CAD/CAM LABORATORY

Course Objectives: Student will be able to

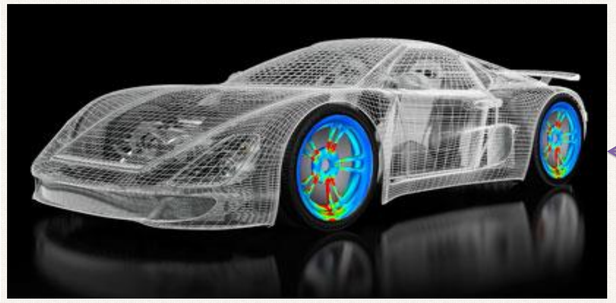
- Understand the ways in which 2D, 3D, part drawings and assembly drawings are made using appropriate CAD packages.
- Learn the part programming techniques in turning, milling and drilling operations.
- Understand the determination of stresses and strains in systems like trusses and beams.

THEME

DESIGN, MANUFACTURING AND ANALYSIS OF AUTOMOTIVES

Course Outcomes :At the end of the course student should be able to

- Generate part and assembly drawings using CAD packages.
- Produce component with different features using CNC machines and machining centres.
- Determine the elastic properties in components of the structures.

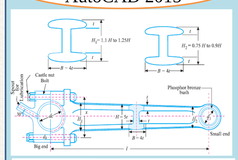


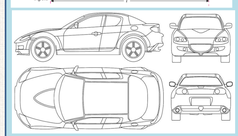
Computer Aided Design

1 2D Drawing

2D Drawing models were the first ones to be develop in view of their relatively lesser complexity.

Software Required: AutoCAD 2015

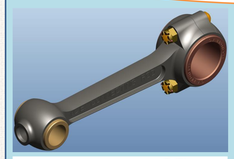




2 3D Drawing

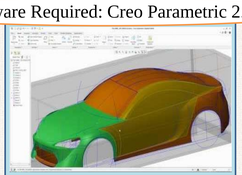
3D Drawing models are to represent complete size and shape with the help of Creo or AutoCAD, etc..

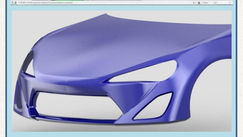
Software Required: Creo Parametric 2.0



4 Surface Modelling

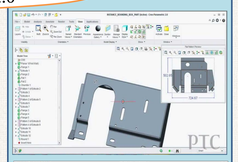
Surface Model is constructed essentially from surfaces such as planes, rotated curved surfaces (ruled surfaces) and even complex surfaces.

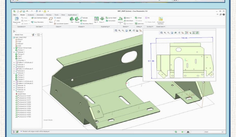




5 Sheet Metal Working

Sheet Metal Working is simple metal formed in to thin pieces. It is one of the fundamental forms used in metalworking, and can be cut and bent into a variety of different shapes.

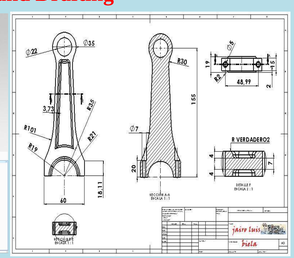




3 Assembly and Drafting

Assembly Drawing refer to how parts of a product fit together. They are often used to show how to assemble parts.

Software Required: Creo Parametric 2.0



Drafting refer to the way the model developed can be utilised for the purpose of transmitting the information in hard-copy form for other applications, such as part prints onto the shop floor, or maintenance of manuals for the equipment.

NAME OF THE EXERCISE / PROGRAM

CAD

1. 2D Drawing
2. 3D modelling
3. Assembly and Drafting
4. Surface Modelling
5. Sheet Metal Working

CAM

6. Part programming
7.
8. Generation of tool path
9. Machining of small components
10.

CAE

11. Deflection and stresses in 2D and 3D trusses and beams
12. Principal/ Von-mises stresses and deflections, in plane stress/ plane strain/ axisymmetric models
13. Stresses in 3D and shell structures

Computer Aided Manufacturing

6 Part programming

Edgecam **Part Modeler** is a cost effective, 3D modelling tool specifically designed for quick and simple construction and/ or modification of solid models.

Edgecam Part Modeler will import and manipulate files from most CAD systems, including: SolidWorks, Unigraphics NX, Catia V5, Creo Parametric, Autodesk Inventor and IGES

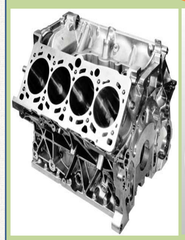
7 Generation of tool path

Simulation aims to show you the finished part that the output CNC code will produce. When Cutter Radius Compensation is to be applied on the machine this must be done correctly for the finished part to match the part shown in Simulator.

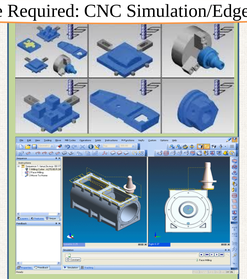
8 Machining of small components

Edgecam **Manufacturing** aims to after finalising the product design, it is important to move the product to manufacturing stage.

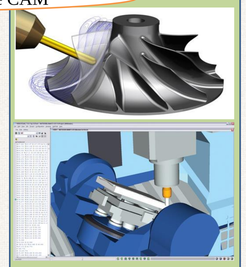
Software Required: CNC Simulation/Edge CAM



CNC Part Programming is a detailed list of instructions that need to be executed by the Machine Control Unit (MCU) to achieve the final component shape.



Edgecam **Tool path Generation** aims to the path through which the tool transverses to remove the material from the stock.



The requisite manufacturing specifications are achieved at the lowest cost.

Computer Aided Engineering

11 Deflection and stresses in 2D and 3D trusses and beams

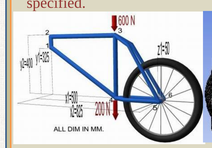
A typical analysis in ANSYS begins with **pre processing** where data such as the geometry, materials and element types are specified.

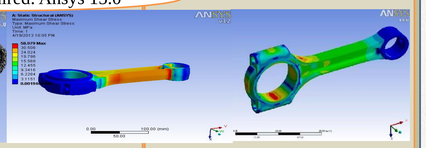
12 Principal/ Von-mises stresses and deflections, in plane stress/ plane strain/ axisymmetric models

13 Stresses in 3D and shell structures

Post processor is used to review the results through graphics display and tabular listing.

Software Required: Ansys 15.0





Solution: Boundary conditions (Displacement constraints) and loads can be applied in this stage.

Meshing: The goal of meshing in ANSYS Workbench is to provide robust, easy to use meshing tools that will simplify the mesh generation process.

In **Post processor** we can do Shear force diagram, Bending moment diagram, Nodal solution, Von Misses, Principle, and Shear stress, etc…

Prepared by Naveen Kumar T, Asst. Prof. Dept. of ME, KLS VIET

By adding the Nano metallic powder, i. e, aluminium oxide to the blends of B20 there was a considerable change in the above values. Indicated power, break power, indicated & break thermal efficiency, specific fuel consumption and mechanical efficiencies increased. The increase of these values are noticeable. It is observed that we have got best results for B20, with addition of nano particles to B20 smoke opacity is further reduced but there is slight increase in NO emissions.

Automotive Engines Laboratory

Department of Automobile Engineering

Lab In-charge: Dr. G.V.L.Prasad , Asst.Prof

Lab Assistant: Mr. V. Chandrasekhar Rao

Automotive Engines Lab Story Board

Course Objectives

- To make students familiar with the design and operating characteristics of modern internal combustion engines
- To apply analytical techniques to the engineering problems and performance analysis of internal combustion engines.
- To study the thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency and emissions
- To introduce students to the environmental and fuel economy challenges facing the internal combustion engine
- To introduce students to future internal combustion engine technology and market trends

Course Outcomes

On completion of this course the student will be able to

•Differentiate among different internal combustion engine designs

•Recognize and understand reasons for differences among operating characteristics of different engine types and designs

•Based on an in-depth analysis of the combustion process, predict concentrations of primary exhaust pollutants

Develop skills to run engine dynamometer experiments

Learn to compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations

Develop an understanding of real world engine design issues

Develop an ability to optimize future engine designs for specific sets of constraints (fuel economy, performance, emissions)

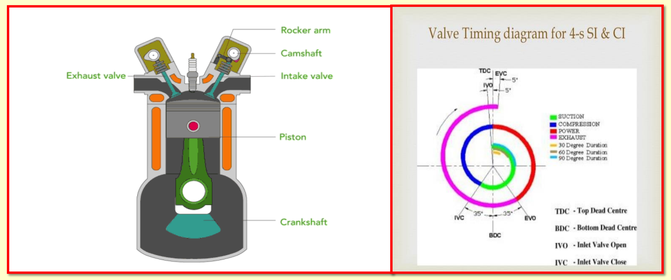
S. N0	Name of the Experiments
1	Valve Timing Diagram for 4-Stroke Diesel Engine
2	Valve Timing Diagram for 4-Stroke Petrol Engine
3	Port Timing diagram for 2-Stroke Petrol Engine
4	Performance test on 4- Stroke Single Cylinder Diesel Engine
5	Performance Test on 2 – Stroke Petrol Engine
6	Heat Balance Test on 4 – Stroke Single Cylinder Diesel Engine
7	Optimum cooling temperature test on Single Cylinder Diesel Engine
8	Morse Test on Multi Cylinder Petrol Engine
9	Performance Test on Computerized Diesel Engine
10	Performance Test on Computerized Dual Fuel Engine
11	Exhaust Gas Analysis on Computerized Diesel Engine By Flue Gas Analyzer
12	Permanence test on reciprocating compressor test rig

5 Gas Exhaust Analyser

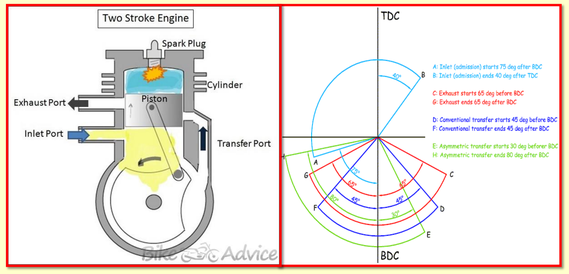
5 Gas Exhaust Analyser helpful in troubleshooting both emissions and driveability concerns. The five gasses measured (for petrol emissions) are: HC, CO, CO_2, O_2 and NO_x. The O_2 and CO_2, are excellent troubleshooting tools. If CO goes up, O_2 goes down, and conversely if O_2 goes up, CO goes down. CO readings are an indicator of a rich running engine and O_2 readings are an indicator of a lean running engine.

Diesel Smoke Meter

Diesel Exhaust Smoke meter or opacity meter, displays the smoke density giving a measure of the efficiency of combustion. The measurement principle is based on light extinction detection. The smoke meter detect and measure the amount of light blocked in a sample of smoke emitted by diesel engine .

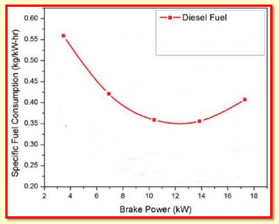


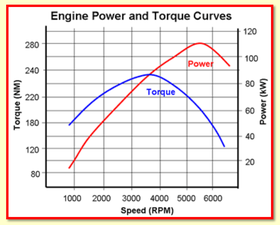
Four Stroke C I Engine Cut section Model for Performing Valve Timing Diagram



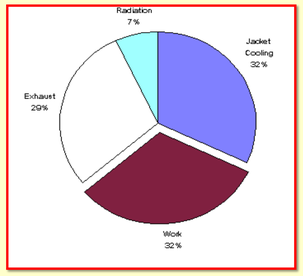
Two Stroke S I Engine Cut section Model for Performing Port Timing Diagram

Performance Curves

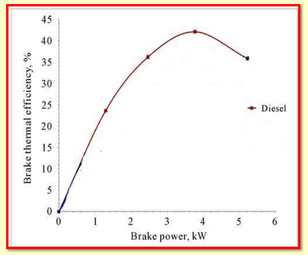


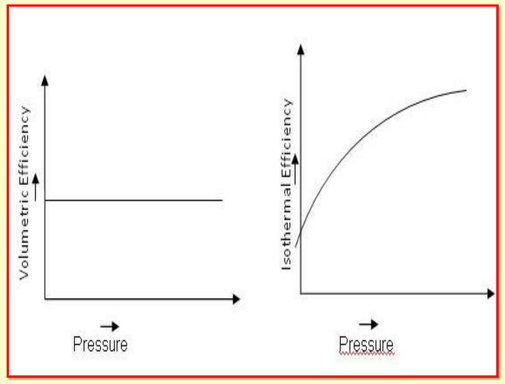


Diesel Engine Test Rig To Conduct Performance Test And Heat Balance Test



Heat Balance PI Chart





Multi Stage Air Compressor Test Rig To Conduct Performance Test

AUTOMOTIVE ELECTRICAL AND ELECTRONICS Laboratory

Department of Automobile Engineering, Room No.A 212, Area: 77.44 sqm

Lab In-charge: Mr. MohamadAziz Athani
Lab Assistant: Mr. V. Chandrasekhar Rao

STORY BOARD

Course Theme

This course has been designed to provide specialised skills in the field of vehicle electrical and electronics related to maintenance procedures and repair techniques after performing a set of technical tests on a vehicle. This course also provides training on different problems found in vehicle electrical systems, causes of their faults and methods of diagnosing using suitable equipments.

Course Objectives

- Concepts and develop basic skills necessary to diagnose automotive electrical problems, to include electrical principles, use of basic electrical test equipment.
- Interpret wiring diagrams, and to gather and analyze information.
- Diagnose and repair automotive batteries, starting, and charging, lighting systems, advanced automotive electrical systems

Course Outcomes

On completion of this course the student will be able to

- Identify different electrical problems in vehicle and their functionality
- Inspect the vehicle electrical components and identify the faults
- Perform fault diagnosis and detection using suitable test equipment

Name of the Equipments / Experiments

1. Battery Charger
2. Electrical test bench
3. Spark plug tester
4. Starter motor
5. Alternator
6. Automotive Wiring Layout
7. Training module for MPFI Petrol engine
8. Automotive battery tester
9. LVDT
10. Strain gauge
11. RTD
12. Thermistor
13. Pressure measurement

Battery Charger

A battery charger is intended to be connected to a battery, it may not have voltage regulation or filtering of the DC voltage output. Battery chargers equipped with both voltage regulation and filtering may be identified as battery eliminators

- To recharge a fuel vehicle's starter battery, where a modular charger is used
- To recharge an electric vehicle (EV) battery pack

Electrical Test Bench

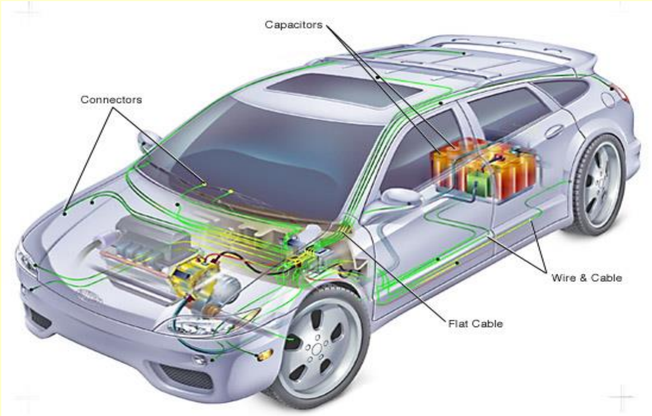
Auto electrical test bench is a table model and has been designed to cater to the needs of auto electrician, garages, service centres, transport corporation institution and other bulk users of auto electrical equipment for complete testing of alternator, regulator and their associated parts. It has also built-in dc power supply to check light run of starter motor and alternator

Sparkplug tester

Spark plug is a device to produce electric spark to ignite the compressed air-fuel mixture inside the cylinder. The spark plug is screwed in the top of the cylinder so that its electrodes projects in the combustion chamber.

Starter motor

To start the first cycle of engine's run session, the first two strokes must be powered in some other way. The starter motor is used for this purpose and is not required once the system starts running. Starter motor is an electric motor



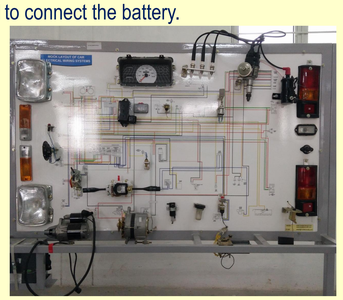
Alternator

Alternators are used in modern automobiles to charge the battery and to power the electrical system when its engine is running. Alternators have several advantages over direct-current generators. They lighter, cheaper and more rugged

.

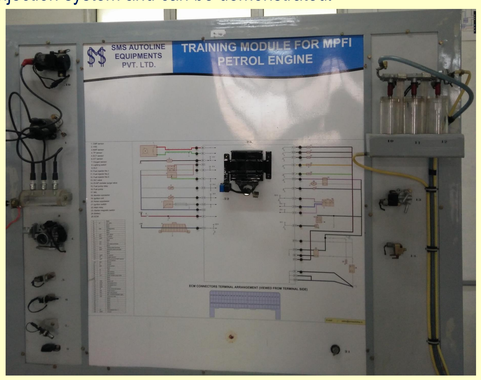
Automotive Wiring Layout

Automotive wiring layout is used to demonstrate the total wiring of a car. With this students can understand how the wiring is done and it demonstrates complete idea of the electrical system of a car and the actual wiring with parts and accessories of a car had been arranged, according to the electrical circuit of a car and terminals are provided to connect the battery.



Training Module for MPFI Petrol Engine

Petrol engines now a days are equipped with fuel injectors instead of carburetor. This module helps in understanding the work flow of the injection system and can be demonstrated.



Automotive Battery Tester

Automotive battery tester is used to check the battery of an automobile in live conditions. It can test cranking and cold cranking conditions while being connected to the vehicle. Total life of the batter, complete analysis and health of the battery.

DEPARTMENT OF AUTOMOBILE ENGINEERING

AUTOMOBILE ENGINEERING LABORATORY STORY BOARD

LOCATION- S4-4
AREA- 83.1Sq.M

COURSE THEME

The course has been designed to provide deep understanding of the Automobile Components, Working and Sectional View. This laboratory facilitates the students with cut-sections of main components which form an integral part of Automobile. This laboratory also provides the approach of understanding the component part-wise and relating it to a whole.

COURSE OBJECTIVE

Visualization of the automotive components and their working.
Understanding of the different parts and the mechanisms and relating it to whole.

COURSE OUTCOMES

On completion of this course the student will be able to

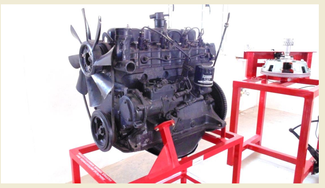
- Identify different components of a vehicle and their functionality
- The working of the components in a automobile.
- The sectional view of the components provide an in-depth knowledge of the modelling of the component

AUTOMOTIVE SYSTEMS

A major effort for many years has involved the study of the two principal control facets of transportation systems: a microscopic aspect which relates to each individual vehicle, and a macroscopic aspect which relates to overall network operations. Laboratory work has included, study and understand the design and development of the automotive systems.

MULTI CYLINDER DIESEL ENGINE

The diesel engine is a type of I/C Engine in which fuel is ignited by being suddenly exposed to the high temperature and pressure of a compressed gas containing oxygen rather than a separate source of ignition energy , as in the case of a petrol engine. Diesel Engines are very well established in a wide variety of applications.

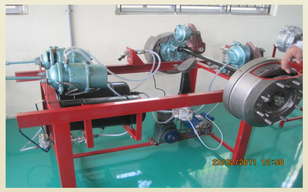


STEERING AND SUSPENSION SYSTEM

The ability of the car to avoid accidents depends on its steering, stopping and stability components working together. The steering and suspension systems of the vehicle are important both for safety reasons and also to give the vehicle a more comfortable ride.

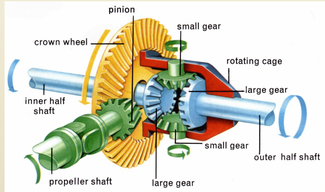
PNEUMATIC AIR-BRAKE SYSTEM

An air brake or a compressed air brake system is a type of friction brake for vehicles in which compressed air pressing on a piston is used to apply the pressure to the brake pad needed to stop the vehicle. Air brakes are used in large heavy vehicles particularly those having multiple trailers which must be linked into the brake system.



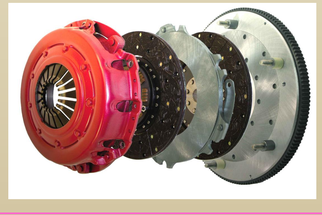
DIFFERENTIAL GEAR BOX

The differential gear, in automotive mechanics, gear arrangement that permits power from the engine to be transmitted to a pair of driving wheels, dividing the force equally between them but permitting them to follow paths of different lengths, as when turning a corner or traversing an uneven road.



CLUTCH MECHANISM

A clutch is that part of engine which engages or disengages power from engine crankshaft to transmission. In a car, you need a clutch because the engine spins all the time, but the car wheels are not. In order for a car to stop without killing the engine, the wheel needs to be disconnected from the engine.



MULTI POINT FUEL INJECTION SYSTEM

Fuel injection is a method or system for admitting fuel into the I/C Engine. The popular injection systems used are MPFI in petrol Engine and CRDI in Diesel Engine. Earlier we used to have a Carburettor in petrol engines for supplying the air-fuel mixture in correct ratio to cylinders in all rpm ranges, but the use of MPFI system provided us with cleaner exhaust emissions, more fuel economy and improved drivability.

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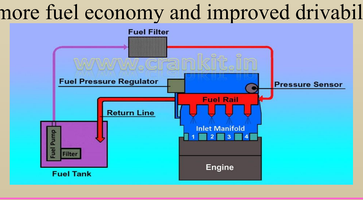


NAME OF THE EXPERIMENT

1. Dismantling, Inspection and Assembly of Multi Cylinder Petrol Engine
2. Dismantling, Inspection and Assembly of Multi Cylinder Diesel Engine
3. Study of Multi Point Fuel Injection System and Components
4. Valve Spring testing.
5. Connecting Rod Alignment.
6. Piston ring Dismantling, Testing and Assembly.
7. Study and demonstration of Steering System of LMV.
8. Study and demonstration of Suspension System of LMV.
9. Study, Dismantling and Assembly of Synchromesh Gear Box
10. Study, Dismantling and Assembly of Differential Gear Box.

LAB INCHARGE: Mr. D. Suresh, Asst. Professor, AED

LAB ASSISTANT: Mr. V. Chandra Sekhar Rao, Jr. Skilled Assistant, AED

Vehicle Maintenance and Testing Laboratory

Department of Automobile Engineering, Room No: S4-5, Area: 125.77 Sq.m

Lab In-charge: Mr .Venkata ramarao M
Lab Assistant: Mr. G.Pundarika

VMT Lab Story Board

Course Theme

This course has been designed to provide specialised skills in the field of vehicle mechanics related to maintenance procedures and repair techniques after performing a set of technical tests on a vehicle. This course also provides training on different problems found in vehicle systems, causes of their faults and methods of diagnosing using suitable equipments.

Course Objectives

- Hands on training in in automotive shops with safety procedures
- Vehicle inspection and identification of faults
- Diagnosis using suitable test equipments and use of service manuals
- Adjust / repair / replace of parts

Course Outcomes

On completion of this course the student will be able to

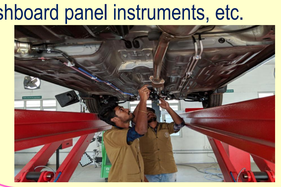
- Inspect the vehicle and identify sub-systems
- Perform fault diagnosis of engine
- Perform fault diagnosis of vehicle
- Execute maintenance and repair/replacement operations

Name of the Experiments

1. Vehicle Inspection
2. Engine compression test
3. Engine manifold vacuum test
4. Automotive battery test
5. Multi car scanning
6. Petrol vehicle exhaust analysis
7. Diesel smoke measurement
8. Wheel balancing of wheel and tyre assembly
9. Wheel alignment test
10. Headlight alignment test
11. Ignition timing test

Vehicle Inspection

A understanding about the vehicle and visual inspection of interiors and exteriors. Going through the owner's manual and regular maintenance checkups. Identifying and verifying the correct functionality of various automotive systems involved in that particular vehicle like engine, steering, brakes, wheel and tyres, frame, transmission, driveline, suspension, accessories, dashboard panel instruments, etc.



Multi Car Scanner

The Multi car scanner is a multifunctional diagnostic and technical information system. This tool can scan and diagnose error codes, access information relative to the specific vehicle (circuit diagrams, maintenance schedules and reference a host of maintenance, hydraulic, pneumatic and electrical connection diagrams, location of various system components, troubleshooting guides and steps, etc.).

Diesel Smoke Meter

Diesel Exhaust Smoke meter or opacity meter, displays the smoke density giving a measure of the efficiency of combustion. The measurement principle is based on light extinction detection. The smoke meter detect and measure the amount of light blocked in a sample of smoke emitted by diesel engines from cars, trucks, ships, buses, motorcycles, locomotives and large stacks from industrial operations

5 Gas Exhaust Analyser

5 Gas Exhaust Analyser helpful in troubleshooting both emissions and driveability concerns. The five gasses measured (for petrol emissions) are: HC, CO, CO_2, O_2 and NO_x. The O_2 and CO_2, are excellent troubleshooting tools. If CO goes up, O_2 goes down, and conversely if O_2 goes up, CO goes down. CO readings are an indicator of a rich running engine and O_2 readings are an indicator of a lean running engine.

Battery Tester

A good battery is essential for reliable starting, especially during cold weather because cold weather increases the cranking load on the battery. The electronic battery tester sends a alternating frequency signal through the battery to determine the condition of the cell plates inside the battery.. A battery tester analyze the battery's CCA capacity, which can be used to estimate the battery's remaining service life. Some testers can also measure the amps drawn by the starter while cranking the engine, and analyze charging system output under load once the engine is running.

Wheel Balancing Machine

Unbalanced wheels can cause your tyres to wear prematurely, as well as causing accelerated wear of your shock absorbers, struts and steering components. In computarised wheel balancing machine, the wheels are balanced perfectly, improving fuel economy and providing you with smooth, vibration-free driving. If the wheel is out of balance, small weights are added to ensure even weight distribution and a smooth and consistent rotation of the tyre.

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Headlight Alignment Tester

A headlight Alignment tester is a means to check both the orientation and intensity of a vehicle headlights to ensure that it meets a minimum standard for the country of use of the vehicle. It comprises a fully adjustable single optical collimated light lens. The optical lens is designed to accurately focus all types of vehicle headlamp, and is fully adjustable in the vertical plane. achieved by mounting it to a vertical column.

Compression Tester & Vaccum Tester

A compression test is used to determine the health of your engine by measuring cylinder pressure. A wet compression test is used to indicate if low cylinder pressures are caused by worn piston rings only. The test is done exactly the same as the "dry" test, however a small amount of engine oil (about 1-2 teaspoons) is added into the cylinder to create temporarily seal (to prevent possible blow-by).

Wheel Alignment Machine

Wheel Alignment is the measurement of complex suspension angles and the adjustment of a variety of suspension components. It greatly influences the vehicle's handling and tire wear. Wheel alignment consists of adjusting the angles of the wheels so that they are parallel to each other and perpendicular to the ground, thus maximizing tire life and ensures straight and true tracking. The primary angles that need to be measured and adjusted are caster, camber and toe angle.

Course objectives: Student will be able

- To study coefficient of discharges for different flow meters
- To study friction factor in different pipes
- To study the various types of flows
- To study the performance of the turbines
- To Study understand the performance of the pumps

FLUID MECHANICS AND MACHINERY LABOROTARY
AUTOMOBILE ENGINEERING

THEME: Identification of Types Of Flows , Determination of Hydraulic Coefficient Of Different Flow Measuring Instrument, Performance Prediction of Different Turbines And Pumps .

Course out comes: At the end of course student should able to

- Verify Bernoulli's theorem
- Determine C_d of venturi, orifice and notch
- Study the effect of friction factor in different pipe
- Find the performance and plot performances curves for pumps and turbines

1 Calibration of venturimter

Attributes	Data
1. Instrumentation	Manometer ,stop clock, mercury ,water
2. Run the setup	Started by switching on motor and pump ,water circulation
3. Analysis	Noted down the respected data
4. Results	find: theoretical discharge, Actual discharge and find C_d

2 Determination of friction factor for given

Attributes	Data
1. Instrumentation and Specifications	Manometer, stop clock, mercury, water, different pipes
2. Run the setup	Started by switching on motor and pump ,water circulation
3. Analysis	By varying the flow raters ,note down the head loss readings
4. Results	Determination of friction factor

3 Determination of efficiencies of different turbines

Attributes	Data
1. Instrumentation and Specifications	Tachometer, weights, mercury,
2. Run the setup	Started by switching on motor and pump
3. Analysis	Noted down the speed ,load, manometer readings and pressure gauge readings
4. Results	Find: efficiencies of turbines under different loads, obtain curves

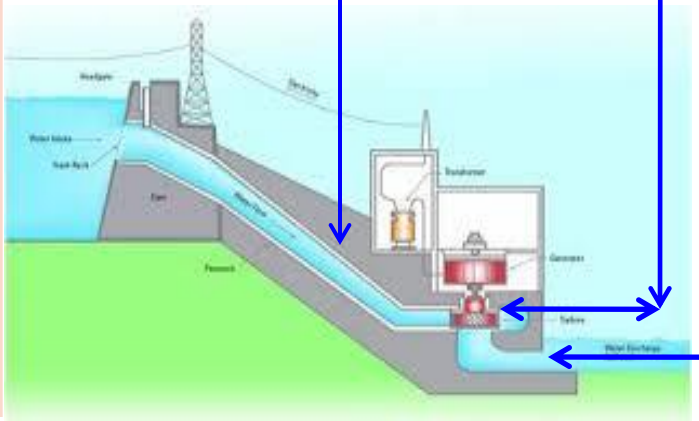
4 Determination of co-efficient of loss of head

Attributes	Data
1. Instrumentation and Specifications	Manometer, stop clock, mercury,water, Bends ,elbow
2. Run the setup	started by switching on motor and pump
3. Analysis	Noted down the required data,
4. Results	Find: co-efficient of loss of pipes

6 Determination of coefficient of impact of jet

Attributes	Data
1. Instrumentation and Specifications	Load ,motor pump ,circular plate
2. Run the setup	Started by switching on motor and pump
3. Analysis	Noted down the required data
4. Result	Find: coefficient of impact of jet

Hydro Electric Power Plant



8. Determination of efficiencies of pumps

Attributes	Data
1. Instrumentation and Specifications	Pumps ,pressure gauges ,stop clock
2. Run the setup	Started by switching on motor and pump
3. Analysis	Note down suction pressure gauge and delivery gauge reading ,energy meter at time
4. Result	Efficiency of the pump for different outlet pressures ,obtain curves

List of Exercises

() fluid mechanics lab Name of Exercise/ Program	Equipment Required / Available
1. Calibration of venturimeter	Setup
2. Determination of friction factor for given pipe	Setup
3. Calibration of triangular notch	Setup
4. Determination of coefficient of loss of head in a sudden contraction of pipe line	Setup
5. Verification of Bernoulli's equation	Setup
6. Determination of coefficient of impact of jet on different circular vanes	Setup
7. Determination of efficiency and specific speed of pelton wheel	Setup
8.Efficiency of Francis turbine and performance curves	Setup
9. Performance TSST on reciprocation pump	Setup
10. Performance test on centrifugal pump	Setup

1. Pre procedure
2. Run the setup
3. Analysis
4. Results