radiation), coefficient of thermal conductivity Isothermal and adiabatic process. Zeroth First, Second Law of Thermodynamics and Carnot cycle, Heat Engine (Concept Only).

10. ACOUSTICS (5 MARKS)

Definition of pitch, loudness, quality and intensity ofsound waves. Echo, reverberation and reverberation time. Sabine's formula without Derivation. Control of reverberation time (problems on reverberation time). Accoustics of building defects and remedy.

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I Year I Semester
104 APPLIED CHEMISTRY

DETAILED CONTENTS:

1. **ATOMIC STRUCTURE :**

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

2. **CHEMICAL BONDING :**

Covalent bond, Ionic & Co-ordinate, Hydrogen bonding, Valence bond theory, Hybridisation, VSEPR theory, Molecular orbital theory.

3. **CLASSIFICATION OF ELEMENTS :**

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

4. **ELECTRO CHEMISTRY-I:**

Arrhenius Theory of electrolytic dissociation, Transport number, Electrolytic conductance, Ostwald dilution law. Concept of Acid and bases : Bronsted, Arrhenius and Lewis theory. Concept of pH and numericals. Buffer solutions, Indicators, Solubility product, Common ion effect with their application,

5. **ELECTRO CHEMISTRY-II:**

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

6. **CHEMICAL KINETICS :**

Law of mass action, order and molecularity of rection. Activation energy, rate constants, Ist order reactions and 2nd order reactions.

7. **CATALYSIS :**

Definition Characteristics of catalytic reactions, Catalytic promotors and poison , Autocatalysis and Negative catalysis, Theory of catalysis, Application.

8. **SOLID STATE :**

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

9. **FUELS :**

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

10. **WATER TREATMENT :**

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

11. **COLLOIDAL STATE OF MATTER :**

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

12. **LUBRICANTS :**

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

13. **HYDROCARBONS:**

A. Classification and IUPAC nomeuclature of organic compounds hamologous series (Functional Group)

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

14. **ORGANIC REACTIONS & MECHANISM:**

1. Fundamental auspects -
   A. Electrophiles and nucleophiles, Reaction Intermediates, Free radical, Carbocation, Carbanion
   B. Inductive effect, Mesomeric effect, Electromeric effect.

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

B. Mechanism of Substitution reactions; (Nucleophillic) hydrolysis of alkyle halide, electrophillic substitution halogenation, Sulphonation, Niration and friedel-Craft reaction.

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

15. **POLYMERS :**

1. Polymers and their classification. Average degree of polymerisation, Average molecular weight, Free radical polymerisation (Mechanisms)
2. Thermosetting and Thermoplastic resen - A. Addition polymers and their industrial application- Polystyrene, PVA, PVC, PAN, PMMA, Buna-S, Buna-N, Teflon.

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

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

16. **SYNETHETIC MATERIALS :**

A. Introduction - Fats and Oils

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

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

3. EXPLOSIVES: TNT, RDX, Dynamite.
4. Paint and Varnish

LIST OF PRACTICALS

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

A. Basic Radicals :

NH4+, Pb++, Cu++, Bi+++, Cd++, As+++, Sb+++, Sn++, Al+++, Fe+++, Cr+++, Mn++, Zn++, Co++, Ni++, Ba++, Sr++, Ca++, Mg++

B. Acid Radicals:

CO3--, S--, SO3--, CH3COO-, NO2-, No3- , Cl-, Br_ , I- , So4--

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

3. To determine the total hardness of water sample in terms of CaCo3 by EDTA titration method using Eriochroma black-T indicator.

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

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

6. Determination of temporary hard ness of water sample by O-Hener's method.

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I Year I Semester

105 ENGINEERING DRAWING

1. **Drawing, instruments and their uses.** **1 Sheet**

1.1 Introduction to various drawing, instruments.
1.2 Correct use and care of Instruments.
1.3 Sizes of drawing sheets and their layouts.

2. (a) **Lettering Techniques** **2 Sheet**

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

(b) **Introduction to Scales** **2 Sheet**
Necessity and use, R F Types of scales used in general engineering drawing. Plane, diagonal and chord scales.

3. **Conventional Presentation** : **1 Sheet**

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

4. (a) **Principles of Projection** **1 Sheet**

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

(b) **Projections of points, lines and planes**. **1 Sheet**

5 (a) **Orthographic Projections of Simple Geometrical Solids** **2 Sheet**

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

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

(c) Exercises on missing surfaces and views

6. **Section of Solids** **2 Sheet**

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

7. **Isometric Projection.** **2 Sheet**

Isometric scale
Isometric projection of solids.

8. **Free hand sketching** **1 Sheet**

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

9. **Development of Surfaces** **2 Sheet**

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

10. **ORTHOGRAPHIC PROJECTION OF MACHINE PARTS:** **2 Sheet**

Nut and Bolt, Locking device, Wall bracket

11. **PRACTICE ON AUTO CAD** : **2 Sheet**

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

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I Year II Semester
DME-201 APPLIED MATHEMATICS I (B)
DETAILED CONTENTS:

1. INTEGRAL CALCULUS - I :

Methods of Indefinite Integration :-

1.1 Integration by substitution.

1.2 Integration by rational function.

1.3 Integration by partial fraction.

1.4 Integration by parts.

2. INTEGRAL CALCULUS -II :

2.1 Meaning and properties of definite integrals, Evaluation of definite integrals. Integration of special function.

2.2 Application : Finding areas bounded by simple curves, Length of simple curves, Volume of solids of revolution, centre of mean of plane areas.

2.3 Simposns 1/3rd and Simposns3/8th rule and Trapezoidal Rule : their application in simple cases.

3. CO-ORDINATE GEOMETRY (2 DIMENSION):

3.1 CIRCLE : Equation of circle in standard form. Centre - Radius form, Diameter form, Two intercept form.

3.2 Standard form and simple properties

Parabola $x^2=4ay$, $y^2=4ax$,

Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

4. CO-ORDINATE GEOMETRY (3 DIMENSION):

4.1 Straight lines and planes in space - Distance between two points in space, direction cosine and direction ratios, Finding equation of a straight line and Plane (Different Forms),

4.2 Sphere $x^2 + y^2 + z^2 + 2gx + 2fy + 2wz = d$ (Radius, Centre and General Equation)

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I Year II Semester
DME-202 APPLIED PHYSICS-II

1. Optics :

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

2. Introduction To Fibre Optics :

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

3. Lasers and its Applications :

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

4. Electrostatics :

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

5. D.C. Circuits :

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

6. Magnetic Materials and Their Properties:

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

7. Semiconductor Physics :

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

8. Junction Diode and Transister :

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

9. Introduction To Digital Electronics :

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

10. Non-conventional energy sources:

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

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

202 APPLIED PHYSICS-II

PHYSICS LAB

Note: Any 4 experiments are to be performed.

1. Determination of coefficient of friction on a horizontal plane.
2. Determination of 'g' by plotting a graph T2 verses l and using the formula g=4n2/Slope of the graph line
3. Determine the force constant of combination of springs incase of 1. Series 2. Parallel.
4. To verify the series and parallel combination of Resistances with the help of meter bridge.
5. To determine the velocity of sound with the help of resonance tube.
6. Determination of viscosity coefficient of a lubricant by Stoke's law.
7. Determination of E1/E2 of cells by potentiometer.
8. Determination of specific resistance by Carry Foster bridge.
9. Determination of resistivity by P.O.Box.
10. Verification of Kirchhoff's Law.
11. To draw Characteristics of p-n Junction diode.
12. To measure instantaneous and average wind velocity by indicating cup type anemometer/hand held anemometer.

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I Year I Semester
DME-203 APPLIED MECHANICS

1. Introduction:

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

2.A. System of Forces :

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

B. General Condition of Equilibrium:

General condition of equilibrium of a rigid body under the action of coplaner forces, statement of force law of equilibrium, moment law of equilibrium, application of above on body.

3. Moment & couple:

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

4. Friction:

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

5. Machines:

Definition of a machine. Mechanical advantage, velocity ratio, input, output, mechanical efficiency and relation between them for ideal and actual machines. Law of a machine Lifting

machines such as levers, single pulley, three system of pulleys. Weston differential pulley, simple wheel and axle, differential wheel and axle. Simple screw jack, differential screw jack, simple worm and worm wheel.

6. Centre of Gravity:

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

7. Moment of Inertia:

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

8. Beams & Trusses:

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

Applied Mechanics Lab : Practicals

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

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I Year I Semester
DME-204 Basics of Mechanical & Civil Engg.

1. Thermal Engg.

A. SOURCES OF ENERGY:

Definition, Concept of thermodynamic system and surroundings, Closed system, Open system, Isolated system, Thermodynamics definition of work. Zeroth law of
Thermodynamics Basic ideas, conventional and nonconventional forms-Thermal, Hyde, Tidal, wind, Solar, Biomass and Nuclear and their uses.

B. FUELS & COMBUSTION:

Introduction to common fuels - solid, liquid and gases and their composition. Combustion of fuels-their higher and lower calorific values. Combustion equations
for carbon, sulphur, hydrogen and their simple compounds. Calculation of minimum amount of air required for complete combustion. Combustion analysis
on mass basis and on volume basis. Concept of excess air in a boiler furnace combustion. Heat carried away by flue gases. Analysis of flue gases by Orsat
apparatus. Simple numerical problems Idea of specific properties of liquid fuels such as detonation, knock resistance (cetane and octane numbers), viscosity, solidification point, flash point and flame point.

2. MACHINE COMPONENTS:

Brief Idea of loading on machine components.

(i) Pins, Cottor and Knuckle Joints.

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

(iii) Shafts, Collars, Cranks, Eccentric

(vi) Couplings and Clutches.

(v) Bearings-Plane, Bushed, Split-step, ball, Roller bearing, Journal bearing, Foot step bearing, thrust bearing, collar bearing and Special type bearings and their applications. Selection of ball bearing and roller bearing for given application using design data book.

(vi) Gears

Different types of gears, gear trains and their use for transmission of motion. Determination of velocity ratio for spur gear trains; spur gear, single and double helical gears, Bevel gears, Mitre wheel, worms, Rack and Pinion. Simple and compound and epicyclic gear trains and their use. Definition of pitch and pitch circle & module.

(vii) Springs:

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

3. LUBRICATION:

Different lubrication system for lubricating the components of machines. Principle of working of wet sump and dry sump system of lubrication. (Explain with simple line diagram). Selection of lubricant based on different application (Requirement with the help of manufacturer catalogue).

5. Civil Engineering Materials:

General idea of raw materials, manufacturing process, properties and uses of Bricks, lime, cement and Timber.

6. Foundation

(i) Bearing capacity of soil and its importance, need of foundation for electrical machines.
(ii) Foundations for heavy, light and vibrating machines.
(iii) Concrete proportion, mixing w/c ratio, workability RCC and its use.

6. Surveying

(i) Basics of chaining and leveling
(ii) Description of Instruments used

NOTE: While teaching theory it is important to bring and show the machine components to the students.

BASICS OF MECH. & CIVIL ENGG. LAB.

Part I : (Mechanical Engineering Laboratory/Hydraulics laboratory

(i) To operate a diesel engine (starting, running and shutting down) and to study lubricating and cooling system of the engine.

(ii) To determine BHP of diesel or petrol engine ands how that BHP is directly proportional to revolution per minute of engine shaft.

(iii)To determine mechanical advantage, velocity ratio, efficiency and effort loss due to friction in screw jack.

(iv) To verify Bernoulli's theorem with the help of Bernoulli's apparatus.

(v) To determine head loss due to friction in GI pipes.

(vi) To operate the Pelton wheel and Francis Turbine and to understand its construction and working.

(vii) To perform tensile test on mild steel and aluminum wire specimen and compare the result.

(viii) To do alignment and coupling of a motor generator set.

Part II: (Civil Engineering Laboratory):

(i) Chain survey of a small area

(a) Ranging a line (b) Chaining a line

(c) Taking offset on the chain line and recording the field book.

(ii) Leveling

(a) To find the difference in level between several points by single setting by the use of dumpy level.

(b) To find the difference in level between two distant points by (i) Rise & Fall method, (ii) Line of collimation method.

Models:

1. Cut section models of turbine, pumps.
2. Cut section models boilers, condensers.
3. Cut section models of diesel and petrol engines.
4. Models showing power transmission by, rope, belt, chain and gears.
5. Models of clutch and brakes, shaft coupling.
6. Model of chain pulley block and three systems of pulleys.

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I Year I Semester
DME-205 ELEMENTARY WORKSHOP TECHNOLOGY

GENERAL INTRODUCTION:

(a) Scope of subject "Workshop Technology" in engineering.

(b) Different shop activities and broad division of the shops on the basis of nature of work done such as
(i) Wooden Fabrication (Carpentry)
(ii) Metal Fabrication (shaping and Forming, Smithy, Sheet- metal and Joining-welding, Riveting, Fitting and Plumbing.

(c) Organization and layout of workshop.

(d) General safety precaution in workshop

3. CARPENTRY :

(a) Types of wood and timber, Cutting and seasoning of wood, Decaying of wooden component.

(b) Fundamental of wood working operations:

- Marking & Measuring.
- Holding & Supporting.
- Cutting & Sawing.
- Drilling & Boring.
- Turning.
- Jointing.

(c) Common Carpentry Tools:
Their classification, size, specification (name of the parts and use only).

(1) **Marking and measuring tools:**
Rules, try square, Bevel Square, Marking gauge, Mortise gauge, Scriber (marking knife). Combination set

(2) **Holding and supporting Tools**:
Carpentary vice, Bench hold fast, Bar clamp, Bench hook, Hand clamp C and G clamp.

(3) **Cutting and Sawing Tools:**
Saws:(Grip or Hand, panel,cross cut,Tenon,dove tail, compass, key hole and bow saw),
Chisel: (Firmer, dovetail, mortise and gauge),Planes:
(Wooden & Iron plane. Jack plane, Smoothing plane).

(4) **Drilling and Boring tools:**
Auger, Gimlet, Hand drill,Brace and bits.
(5**) Striking Tools**: Mallet and Claw hammer.
(6) **Turning Tools & Equipments:** Wood working lathe and lathe tools.
(7**) Miscellaneous Tools:**
Screw driver, Rasp, Pincer, Oil stone, Triangular file and Saw set.

(d) Joining of Timber Components For Fabrication Works:

Assembly of joints (Preparation steps and tools used only) Mortise, Tenon, Rivet , Groove, Tongue, Dowel, operations in assembly-Simple lap and butt, Mortise,Tenon, Dovetail, Mitre & briddle joints. Uses of glue, dowelpin and screw in preparation of joints. Common defects likely to occur during and after joining, defects due to wrong use of tools, defects due to wrong operation, defects due to improper seasoning of timber- their identification and remedy. Safety (personal and equipment) to be observed.

3. METAL FABRICATION:

(A) Metal Shaping

Smithy:

(1) Operations involved (concept only)-Preparation of fire, Supporting and holding the metal, cutting the metal in size, heating, drawing down or fullering, usetting, swaging, bending, punching, blanking, drifting and forge welding,
(2) Tools and equipment used (Names, size, specification for identification only).
(3) Heating and fuel handling equipment-Smithy Forge, Blower, Shovel, Poker.
(4) Holding and supporting tools-Common tongs, anvil, swage block.
(5) Striking Tools-Ball pein, cross pein ,Straight pein double face and sledge hammers (6) Cutting tools - Hot and cold chisel and shear set.
(7) Punching & Drifiting Tools - Punch & Drift.
(8) Bending Tools and fixture.
(9) Forming & Finishing Tools - Fullers, Swage Flatters, Set hammers.
(10) Defects likely to Occur during and after operations their Identification and Remedy. Defects due to wrong operation , wrong tool and wrong heating.
(11) Safety of Personnel, Equipment & Tools to be observed.
(12) Study of forge hammers and power presses.

(2) Sheet metal working

(I) Tools and Operation:

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

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

(3) Tools and equipments used (Name, size, specification for identification only).
(4) Marking Tools- Scriber, Divider and Trammel, Protractor, Trysquare, Dot punch, Steel Rule, Steel tape, Sheet metal gauge.
(5) Cutting and shearing Tools-hand Shear and lever, Snips, Chisels.
(6) Straightening tool-Straight edge.
(7) Striking Tools-Mallet, Hammer.
(8) Holding Tools-Vice, Plier, C or G clamps, Tongs.
(9) Supporting Tools-Stakes and Anvil
(10) Bending Tools-Crimpers, Form dies, Round nose plier, Rails.
(11) Punching-Piercing and Drifting tools.
(12) Burring Tools-Files.
(13) Common defects likely to occur during and after operation-Their identification and remedy. Defects due to wrong operation or wrong tool.
(14) Safety of Personnel, Equipment & Tools to be observed.
(15) Development and estamination of sheet for simplearticles.

(B) Metal Joining During Fabrication:

(1) Permanent Joining:

(a) (1) Welding methods- Forge welding, gas welding (high and low pressure- oxyacetylene welding, types of flames.
(2) Electric welding- D.C. & A.C., Connected tools, operation, materials and safety measures.

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

(1) Its concept, comparison with welding as joining method and classification, electric soldering and forge soldering.
(2) Soldering operation- edge preparation of joints, Pickling and degreasing, Fluxing, Tinning and Soldering.

(3) Materials Used-Common fluxes, soft and hard solder, solder wire (Plain and Resin core) andsticks, spelters and their specifications and Discription (For Identification Only), for gas soldering bits.
(4) Electric soldering iron.
(5) Common defects likely to occurs during and after soldering.
(6) Safety of Personnel, Equipment & Tools to be observed.

(c) Rivetting:
(1) Its comparison with welding as joining method.

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

(4) Tools and equipments used- (Names, Size, Specification and uses)-Supporting and holding tools (Stakes and Tonqs)-Striking tools-Ball pien, Straight pien and Cross pien hammers and head forming tools (Shapes), drills punches and solid punches, drift, elementary knowledge about working of pneumatic, hydraulic and electric rivetor.

(3) Temporary Joining (Fastners & Their Uses):

Introduction to

(1**) Various types of Bolts (**Names of prats and specification) and various types of washers and nuts used with them and their uses, material they are made of , studs and foundation bolts.
(2) Screws, keys, pins and cottors-their material and use.
(3) Pipe connectors-Sockets, elbows, tees, cross and bends, unions, volves, glands packing and operation in use of pipe connectors-cutting, marking, threading, pipe bending, joining different pipe line fittings- (Steps of operation only).Tools and equipment used in their operations (Name, Size, Specification and Description for Identification). Supporting and holding tools-Pipe vices (Bench, leg and hand), Pipe wrenches, Spanners. Cutting Tools- Hack saw and Pipe cutters.Threading Tools- Pipe dies and Taps. Materials Used for Joining-White lead, Cotton and Gasket.Common defects lickely to occur during and after operation and their remedies.

(3) Familiarity with The Use of Various Tools Used In
Mechanical Engineering Workshop:
Marking & Measuring:
Steel rule, surface gauge, marking block, protractor, trysquare, scriber, punches, divider and callipers, surface plate, V. block, gauges- (screw, pitch, radius, feeler), Vernier callipers, Micrometer, Vernier height and depth gauge, use of dialgauge.
Holding Tools:
Vices (Bench, leg and hand vice), clamps tongs, pliers,

Cutting Tools:

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

Files:

According to section-Knife edge, Flat, Triangular round, Square, Half round,

According to grade - Rough, Bastard, Second cut, Smooth and Dead smooth,

Drills and Allied Tools:

Parallel and taper shank Twist drill,

Thread Cutting Tools:

Taps and Dies,

Miscellaneous Tools:

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

4. PROTECTION OF FABRICATED STRUCTURES FROM WEATHER:

1. PAINTING:

Its need, Introduction to methods of paintings (Classification only); Mannual, Machine (spray) and dip painting at room temperature, operations involved-

discription of steps only eg. surface preparation method for old and new surface in timber and iron structure-sanding, derusting, deqreasing, filling of pore and dents, paint

application- manual, machine (spray and dip painting drying of paint air drying and oven drying under coat and filler material (red oxide, putty, yellow clay), surface

preparation materials (sand and emery papers); tools and equipments used (Name, size specification for indification).

Brushes-

Round and flat wire brush, scraper, trowel , spray gun, compressor.

Defects likely to occur in painting and their remedies

Safety of Personnel, Equipment & Tools to be observed.

2. VARNISHING & POLISHING:

Its need operation involved (description of step only), surface preparation method of old and new articles, application of polishing materials, materials used for

preparation of french and sprit polish,copal varnish. Defects likely to occur.

Safety of Personnel, Equipment & Tools to be observed.

5. FOUNDRY WORK:

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

6. MACHINE SHOP:

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

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I Year I Semester
DME-205 WORKSHOP PRACTICE

1. Carpentry Shop:

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

EX-2 Planning and sawing practice

EX-3 Making of lap joint

EX-4 Making of mortise and tenon joint

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

2. Painting and Polishing Shop:

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

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

To prepare french polish for wooden surface and polish the other side.

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

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

* The sequence of polishing will be as below:
  - i) Abrassive cutting by leather wheel.
  - ii) Pollishing with hard cotton wheel and with polishing material.
  - iii) Buffing with cotton wheel or buff wheel.

3. Sheet Metal and Soldering Shop :

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

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

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

EX-4 Cutting, shearing and bending of sheet.

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

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

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

4. Fitting Shop, Plumbing Shop & Fastening Shop:

EX-1 Study of materials, limits, fits and toterances.
EX-2 Introduction & demonstration of tools used in Fitting Shop.
EX-3 Hacksawing and chipping of M.S. flat. Filing and squaring of chipped M.S. job. Filing on square or rectangular M.S. piece.
EX-4 Making bolt & nut by tap and die set and make its joints
Ex-5 To drill a hole in M.S. Plate and taping the same to creat threads as per need.
EX-6 Utility article-to prepare double open mouth spanner for 18" hexagonal head of a bolt.
EX-7 Cutting and threading practice for using socket, elbow and tee etc. and to fit it on wooden practice board.
EX-8 Study of-bib cock, cistern or stop cock, wheel valve and gate valve etc.
EX-9 Practice of bolted joints
EX-10 To prepare a rivetted joint
EX-11 To make a pipe joint

5. Foundry Work

Ex-1 Study of metal and non metals
Ex-2 Study & sketch of the foundry tools.
Ex-3 Study & sketch of cupula & pit furnace.

6. Smithy Shop :

EX-1 Study & Sketch of Tools used in smithy shop.
EX-2 To prepare square or rectangular piece by the M.S. rod.
EX-3 To make a ring with hook for wooden doors.
EX-4 Utility article-to preapre a ceiling fan hook.

7. Welding Shop :

EX-1 Introduction to welding, classinfication of welding, types of weld joints.
EX-2 Welding practice-gas and electric.
EX-3 Welding for lap joint after preparing the edge.
EX-4 Welding of Butt joint after preparation of the edge.
EX-5 'T' joint welding after preparation of edge.
EX-6 Spot welding, by spot welding machine.

8. Machine Shop

EX-1 Study & sketch of lathe machine.
EX-1 Study & sketch of grinders, milling M/c, Drilling M/c and CNC Machines
Ex-2 Plain and step turning & knurling practice.
Ex-3 Study and sketch of planning/Shaping machine and to plane a Rectangle of cast iron.

EVALUATION SCHEME

II Year SEMESTER III						
SUBJECT CODE	**SUBJECT NAME**	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DAU-301	APPLIED MATHEMATICS- II	30	70	NA	NA	100
DAU-302	MATERIALS & MATERIAL SCIENCE	30	70	25	25	150
DAU-303	THERMAL ENGINEERING	30	70	NA	NA	100
DAU-304	MANUFACTURING PROCESSES	30	70	25	25	150
DAU-305	INTRODUCTION TO COMPUTER PRACTICALS	NA	NA	25	25	50

SEMESTER IV						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	**SUBJECT NAME**	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DAU-401	MECHANICS OF SOLIDS	30	70	25	25	150
DAU-202	HYDRAULICS & HYDRAULIC MACHINE	30	70	25	25	150
DAU-203	ELECTRICAL TECHN. & ELECTRONICS	30	70	25	25	150
DAU-404	MECHANICAL ENGG. DRAWING	30	70	NA	NA	100

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II Year III Semester
DAU 301: APPLIED MATHEMATICS - II

1. MATRICES :(12 Marks)

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

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

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

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

2. DIFFERENTIAL CALCULUS :(10 Marks)

2.1 Function of two variables, identification of surfaces in space, coincides
2.2 Partial Differentiation : Directional derivative, Gradient, Use of gradient f, Partial derivatives, Chain rule, Higher order derivatives, Eulens theorem for homogeneous functions, Jacobians.
2.3 Vector Calculus : Vector function, Introduction to double and triple integral, differentiation and integration of vector functions, gradient, divergence and curl, differential derivatives.

3. DIFFERENTIAL EQUATION :(10 Marks)

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

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

3.3 Higher Order Linear Equation: Property of solution, Linear differential equation with constant coefficients (PI for X=eax, Sin ax, Cos ax, Xn, eaxV, XV.

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

4. INTEGRAL CALCULUS - II: (12 Marks)

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

4.2 Fourier Series : Fourier series of f(x),-n<x

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

5. PROBABILITY AND STATISTICS :(6 Marks)

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

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

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II Year III Semester
DAU 302: MATERIALS & MATERIAL SCIENCE

DETAILED CONTENTS

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

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

3. PROPERTIES AND USAGE OF METALS:

(1) (a) Ferrous Metals. (b) Non Ferrous Metals.

(2) Nonmetallic Materials.

3.1. METALS:

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

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

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

(iv) Alloy Steel : Effect of alloying various elements, viz Cr, Ni, Co, V, W, Mo, Si and Mn on mechanical properties of steel, Common alloy steels, viz, (a) Ni-Steel (b) Ni-Cr-steel (c) Tungsten Steel (d) Cobalt steel (e) Stainless steel (f) Tool steel- High Carbon Steel, High Speed tool Steel, Satellite Metal, Tungsten Carbide Diamonds. (g) Silicon magnese steel (h) Spring steel (i) Heat resisting alloy steels (Nimonic steels). (j) Impact hardening steel (B) Non-ferrous Materials: (i) Important ores and their metal content, outline of manufacturing methods, trade names, properties (Phy/Mech./Elect.) and use of the following metals: Aluminium, Zinc, Copper, Tin, Silver, Lead. (ii) Base metal with principle alloying elements (I.S.I. specification). Improtant properties and use of the

following alloys: (a) Aluminium Alloys: Aluminium-Copper alloy, Al, Zn alloy, Aluminium- Silica Alloy-Al-Ni-Alloy, Duralumnium-derived alloys (R.R. and Y-alloy).
(b) Copper Alloys: Brass, Bronze, Gun metal, Phosphor Bronze, Aluminium Bronze, Ni Bronze.
(c) Nickel Silver: Nickel-Copper Alloy (monel metal) inconel, Nickel, Silver.
(d) Bearing Metals: Lead base alloys, tin base alloys. (White metals or babbit metals) Copper base alloys. (e) Solders: Solders-(Lead, Tin solder, Plumber solder, Tinman's solder or Tin solder) Silver solder, Brazing alloys (spelter), Inconel alloys.

3.2. NON-METALIC MATERIALS:

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

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

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

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

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

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

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

5. HEAT TREATMENT OF METALS: Elementary concept, purpose, Iron-carbon equilibrium diagram. T.T.T. or 'S' curve in steels and its significance, micro structure of steels and martensitic transformation (elementary idea). Hardening, Tempering, Annealing, Normalising and case

hardening. Ageing, Various temperature ranges for different metals and alloy (From heat treatment hand book)

6. MISCELLANEOUS MATERIALS: Important properties, characteristics and use of the following materials. (a) Abrasives-Natural and Manufactured, sand stone, emery and corrundum, diamond, garnet, silicon carbide, Boron carbide, aluminum oxide, anyother abrasives qualities of good abrasive.

(b) Celluloid or Xylomite

(c) Felt

(d) Magnetic Materials

(e) Mica

(f) Refractory Materials-Fire clay, Dolomite, Magnete, Poreclain, Fire bricks and their uses

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

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

(j) Source of procurement of various Ferrous and non- ferrous and composite materials

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II Year III Semester
DAU303: THERMAL ENGINEERING

1. FUNDAMENTAL OF THERMODYNAMICS: Definition, concept of thermodynamic system and surroundings. Closed system, open system, isolated system, thermodynamics definition of work. Zeroth low of thermodynamics. First law of thermodynamics for cyclic and non cyclic processes. Idea of internal energy and enthalpy. Thermodynamic processes - constant volume, constant pressure, constant temperature (Isothermal) processes, adiabatic process polytrophic process, their representation on P-V diagram and calculation of work done. Application of the first law of these process. Simple numerical problems. Second law of thermodynamic concept of perpetual motion machine of first order and that of second order. Concept of heat engine, heat pump and refrigerator. Carnot cycle efficiency for heat engine and cop for refrigerator and heat pump. ENTROPY - its physical concept and significance, reversibility and efficiency, Irreversibility and entropy. Expression for change of entropy in various thermodynamic processes. Simple numerical problems concerning the above.

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

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

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

B. STEAM CONDENSER: Principle of operation, classification, A brief concept of condenser details.

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

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

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

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

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

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

11. Introduction to Sterling Engine.

Books and References:

1. Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA
2. Thermodynamics for Engineers by Kroos & Potter, Cengage Learning
3. Thermodynamics by Shavit and Gutfinger, CRC Press.
4. Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Basic Engineering Thermodynamics, Joel, Pearson.

List of Practical's

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

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II Year III Semester
DAU304: MANUFACTURING PROCESSES

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

(B)-WELDING:

(I) Weld edge preparation, Introduction to various welding processes with procedure equipments and applications such as
(i) Electric arc welding. (ii) Resistance welding-Spot welding, Flash butt, Percussion welding.
(iii) Thermit welding. (iv) Carbon arc welding (v) Metal-Inert-Gas welding (MIG). (vi) Tungsten arc welding (TIG). (vii) Atomic Hydrogen arc welding. (viii) Stud welding. (ix) Laser Beam, Electron Beam Welding, Explosion Welding, Ultrasonic Welding. (x) Under water welding (xi) Submerged Arc welding
(II) WELDING: Definition, arc initiation, arc structures, types of arc, metal transfer characteristics and influencing parameters, weld bead geometry, various types of electrodes used in various processes. Selection of electrode from catalogue, current and voltage setting from welder's hand book.

(III) WELDING OF SPECIAL MATERIALS: (i) Welding of plastics, equipment, filler, rods, weld ability, procedures and precautions. (ii) Welding of Grey Cast Iron, shielded metal arc gas welding procedures. (iii) Welding of Aluminum, Argon arc and gas welding procedures. (iv) Welding of copper, Brass and Bronze, Gas shielded metallic arc welding, TIG., Oxy-acetylene method. (v) Welding of Alloy steels welding, Stainless steel, welding by oxyacetylene process, MIG, TIG. Specification of electrode as per latest I.S. code.

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

2. FOUNDRY PRACTICE:

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

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

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

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

3. POWDER METALLURGY: Introduction, principle, scope and names of processes. Production of metal powders, compaction, sintering and sizing. Self lubricated bearings. Advantages of the process and its limitations.

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

List Of Practical's

I. FOUNDRY PRACTICE (WORKSHOP): Minimum work in each section is indicated against that

1. PATTERN MAKING: (a) Making Patterns (At least two). (i) Solid one piece pattern. (ii) Split two piece pattern. (iii) Split three piece pattern. (iv) Gated pattern. (v) Four Piece pattern. (vi) Sweep pattern. (vii) Skeleton pattern. (viii) Segmental pattern. (b) MAKING CORE BOXES (At Least

2) For: (i) Straight Core Box. (ii) Bent Core Box. (iii)Unbalanced Cores. 2. SAND PREPARATION AND TESTING: (a) Sand Testing (At Least

2 Experiments). (i) Grading (Grain Size). (ii) Determination of Moisture content (iii) Determination of Clay content. (iv) Determination of Permeability for gases. (b) Preparation of : (i) Green Sand Composition. (ii) Dry Sand Composition. (iii) Loam Sand Composition. (iv) Oil Sand for Cores.

3. MOULDING: (a) Making at least 8 sands moulds of different forms with different types of pattern using. (i) Floor Moulding. (ii) Two Box Moulding. (iii)Three Box (or more) Moulding.

(b) At least one of the following : (i) Making and setting of cores of different types. (ii) Making one shell mould apparatus.

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

(a) Demonstration of Melting of cast iron in

(i) Pit Furnace.

ii) Cupola.

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

(i) Pit Furnace.

(ii) Tilting Furnace.

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

.

5. CLEANING, INSPECTION AND NON DESTRUCHIVE TESTING:

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

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

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

(iii)Dye penetration test for casting

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

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

7. ADVANCE WELDING SHOP : (a) Study of various Gas cutting and welding equipments :- Welding transformer, Generator/rectifier, Gas cylinder, Gas cutting machines, Cutting torches etc., Various electrodes and filler metals and fluxes.

Practice of welding and cutting of different metals by making suitable jobs by different methods :-

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

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II Year III Semester
DAU305: INTRODUCTION TO COMPUTER PRACTICALS

1. Introduction to Computer: A. Block Diagram of Computer. B. Types Of Computer C. Types of Input and Output devices. Memories Devices (Its Types and Basic).

2. INTRODUCTION TO OPERATING SYSTEMS (MS-DOS/MS-WINDOWS:) What is operating system, its significance, Commands of DOS, Features/Application of window.

3. WORD PROCESSING: File : Open, Close, Save, Save as, Search, Send to, Print Preview, Print and Page Setup Edit : Cut, Copy, Paste, Office Clipboard, Select All, Find, replace, Goto, etc. View : Normal/Web Layout/Print Layout; Tool Bars; Header/Footer; Zoom, etc. Insert: Break, Page Number, Date & Time, Symbol, Comment, Reference, etc. Format: Font, Paragraph, Bullets & Numbering, Borders & Shading, Column, Change case, Back ground, etc. Tools : Spelling & Grammar, Language, Word Count, Letters & Mailing, Options, Customize, etc. Table : Draw, Insert, Delete, Select, Auto Format, AutoFit, Convert, Sort, Formula, etc. Mail Merge

4. WORKSHEET: Introduction, Use of Tools/Icons for preparing simple Mini Project.

5. PRESENTATION : Introduction, Use of Tools/Icons for preparing simple presentation on Power Point. **6. DATABASE OPERATION :** Create database using MS Access, Create Table and Creating Reports.

7. Introduction to Internet: What is Network, How to send & receive messages, Use of Search Engines, Surfing different web sites. Creating Mail ID, Use of Briefcase, Sending./replying emails.

8. INTRODUCTION TO ADVANCE TOOLS :

I. Steps requires to solving problems.
A. Flow Chart
B. Algorithm
C. Programming
II. Use of advance Tools such as Skype, Teamviewer, Installation of Modem, use of WiFi, Etc.

List Of Practical's

1. Practice on utility commands in DOS.

2. Composing, Correcting, Formatting and Article (Letter/Essay/ Report) on Word Processing tool Word and taking its print out.
3. Creating, editing, and modifying tables in Database tool.
4. Creating labels, report, generation of simple forms in Database tool
5. Creating simple spread sheet, using in built functions in Worksheet tool..
6. Creating simple presentation.
7. Creating mail ID, Checking mail box, sending/replying e- mails.
8. Surfing web sites, using search engines.

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II Year IV Semester
DAU401: MECHANICS OF SOLIDS

1. INTRODUCTION TO MATERIAL PROPERTIES: Mechanical properties of materials such as elasticity, plasticity, ductility, brittleness, toughness, hardness, tenacity, fatigue, malleability, stiffness. Elastic bodies, plastic bodies and right bodies, deformation.

2. STRESSES AND STRAIN: Force, its definition and types, units, different types of loads. Definition of stress and strain, axial loading, different types of stresses and strains, tensile and compressive stress and strain, elastic limit, Hooke's law, stress-strain curve for ductile and brittle material, salient features of stress-strain curve. Young's modules of elasticity. Factor of safety, safe stress, ultimate stress. Stress and strain in straight, stepped bars and taper bar of circular cross section, determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only. Temperature stresses for single section.

Stress and strain on composite section under axial loading, stress and strain due to temperature variations in homogeneous and composite bars and metallic tyres. Shear load, shear stress and strain, modulus of rigidity, lateral strain, Poisson’s ratio, Volumetric strain, bulk modulus relation between modulus of elasticity, modulus of rigidity and bulk modulus.

Compound stresses- Introduction, stresses due to different types of load, Principle planes and principal stresses, Mohr's stress circle, Combined bending and torsion.

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

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

5. STRAIN ENERGY: Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension. Proof resilience, modulus of resilience, suddenly applied load,

Impact or shock load. Strain energy in a material subjected to uniaxial tension and uniform shear stress. General expression for total strain energy of simple beam subjected to simple bending.

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

7. Slopes and Deflections of Beams: Definition of slope and deflection, sign convention .Circular bending. Calculation of maximum slope and deflection for the following standard cases by double integration or moment area method.

(1) Cantilever having point load at the free end. Cantelever having point load at any point of the span. Cantitilever with uniformly distributed load over the entire span Cantilever having U.D.L. over part of the span from free end Cantelever having U.D.L. over a part of span from fixed end (2) Simply supported beam with point load at centre of the span. Simply supported beam with U.D. load over entire span.

8. COLUMNS AND STRUTS: Definition of long column, short column and slenderness ratio. Equivalent length, Critical load, Collasping load, End conditions of columns. Application of Euler's and Rankin's formula . Simple numerical problems.

9. THICK AND THIN CYLINDERICAL & SPHERICAL SHELLS: Differentiation between thick and thin shells, cylindrical and spherical shells, thin spherical and cylindrical shells subjected to internal pressure, longitudinal stresses, circumferential or hoop stresses. Longitudinal, circumferential and volumetric strains. Changes in the dimensions and volume of a thin shell subjected to internal fluid pressure.

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins

List of practical

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

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II Year IV Semester
DAU402: HYDRAULICS & HYDRAULIC MACHINE

DETAILED CONTENTS

1. INTRODUCATION: Fluid, Fluid Mechanics, Hydraulics, Hydro-statics, Hydro dynamics, Ideal fluid.

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

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

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

5. ENERGY AND MOMENTUM EQUATION: Types of energies, Energy equation and its application. Bernoulle'stheorem flow measurement instruments where energy equation is used e.g. Venturimeter, Orifice meter, Flow nozzle, pitot tube, Prandtle tube. (Simple Numerical Problems)

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

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

8. FLOW THROUGH PIPES AND CHANNELS: Losses in pipe flow due to friction, sudden enlargement, contraction and bends, Elbow & Tee. (Simple Numerical Problems)

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

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

List of practical :

1. Piezometer tube, Mechanical flow meter, Manometers, Pressure gauge.
2. Hydraulic ram, press and jack.
3. Pelton wheel and Francis turbine or their model.
4. Centrifugal and Reciprocating pumps.
5. Measurement of discharge over notches and its verification.
6. To verify Bernaulli's theorem.
7. To determine coefficient of discharge of a Venturi-meter.
8. To determine coefficient of contraction, coefficient of velocity and coefficient of discharge for a given orifice.
9. To determine the loss of head of water due to friction in a water pipe line.
10. To study performance
    i. Pelton Wheel
    ii. Francis Turbine.
11. To study the performance of
    i. Centrifugal Pump
    ii. Reciprocating Pump.
    iii. Gear Pump
12. To measure the velocity of water flow in a open channel by a current meter

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II Year IV Semester

DAU403: ELECTRICAL MACHINES & CONTROLS

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

2. A. C. THEORY: Production of alternating e.m.f. Definition of cycle, Frequency, Amplitude, Time period, Instantneous, Average, R.M.S. maximum values of sinosoidal wave. Form factor, peak factor. Representation of a sinusoidal quantity by a mathematical expression and phase, phase and phase difference, Relationship of voltage and current for pure resistance, pure inductance and pure capacitive reactance, impedance. Solution and phase diagrams of simple R.L.C. series and parallel circuits. Active and reactive power. Significance of P.F.

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

4. MEASUREMENT & MEASURING INSTRUMENTS:

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

(ii) Working principle and construction of the following instruments.

(a) Ammeter & Voltmeter (Moving coil & Moving Iron). Extension of their ranges

(b) Dynamometer type wattmeter.

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

(iii) Measurement of power in a single phase and three phase circuits by wattmeter, Use of digital multi

meter for measurement of voltage, Current and testing of devices.

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

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

Text and Reference Books:

1. I J Nagrath & D. P. Kothari, "Electrical machines" Tata McGraw Hill.
2. B R Gupta & Vandana Singhal, "Fundamentals of Electrical Machines", New Age International.
3. K. Ogata, "Modern Control Engineering" Prentice Hall of India.

ELECTRICAL MACHINES & CONTROLS LAB

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

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II Year IV Semester
DAU404: Mechanical Engg. Drawing

1. GENERAL CONCEPT OF MACHINE DRAWING

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

(b) General concept of IS working drawing symbols for

(i) Welding & Riveting

(ii) Screws & Screw threads

(iii) Surface Finish Marks

(iv) Limits, Fits & Tolerances

2. FAMILIARIZATION WITH AUTO CAD COMMOANDS: etc.

What is CAD, Different type of CAD software available, Advantages of using CAD, AUTOCAD graphical user interface.

- Setting up drawing environment : Setting units, Drawing limits, Snap, Opening and Saving a drawing, Setting drafting properties, Different co-ordinate system used.

- Commands and their aliases, Different methods to start a command.

- Selecting object, removing object from selection set, Editing with grips, Editing object properties. - Use of draw commands

- Line, Arc, Circle, Polygon, Polygon, Polling, rectangle, Ellipse, construction line, Spline. - Use of modify commands

- erase offset, Move, Copy, Mirror, Fillet, Chamfer, Array, Scale, Stretch, rotate, Explode, Lengthen

Creating 2D objects using Draw and Modify commands, Use of Hatch commands.

- Controlling the drawings display; Zoom, PAN, view ports, Aerial view. - Drawing with precision : Adjusting snap and Grid alignment.

- Use of Tools Menu bar for calculating distance, angle, area, ID points, Mass using inquiry command, Quick select.

- Adding text to drawing, Creating dimension.

- Use of UCS, Alignment of UCS, Move UCS, Orthographic UCS. - Creating 3 D objects using region, boundary, 3D Polyline, Extrude, revolve feature.

- Use of solid 3D edit features, Shell, Imprint, Separate, Section, Boolean functions like Union, Subtract and Intersect, Extrude faces, Move faces, Delete face, Offset faces, Copy faces and colour faces commands.

- To show the section - Use of slice, Section commands.

- Rendering and imaging, Produce hard copies.

3. Sectioned View of

(i)) Foundation bolts

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

4. Assembly Drawing of

(i) Knuckle joint- Part drawing, Solid Modeling, Assembly and Sectioning.

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

5. A Assembly drawing from detail and vice versa.

(i) Tail stock of Lathe machine

(ii) Screw jack

(iii) Drilling Jig

B. Assembly and Disassembly Drawings Plummer block Footstep bearings Couplings etc. Rivetted & Welded Joints Screw and form of screw thread

6. Spur gear profile drawing from given data

7. Free hand sketching of

(i) Pipe fittings-Such as-Elbows-Reducers, T-Cross and Bibcock.

(ii) I. C. engine piston, Simple bearing, Cottor and Knuckle joint, pulleys and flywheel-Sectioned views.

(iii)Cutting tools of Lathe machine, shaper and common milling cutters.

(iv) Gear puller and C-clamp

(v) Sketching of ortho graphics views from isometric views are practiced.

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

EVALUATION SCHEME

III Year SEMESTER -V						
SUBJECT CODE	**SUBJECT NAME**	THEORY		PRACTICAL		TOTAL
		SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DAU-501	INDUSTRIAL MANAGT. AND ENTREPRENEURSHIP DEVELOPMENT	30	70	NA	NA	100
DAU-502	THEORY OF MACHINES	30	70	NA	NA	100
DAU-503	M/C TOOL TECH.& MAINTENANCE	30	70	NA	NA	100
DAU-504	DESIGN & ESTIMATION	30	70	NA	NA	100
DAU-505	AUTOMOBILE ENGINE	30	70	NA	NA	100
DAU-506	INTEGRATIVE COMMUNICATION	NA	NA	25	25	50
DAU-507	AUTOMOBILE SHOP	NA	NA	25	25	50
SEMESTER -VI						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	**SUBJECT NAME**	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
DAU-601	ENVIRONMENTAL EDUCATION AND	30	70	NA	NA	100
DAU-602	INDUSTRIAL ENGG.& SAFETY	30	70	NA	NA	100
DAU-603	METROLOGY & MEASURINGINSTRUMENTS	30	70	25	25	150
DAU-604	AUTOMOBILE TECHNOLOGY	30	70	NA	NA	100
DAU-605	AUTOMOBILE MAINTENANCE,	30	70	NA	NA	100
DAU-606	AUTOMOBILE ENGG. LAB	NA	NA	25	25	50
DAU-607	PROJECT	NA	NA	25	25	50

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III Year V Semester

DAU 501: INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP DEVELOPMENT

1. Principles of Management

1.1 Management, Different Functions: Planning, Organizing, Leading, Controlling.

1.2 Organizational Structure, Types, Functions of different departments.

1.3 Motivation: Factors, characteristics, methods of improving motivation, incentives, pay, promotion, rewards, job satisfaction, job enrichment.

1.4 Need for leadership, Functions of a leader, Factors for accomplishing effective leadership, Manager as a leader, promoting team work.

2. Human Resource Development

2.1 Introduction, objectives and functions of human resource development (HRD) department.

2.2 Recruitment, methods of selection, training strategies and career development.

2.3 Responsibilities of human resource management – policies and functions, selection – Mode of selection – Procedure – training of workers, Job evaluation and Merit rating.

3. Wages and Incentives

3.1 Definition and factors affecting wages, methods of wage payment.

3.2 Wage incentive – type of incentive, difference in wage, incentive and bonus; incentives of supervisor.

3.3 Job evaluation and merit rating.

4. Human and Industrial Relations

4.1 Industrial relations and disputes.

4.2 Relations with subordinates, peers and superiors.

4.3 Characteristics of group behavior and trade unionism.

4.4 Mob psychology.

4.5 Grievance, Handling of grievances.

4.6 Agitations, strikes, Lockouts, Picketing and Gherao.

4.7 Labour welfare schemes. 4.8 Workers' participation in management.

5. Professional Ethics

5.1 Concept of professional ethics.

5.2 Need for code of professional ethics.

5.3 Professional bodies and their role.

6. Sales and Marketing management

6.1 Functions and duties of sales department.

6.2 Sales forecasting, sales promotion, advertisement and after sale services.

6.3 Concept of marketing. 6.4 Problems of marketing.

6.5 Pricing policy, break even analysis.

6.6 Distribution channels and methods of marketing.

7. Labour Legislation Act (as amended on date)

7.1 Factory Act 1948.

7.2 Workmen's Compensation Act 1923.

7.3 Apprentices Act 1961. 7.4 PF Act, ESI Act.

7.5 Industrial Dispute Act 1947.

7.6 Employers State Insurance Act 1948.

7.7 Payment of Wages Act, 1936.

7.8 Intellectual Property Rights Act

8. Material Management

8.1 Inventory control models.

8.2 ABC Analysis, Safety stock, Economic ordering quantity.

8.3 Stores equipment, Stores records, purchasing procedures, Bin card, Cardex.

8.4 Material handling techniques.

9. Financial Management

9.1 Importance of ledger and cash book.

9.2 Profit and loss Account, Balance sheet.

9.3 Interpretation of Statements, Project financing, Project appraisal, return on investments.

10. Entrepreneurship Development

10.1 Concept of entrepreneur and need of entrepreneurship in the context of prevailing employment conditions.

10.2 Distinction between an entrepreneur and a manager.

10.3 Project identification and selection.

10.4 Project formulation.

10.5 Project appraisal.

10.6 Facilities and incentives to an entrepreneur.

11. Fundamental of Economics

11.1 Micro economics.

11.2 Macro economics.

12. Accidents and Safety

12.1 Classification of accidents based on nature of injuries, event and place.

12.2 Causes and effects of accidents.

12.3 Accident-prone workers.

12.4 Action to be taken in case of accidents with machines, electric shock, fires and erection and construction accidents.

12.5 Safety consciousness and publicity.

12.6 Safety procedures.

12.7 Safety measures – Do's and Don'ts and god housing keeping

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III Year V Semester
DAU 502: THEORY OF MACHINES

1. MECHANISMS AND MACHINES: Definition, Kinematic pairs, types of mechanism, Special types of mechanism, Space mechanisms.

2. KINEMATIC ANALYSIS & SYNTHESIS: Displacement, Velocity and Acceleration of plane mechanism, Graphical and analytical techniques, Synthesis of mechanisms - Crank Rockers, Four Bar Mechanisms, Slider Crank Mechanisms.

3. DYNAMICS OF MACHINES : Static and dynamic force analysis, Graphical and analytical approaches, Engine mechanisms, Turning moment diagram, Flywheel analysis, Gyroscopic action in machines.

4. GOVERNORS: Types and classification, Principle of working of gravity controlled and spring controlled governors, Stability, Isochronisms, Sensitivity and capacity.

5. UNBALANCE IN MACHINES, ENGINES AND BALANCING : Origin of unbalanced forces and moments and effects of unbalance, Unbalance in rotating bodies and balancing of discs and rotors, Balancing machines, Field balancing of discs and rotors, Unbalance in reciprocating machines - engine, Compressor, Presses. Unbalance force and moment in a single cylinder engine and balancing, Multi cylinder engine balancing in Line engine, V and Radial engines, Lanchestor balancing techniques.

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

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

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

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III Year V Semester
DAU 503: MACHINE TOOL TECHNOLOGY & MAINTENANCE

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

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

3. SHAPING, PLANING & SLOTTING MACHINES: Working principles of planer, shaper and slotter. Differences and similarties among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry . General and periodic maintenance of a shaper.

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

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

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

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

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

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

10. AUTOMATION OF MACHINING CENTRES: Introduction to CNC Machine tools (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.

11. PLANT MAINTENANCE

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

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III Year V Semester
DAU-504 DESIGN AND ESTIMATION

PART-A

1. INTRODUCTION TO DESIGN: General design consideration in machine parts. Mechanical properties of materials of construction, steps in machine design. Factor of safety, Selection of materials.

2. MACHINE PARTS SUBJECTED TO DIRECT LOADS AND SHEAR LOADS: Threaded connections, core and nominal diameter of screw, boiler-Stay. Design for number of studs or bolts and their diameter for cylinder covers due to external forces. Punching and shearing. Design of cotter and Knuckle joints.

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

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4. MACHINE PARTS SUBJECTED TO BENDING MOMENT: Design for the diameter of railway-Wagon axle, axle used in road-vehicles. Semi-elliptic Laminated spring-Proof load and proof stress stiffness. Expression for maximum stress and deflection. Determination of different dimensions number of Laminations, Central deflection in a laminated spring.

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

6. MACHINE PARTS SUBJECTED TO COMBINED BENDING AND TWISTING MOMENT:
Theory of failures
(i) Maxim. Principal stress theory.
(ii) Maxim. shear stress theory

concept of equivalent bending moment, equivalent torque, Design of over hung crank pin. Design of shaft diameter for over hung pulley in a belt drive.

7. MACHINE PARTS SUBJECTED TO COMBINED DIRECT AND BENDING STRESS: Eccentric load and eccentricity. Max. and minimum stress intensities. Reversal of stress. Design for safe load on small columns. Design of brackets and clamps for eccentric loading.

8. DESIGN OF GEAR: Selection of material, Design analyzing, Lewis equation, Stress concentration, Dynamic load, Surface compressive stress, Beam strength, Bending stress, check or plastic deformation, Design procedure for Spur gear and Helical gear.

PART-B:

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

2. ESTIMATION OF TIME FOR DIFFERENT MACHINING OPERATIONS: Turning, Facing, Chamfering, Knurling, Taper Turning, Threading, Drilling, Boring, Shaping and planing, Milling, Broaching, Simple problems pertaining to above.

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III Year V Semester
DAU-505 AUTOMOBILE ENGINE

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

2. **CHOICE OF POWER UNIT FOR AN AUTOMOBILE:**
Torque and power requirements of an automobile in various conditions. Torque characteristics of some power units such as Gas turbine, Electric motor and I.C. engine; their suitability to automobile needs. Draw back of I.C. engine to meet these needs. Measures taken to make it sutiable to these needs.

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

4. **FUEL SUPPLY AND IGNITION SYSTEM:**
(i) PETROL ENGINE: Fuel supply circuit components (fuel tank to engine), their function. Exhaust pipe and silencer. Construction and working of mechanical and electrical fuel pumps, Brief introduction ot carbureators and its function. Airfuel ratio, its variation with speed. Magneto and Coil Ignition Systems-Working of coil ignition system for multicylinder engine and electornic ignition system, Ignition timing, Ignition advance and retard-Their need and factors on which they depend. Spark Plugs-their types as used in automobile engines. Location of spark plug.

(ii) **DIESEL ENGINE:**
Fuel supply circuit for Diesel engine, Primary and secondary fuel filter, their positioning in the circuit. Construction and working of fuel pump and fuel injection pump. Governer and injector, Electronic injector Solid and Air injection in Diesel engine. Distributor types of diesel injection

pump. Turbulence in filters wet and dry types. Inlet and exhaust mani folds arrangement. Exhaust pipe and silencer. Concept of fuel energy saving.

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

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

5. **COOLING SYSTEM:**

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

6. **LUBRICATION SYSTEM OF AUTOMOBILE ENGINES:**

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

TEXT BOOKS:

1.Ganesan V., "Internal Combustion Engines", Tata McGraw Hill, 2007
2 Ramalingam K.K., “Internal Combustion Engines”, Sci-Tech Publications, 2005
3. Mathur and Sharma "Fundamental Combustion Engines" Dhanpat Rai and Sons,
2002 Engineering
4. A.K. Babu, Automotive Engines, Khanna Publishing House
5. I.C Engine, by R. Yadav, Central Publishing House, Allahabad

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III Year V Semester

DAU-507 AUTOMOBILE SHOP LAB

ONLY FOR SPECILIZATION IN AUTOMOBILE ENGINEERING

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

TEXT BOOKS:

1.Ganesan V., "Internal Combustion Engines", Tata McGraw Hill, 2007
2 Ramalingam K.K., "Internal Combustion Engines", Sci-Tech Publications, 2005
3. Mathur and Sharma "Fundamental Combustion Engines" Dhanpat Rai and Sons,
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4. A.K. Babu, Automotive Engines, Khanna Publishing House

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III Year VI Semester

DAU601: ENVIRONMENTAL EDUCATION & DISASTER MANAGEMENT

1. INTRODUCTION:

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

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

2.1 WATER POLLUTION: Flow Measurement: Hot Wire Anemometry, Laser Doppler Velocity meter, Rota meter Temperature Measurement: Thermometers, bimetallic thermocouples, thermostats and pyrometers. Measurements of Force, Torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments Measurements of Acceleration, and Vibration: Accelerometers vibration pickups and decibel meters, vibro-meters.
- Factors contributing water pollution and their effect.
- Domestic waste water and industrial waste water. Heavy metals, microbes and leaching metal. - Physical, Chemical and Biological Characteristics of waste water.
- Indian Standards for quality of drinking water.
- Indian Standards for quality of treated waste water.
- Treatment methods of effluent (domestic waste water and industrial/ mining waste water), its reuse/safe disposal.

2.2 AIR POLLUTION: Definition of Air pollution, types of air pollutants i.e. SPM, NOX, SOX, GO, CO2, NH3, F, CL, causes and its effects on the environment.
- Monitoring and control of air pollutants, Control measures techniques. Introductory Idea of control equipment in industries i.e.

A. Settling chambers
B. Cyclones
C. Scrubbers (Dry and Wet)
D. Multi Clones

E. Electro Static Precipitations
F. Bog Fillers. - Ambient air quality measurement and their standards.
- Process and domestic emission control
- Vehicular Pollution and Its control with special emphasis of Euro-I, Euro-II, Euro-III and Euro IV.
2.3 NOISE POLLUTION: Sources of noise pollution, its effect and control.
2.4 RADISACTIVE POLLUTION: Sources and its effect on human, animal, plant and material, means to control and preventive measures.
2.5 SOLID WASTE MANAGEMENT: Municipal solid waste, biomedical waste, Industrial and Hazardous waste, Plastic waste and its management.

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

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

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

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III Year VI Semester

DAU 602: INDUSTRIAL ENGINEERING AND SAFETY

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

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

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

4. MATERIAL HANDLING AND MATERIAL HANDLING EQUIPMENT: Factors in material handling problems, Cost reduction through improved material handling, Reduction in time of material handling, Material handling equipments -Lifting lowering devices, Transporting devices, Combination devices, Maintenance of material handling equipments.

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

6. STANDARD AND CODE: National and International code, value of standardization. Standardization program, Role of Standardization department, standardization techniques and problems.ISO-9000 - Concept and its evolution and implications

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

8. COST ESTIMATION : Introduction and function of cost estimation, estimation procedure, elements of cost, depreciation - methods of calculating depreciation, overhead expanses, distribution of over head expanses, calculation of cost for machining and metal forming process and break even analyzer.

9. VALUE ENGINEERING: Concept of value engineering and technique.

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

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III Year VI Semester

DAU603: METROLOGY AND MEASURING INSTRUMENTS

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

2. PRINCIPLES AND CLASSIFICATIONS OF MEASURING INSTRUMENTS:
(A) Principle of Mechanical Measuring Instruments: Lever method, vernier method, screw and screw nut method, compound gearing and helical spring methods.
(B) Principles of Optical Instruments: Reflection, Refraction, Interference, Polarization, tical prisms, Lenses and Optical projection (Magnification)
(C) Principle of Electrical measuring instruments
(D) Principle of Hydraulic and Pneumatic Instruments.

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

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

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

6 VARIOUS TYPES OF INSTRUMENTS USED FOR:
(i) (a) Physical Measurements such as - Length, Depth height, Thickness, Gaps, Curvature , Angle, Taper, Area, Undulations, Surface finish, Thread and Gear measurement.

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

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

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

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

7. TEMPERATURE MEASUREMENT: Various types of thermometers, thermocouples, pyrometers

8. SPECIAL MEASURING DEVICES: Computerized 3-D measuring machine (Working Only).

9. MEASUREMENT OF VIBRATIONS: Use of seismic Accelerometer, Potentio metric type and **L. V. D. T.** type, Piezo-electric type accelerometer.

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

DME 603 -List of practicals

1. Measurement of angle with the help of sine bar/vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Use of comparators for measurement
4. To measure the diameter of a hole with the help of precision balls.
5. Measurement of Taper by standard balls and rollers.
6. To test the squareness of a component with auto collimator.
7. To measure the pitch, angle and form of thread of a screw.
8. Measurement of gear elements by using gear tooth vernier.
9. To measure the straightness of the edge of a component with the help of autocollimator.
10. Use of linear measuring instrument such as vernier calliper and micrometer.
11. Calibration of Sensors like LVDT

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III Year VI Semester
DME604: AUTOMOBILE TECHNOLOGY

1. **AUTO TRANSMISSION SYSTEM:**

(a) CLUTCH: Function of clutch in an auto mobile, Construction delail of single plate and multi plate friction clutches, Centrifugal and semi-centrifugal clutch. Construction and working of fluid flywheel.

(b) GEAR BOX: Its function, Assembly detail and working of sliding Mesh, constant mesh, Synchromesh and epicyclic gear boxes. Simple concept of over drive, overrunning clutch,transfer case and torque converter.

(c) PROPELLER SHAFT: Its function, Universal joint and slip joint, Hotchkiss drive and Torque tube drive.

(d) FINAL DRIVES: Concept of tail pinion, Crown wheel, Differential type rear axle.

(e) WHEELS AND TYRES: Sizes of tyres used in Indian vehicles, over inflation, under inflation and their effect. Causes of tyre wear, Tyre retreading, idea of Toe-in, Toe-out, Camber, Caster, King pin inclination. Advantages of tube less tyres over tyres with tubes. Wheel alignment and balancing, Tyre rotation, Difference between radial and cross ply.

2. **STEERING SYSTEM:**

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

3. **BRAKING SYSTEM:**

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

4. **SUSPENSION SYSTEM:**

Function of suspension system. Types of suspension systems, Working of leaf springs, Coil springs. Shock absorbers, Tortion bar suspension and stabilisers. Mac phersion system.

5. **STORAGE BATTERY:** Storage Battery constructional detail of lead acid cell battery. Specific gravity preparation of electrolyte, effect of temperature, Charging and discharging on specific

gravity of electrolyte. Capacity and efficiency of battery. Battery charging from D.C. mains, A.C. mains, Battery charger-Charging circuit, care and maintenance of batteries. Checking of cells for voltage and specific gravity of electrolyte.

6. **DYNAMO AND ALTERNATOR:**
Introduction to Dynamo and its details, Regulators- Voltage, current and compensated types. Cutout Construction working and their adjustment. Alternators-Construction and working, charging of battery from alternator. Use of battery, dynamo/alternator in an automobile.

7. **ENGINE STARTING:**
Engine starting circuit, Drive motor and its characteristics, Conditions of starting and behavior of motor at starting. Starter Drive-Bendix pinion, Torsion, compression, Clutch and sliding armature type. Switch-Mannual, over running, solenoid and vacuum switches. Turbocharging and inter-cooling.

8. **AUTOMOBILE WIRING & LIGHTING SYSTEM**: Earth return and insulated return systems-6 volts, 12 volts and 24 volts systems, Positive and negative earthing,Fuse in circuit, Automobile cabbles-Specifications and colour code.Diagram of a typical wiring systems. Principle of auto illumination, Lighting requirement-Headlamp mounting and construction, sealed beam lamp, Assymetrical head lights, dip and full beam type bulb, auxillary type lights. Polarised head light, Flesher unit, Warning lights and panel lights. Fore head lamp systems. Other lamps-Pass lamps, Fog lamp, reversing lamps. Switching of lamps. Parking brake, Direction indicators. Electric horns, Revolution counter, Speedometer, Fuel gauge, Pressure gauge, Temperature gauge, Wind screen wipers, stereo system and speaker,introduction to remote sensing devices. Microprocessor control of automobile.

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

10. **STUDY OF SPECIFICATION FOR DIFFERENT UNITS**: Clutch, Gear Box, Propeller Shaft, Final Drive, Wheel and tyre manufactured in India

Books and References:
1. Automobile engineering", Dr. Kripal Singh.
2. A.K. Babu, Automotive Mechanics, Khanna Publishing House
3. Automobile engineering" K.M. Gupta.
4. Heldt P.M., "Automotive chassis", Chilton Co., New York.
5. Giles J.G., "Steering, Suspension and tyres", Iliffe Book Co., London.
6. Check Chart; Automatic Transmission; Harper & Row Publication.

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III Year VI Semester

DME605: AUTOMOBILE MAINTENANCE ,SERVICING & REPAIR

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

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

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

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

5. ELECTRICAL SYSTEM REPAIR AND MAINTENANCE :
Starter trouble, shooting and suggesting remedies, removal of starter from engine, repairing the starter, bushes and bushes replacement, checking of armature for short circuit, cleaning of commutates, checking, repairing of starter drive reassembly and testing of starter, dynamo, lubricating the dynamo, changing the bushes, checking and turning the electrical horn.

6. ACCESSORIES OF ELECTRICAL SYSTEM AND THEIR SERVICE :
Wind screen, wiper, electrical horn and relay, cigarette lighter, growler, spark plug cleaner and tester, electrical test bench.

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

8. AUTOMOBILE POLLUTION & CONTROL :
Source and control of automobile air pollution, causes of automobile pollution and their remedies monitoring and analysis of auto exhaust emission, legislative action, judical response. Introduction to energy conservation.

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

Books and References:
1. Heldt P.M.; Torque converters; Chilton Book Co.
2 Giri NK; Automobile Engineering; Khanna Publisher.
3. Newton, Steeds & Garret; Motor Vehicles; B.H. Publication.
4. Judge, A.W., Modern Transmission Systems, Chapman & Hall Ltd
5. Automobile engineering", Dr. Kripal Singh.
6. Automobile engineering" K.M. Gupta.
7. Heldt P.M., "Automotive chassis", Chilton Co., New York.
8. Giles J.G., "Steering, Suspension and tyres", Iliffe Book Co., London.

Department Of Automobile Engineering
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III Year VI Semester

DAU 606 - AUTOMOBILE ENGINEERING LAB

List of practical's

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

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III Year VI Semester

DAU-607 PROJECT

The project paper will be of two parts. Part-A will contain the problems to evaluate students learning. The Part-B will be regarding students awareness of the plans and programmers running for rural development, Ecological balance and environmental pollution control. For Spl. in Automobile Engineering Only) :

PART-A:

Choose any one problem to establish auto workshop. Servicing and repairing of Auto engines (Diesel/Petrol). Reconditioning and overhauling of Diesel and Petrol engine, Phasing and calibration of fuel injection pump and Adjustment of injector, Tyre retreading, Adjustment and repairing of Auto electrical system - Self-starter, Dynamo & Cutout, Charging of Battery (Old/New), Cylinder Boring, Turning of Brake Drum, Valve Grinding, remote sensing devices in vehicle, air-conditioning installation in vehicles.

PART-B:

The student Will survey a village and prepare a report giving details of population, Means of lively hood, Health and hygienic conditions, Education facilities and various programmers/projects running for the development and the personnel's and agencies involved in the work. He will also make observation on environmental pollution and ecological disturbances and will make a mention of that in his report with its reason, suggesting remedies or ways to minimize it.