

# PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Automobile Engineering

SYLLABUS FOR 4th Sem BTech PROGRAMME

Basic Automobile Engineering Project (03102251)

**Type of Course:** BTech

**Prerequisite:** Knowledge of Physics and fundamentals of Mechanical Engineering.

**Rationale:** Study of this course is to get the understanding of construction and functions of basic mechanisms and structure of Automobile System responsible to generate required power, to transmit power for propelling vehicle, to control the vehicle during motion, other supporting systems like battery and vehicle electrical system.

**Teaching and Examination Scheme:**

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
0	0	2	1	-	30	-	-	20	50

Lect - Lecture, Tut - Tutorial, Lab - Lab, T - Theory, P - Practical, CE - CE, T - Theory, P - Practical

**Contents:**

Sr.	Topic	Weightage	Teaching Hrs.
1	<b>INTRODUCTION OF TOOLS:</b> Hand Tools and Tool Kit, A set of Fix Spanners, A set of Ring Spanner, Screw Driver, Circuit Tester	10%	2
2	<b>VEHICLE LAYOUT, CHASSIS AND FRAME:</b> Vehicle layout and flow of motion, Types of Chassis frame for Two, Three and Four Wheeler.	10%	2
3	<b>DISASSEMBLY AND ASSEMBLY OF INTERNAL COMBUSTION ENGINE:</b> Cubic Capacity of I.C. Engine, Disassembly and assembly of Petrol and Diesel Engine.	15%	6
4	<b>DISASSEMBLY AND ASSEMBLY OF POWER TRAIN:</b> Mechanism of Clutch, Types of gear box, Disassembly and assembly of Gear Box, Universal Joint, Slip Joint, Propeller Shaft, Differential.	15%	6
5	<b>DISASSEMBLY AND ASSEMBLY OF VEHICLE CONTROL SYSTEMS:</b> Types of Steering gear box and steering mechanisms, Types of Braking System and Brake operating mechanism.	15%	6
6	<b>BATTERY AND VEHICLE WIRING:</b> Battery: Specification, construction. Electrical Circuit for Spark Ignition, Head Lights, Tail Lights, Side Lights and Horn.	15%	2

7	<b>MINI PROJECT:</b> 1. A technical project consists of construction of working or non-working model of a conventional or modern automobile system. 2. A service related societal project consists to conduct a camp of one day for routine service, repair and maintenance of atleast two wheeled vehicle which includes checking and changing of engine oil, checking of clutch and brake system, replacement of clutch and/ or brake wire, lubrication and greasing in various systems of vehicle, checking of battery and electrical system of a vehicle including head light, tail light, side light, horn etc.	20%	
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**\*Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

**Reference Books:**

1. Basic Automobile Engineering  
C. P. Nakra; Dhanpat Rai Publishing Company (P) Limited
2. Internal Combustion Engines  
Ganesan. V; Tata-McGraw Hill Publishing Co., New Delhi.
3. Internal Combustion Engines  
V.M. Domkundwar; Dhanpat Rai Publishing Company (P) Limited
4. Automotive Engines  
William H. Crouse and Donald Anglin; McGraw-Hill International Editions: Automotive Technology Series
5. Automotive Engines  
Ellinger.H.E; Prentice Hall Publishers

**Course Outcome:**

After Learning the course the students shall be able to:

- Explore basic construction of vehicle body and the power house (Engine) through assembling & de-assembling.
- Develop skills to disassemble and assemble various automobile systems using different tools.
- Learn basic working and construction of various automobile systems and electrical components.

**List of Practical:**

1. Study of various hand tools for maintenance and service of Automobile Systems.
2. Study of Vehicle Layout and flow of motion.
3. Building of Chassis and Frame for Four wheeler vehicle.
4. Disassembly and assembly of Petrol Engine.
5. Disassembly and assembly of Diesel Engine
6. Disassembly and assembly of Gear Box.
7. Disassembly and assembly of Differential.
8. Disassembly and assembly Clutch and its operating mechanism.
9. Disassembly and assembly of Braking system.
10. A Mini Project on assembly of working or non-working model of conventional or modern automobile system.

# PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

## SYLLABUS FOR 4th Sem BTech PROGRAMME

### Mechanical Measurement And Metrology (Mechanical, Automobile) (03109251)

**Type of Course:** BTech

**Prerequisite:** NONE

**Rationale:** To impart basic knowledge about the measurement systems and their components.

#### Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
3	0	2	4	60	30	20	20	20	150

Lect - Lecture, Tut - Tutorial, Lab - Lab, T - Theory, P - Practical, CE - CE, T - Theory, P - Practical

#### Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	<b>Generalized Configuration of Measuring System:</b> Functional elements of a basic measuring system, different types of measuring systems and description of functional elements; Input-output configuration of a measuring system; Interfering and modifying inputs, methods for correction for interfering and modifying inputs.	5%	2
2	<b>Characteristics of Instruments:</b> Objective of studying the characteristics of the instruments; Static characteristics: Accuracy, precision, error, sensitivity, hysteresis, threshold, drift, span, static stiffness etc.; Dynamic characteristics: Time domain and frequency domain characteristics terms; Input-output impedances and meaning of impedance mismatch; Concept of mechanical loading.	5%	2
3	<b>Linear Measurements:</b> Types of Inspection:-Inspection by Gauging: limit gauging, plug gauges, Ring gauges, position gauges Inspection by Measurement: Direct measurement such as Vernier Caliper, Vernier Height gauge, Vernier Depth gauge Outside Micrometer, Inside Micrometer, Depth Micrometer, Slip gauges (gauge blocks), length bars.	8%	4
4	<b>Angular Measurements:</b> Bevel protractor, Sine bar, angle gauges, precision levels, Introduction to Autocollimator, Interferometers.	6%	2

5	<p><b>Measurement of Force, Torque and Strain:</b></p> <p>Force measurement: load cells, cantilever beams, proving rings, differential transformers. Measurement of torque: Torsion bar dynamometer, servo controlled dynamometer, absorption dynamometers. Power Measurements. Measurement of strain: Mechanical strain gauges, electrical strain gauges, strain gauge: materials, gauge factors, theory of strain gauges and method of measurement, bridge arrangement, temperature compensation.</p>	12%	8
6	<p><b>Displacement, Velocity/Speed, and Acceleration Measurement:</b></p> <p>Working principal of Resistive Potentiometer, Linear variable differential transducers, Electro Magnetic Transducers, Mechanical, Electrical and Photoelectric Tachometers, Piezoelectric Accelerometer, Seismic Accelerometer.</p>	10%	5
7	<p><b>Temperature Measurement:</b></p> <p>Temperature Measuring Devices: Thermocouples, Resistance Temperature Detectors, Thermistor, Liquid in glass Thermometers, Pressure Thermometers, Pyrometer, Bimetallic strip. Calibration of temperature measuring devices, Numerical on Flow Measurement.</p>	12%	7
8	<p><b>Metrology:</b></p> <p>Definition and concept of metrology, Need of inspection, Principles of Measurements, Methods of Measurement, Standards of measurements, Line and End Standards, Calibration, Accuracy and Precision</p> <p>Comparators : Functional Requirements, Classification, Mechanical Comparators, Mechanical Optical Comparators, Electrical Comparators, Pneumatic Comparators.</p>	12%	7
9	<p><b>Gear and Screw Thread Measurements:</b></p> <p>Gear measurement: Introduction and Classification of gears; Forms of gear teeth; Gear tooth terminology; Methods of measuring tooth thickness, tooth profile &amp; pitch, Gear Errors; Screw Thread Measurement: Terminology, Forms of thread, Errors in threads, Measurement of major, minor and effective diameters (2-wire and 3-wire methods)</p>	12%	7
10	<p><b>Surface Roughness Measurement:</b></p> <p>Components of surface texture, Need for surface roughness measurement, Measurement of surface roughness, Roughness characterization, Roughness grades.</p>	10%	2
11	<p><b>Miscellaneous Measurement:</b></p> <p>Precision Instrumentation based on Laser Principals, Coordinate measuring machines: Structure, Modes of Operation, Probe, Operation and applications. Optical Measuring Techniques: Tool Maker's Microscope, Profile Projector, Optical Square. Basics of Optical Interference and Interferometry.</p>	8%	2

**\*Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

**Reference Books:**

1. Engineering Metrology and Measurement (TextBook)  
N V Raghavendra and Krishnamurthy; Oxford University Press
2. Theory and Design for Mechanical Measurements  
Richard S Figliola, Donald E Beasley; Wiley India
3. Metrology and Measurement  
Anand Bewoor & Vinay Kulkarni; McGraw-Hill
4. Measurement Systems  
Ernest Doebelin, Dhanesh Manik; McGraw-Hill
5. Instrumentation, Measurement and Analysis  
B.C. Nakra, K.K. Chaudhry; McGraw-Hill
6. Mechanical Measurements  
D.S.Kumar
7. Engineering Metrology and Instrumentation  
R.K.Rajput
8. A textbook of metrology  
M.Mahajan

**Course Outcome:**

After Learning the course the students shall be able to:

1. Describe basic concepts of Metrology.
2. Select linear measuring instrument for measurement of various components.
3. Select angular and taper measurement devices for measurement of various components.
4. Discriminate between various screws by measuring their dimensions.
5. Separate different gears through measurement of various dimensions of gears.
6. Distinguish capabilities of machining process by measuring surface finish of the component produced.
7. Evaluate quality of surface produced using various methods
8. Describe basic concepts of mechanical measurement and errors in measurements.
9. Select appropriate temperature measuring device for various applications.
10. Describe methods of measurement for various quantities like force, torque, power, displacement, velocity/seed and acceleration.

**List of Practical:**

1. Basic understanding of measurements and metrology: concepts, application, advantage and future aspects.
2. Performance on linear measurements and check different characteristics of measurements.
3. Performance of angular measurements and check different characterisation of measurements.
4. Performance on Temperature measurements and check different characteristics of measurements and also do calibration.
5. Performance on Stress, strain and force measurements and check different characteristics of measurements and also do calibration.
6. Performance on Speed/Velocity, acceleration measurements.
7. Performance on surface measurements.
8. Performance on measurements of gears and screw thread.

# PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

## SYLLABUS FOR 4th Sem BTech PROGRAMME

### Fluid Mechanics (Mechanical, Automobile) (03109252)

**Type of Course:** BTech

**Prerequisite:** ELEMENTS OF MECHANICAL ENGINEERING

**Rationale:** The course is designed to give fundamental knowledge of fluid, its properties and behavior under various conditions.

#### Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
3	0	2	4	60	30	20	20	20	150

**Lect** - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

#### Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	<b>Fluid Properties:</b> Fluid, concept of continuum. Fluids properties: mass density, weight density, specific volume, specific gravity, viscosity and shear stress in a moving fluid, surface tension, capillarity, vapour pressure, compressibility and bulk modulus.	10%	4
2	<b>Fluid Statics:</b> Pressure and types of pressure, Pascal's law, hydrostatic law, manometry, hydrostatic force on submerged plane and curved surface, buoyancy and flotation, meta-centre and meta-centric height, stability of floating and submerged bodies, method of determination of meta-centric height.	18%	10
3	<b>Fluid Kinematics:</b> Fluid motion, Lagrangian and Eulerian approach, types of fluid flow, continuity equation. Flow lines: stream line, path line, streak line, stream tube, velocity and acceleration of a fluid particle, motion of fluid particle along curved path, rotational flow, rotation and vorticity, circulation, stream and potential function, flow net.	14%	8
4	<b>Fluid Dynamics:</b> Momentum and Momentum equation for 2D, Euler's Equation, Bernoulli's Equation and its application. Venturimeter, Orifice meter, Pitot tube, Notches and Weirs. Kinetic energy and Momentum correction factor, Vortex flow: Free and forced vortex.	20%	8

5	<b>Dimensional Analysis:</b> Dimensional homogeneity, Rayleigh's method, Buckingham- $\pi$ theorem, Dimensionless Numbers, Geometrical, Kinematics and Dynamic Similarity.	6%	3
6	<b>Laminar And Turbulent Flows:</b> <b>Laminar Flow:</b> Reynolds number, flow of viscous fluids in circular pipe, shear stress and pressure gradient relationship, Velocity distribution, flow of viscous fluids between two parallel plates, shear stress and pressure gradient relationship, velocity distribution, Measurement of viscosity. <b>Turbulent flow:</b> Effect of turbulence, Expression for loss of head due to friction in pipes (Darcy-Weisbach equation), velocity distribution in turbulent flow.	17%	8
7	<b>Pipe Flow:</b> Major and Minor energy losses in pipes, Hydraulic gradient and total energy line, pipe in series and parallel, equivalent pipe, power transmission through pipe, water hammer in pipes.	5%	3
8	<b>Boundary Layer Theory:</b> Concept of Boundary Layer, Boundary Layer over Flat Plates, Boundary Layer Parameters: Boundary Layer Thickness, Momentum Thickness, Displacement Thickness, Boundary layer separation and its Control, Basics of drag and lift.	10%	4

**\*Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

**Reference Books:**

1. Fluid Mechanics & Hydraulics Machines (TextBook)  
R. K. Bansal; Laxmi Publications
2. Fluid Mechanics  
Yunus A. Cengel, John M. Cimbala; Tata McGraw Hill
3. Introduction to Fluid Mechanics and Fluid Machines  
S. K. Som and G. Biswas; Tata McGraw Hill
4. Engineering Fluid Mechanics  
K.L. Kumar; Eurasia Publication House
5. Fluid Mechanics  
Frank .M. White; Tata McGraw Hill

**Course Outcome:**

After Learning the course the students shall be able to:

- 1 Develop an understanding of Fluid Mechanics fundamentals including concepts of mass and momentum conservation.
- 2 Apply Bernoulli Equation to solve problems in fluid mechanics.
- 3 Apply control volume analysis to problems in fluid mechanics.
- 4 Perform dimensional analysis for problems in fluid mechanics.
- 5 Develop knowledge of laminar and turbulent boundary layer fundamentals.

**List of Practical:**

1. Study of Pressure Measurement Devices.
2. Determination of Coefficient of Discharge for a V Notch.

3. Determine Hydraulic Coefficients of a Small Circular Orifice.
4. Determination of the Reynolds's number and type of flow.
5. Determination of Coefficient of discharge for Venturimeter and Orificemeter.
6. Verification of Bernoulli Theorem.
7. Determination of Metacentric Height of a floating body.
8. Study of Dimensional Analysis.
9. Study of Hydrostatic Force and Centre of Pressure on Flat/Curved Surfaces.
10. Measurement of Viscosity of a given fluid.



# PARUL UNIVERSITY - FACULTY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

## SYLLABUS FOR 4th Sem BTech PROGRAMME

### Production Technology (Mechanical, Automobile) (03109253)

**Type of Course:** BTech

**Prerequisite:** Knowledge of Manufacturing Processes

**Rationale:** Production technology focuses on manufacturing process of conventional and non-conventional methods, gear manufacturing process and techniques used for holding and fixing of work piece during manufacturing process. This subject is helpful for getting basic knowledge of metal cutting, force analysis, tool wear, welding, jig and fixture.

#### Teaching and Examination Scheme:

Teaching Scheme			Credit	Examination Scheme					Total
Lect Hrs/ Week	Tut Hrs/ Week	Lab Hrs/ Week		External		Internal			
				T	P	T	CE	P	
3	0	2	4	60	30	20	20	20	150

**Lect** - Lecture, **Tut** - Tutorial, **Lab** - Lab, **T** - Theory, **P** - Practical, **CE** - CE, **T** - Theory, **P** - Practical

#### Contents:

Sr.	Topic	Weightage	Teaching Hrs.
1	<b>Mechanics of Metal Cutting:</b> Introduction to basic elements of machining. Classification of cutting tools, tool geometry and nomenclature, selection of tool materials, characteristics of cutting tool materials. Tool life, factors affecting tool life. Mechanics of chip formation, types of chips and conditions conducive for the formation of Built-up edge, chip breakers. Orthogonal v/s Oblique cutting- Merchant circle diagram. Force and velocity relationship, shear plane angle. Energy consideration in Machining, Earnst-Merchant theory. Economics of metal machining.	20%	10
2	<b>Gear and Threads Manufacturing:</b> Different types of threads, manufacturing methods, and tools involved. Different types of gears, it's forming and generating methods with their special features. Gears finishing processes. Gear manufacturing machines.	10%	5
3	<b>Jigs &amp; Fixtures:</b> Definition. Difference between jigs & fixtures. Design principles, Important considerations in jigs & fixture design. Locating systems, types of locators & clamps, Jig bushes etc. Types of jigs & fixtures, design of jigs and fixtures for various machining operations.	15%	6

4	<p><b>Presses and Press Work:</b></p> <p>Classification of presses and Press operations. Classification of dies, cutting actions in dies, clearance, cutting forces, center of pressure, design of press tools, methods of mounting of punches, scrap reduction, strip layout. Introduction to metal forming and forging processes.</p> <p><b>Metal Shaping and Forming:</b></p> <p>Introduction to Metal forming and forging processes, Hot and Cold Working, Rolling, Extrusion, Wire and Tube Drawing, Cold working processes: Shearing, Drawing Squeezing, Blanking, Piercing, Deep Drawing, Bending, Coining and embossing, Metal working defects.</p>	21%	11
5	<p><b>Metal Joining Processes::</b></p> <p>Principle of welding, soldering, brazing and adhesive bonding. Classification of welding and allied processes. Gas welding and gas cutting principles, its applications, pros and cons. Flame cutting. Arc welding, Power sources and consumables - Electrodes and Electrode Coatings, Resistance welding - Principle and Equipment, Spot, Projection and Seam welding process. Un-conventional welding processes and special welding processes e.g. friction and explosive welding, welding of C.I. and Al. Welding defects and its remedies. Welding joints and positions. Introduction to ASME code.</p>	16%	8
6	<p><b>Non-conventional Machining:</b></p> <p>Introduction, Classification of non-conventional machining processes, EDM, EBM, PAM, IBM, ECM, ECG, CM, AJM, WJM, AWJM, wire cut EDM, USM, LBM process principles, process parameters, process selection and their applications.</p>	18%	6

**\*Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

**Reference Books:**

1. Metal Cutting Principles  
M C Shaw; MIT Press, 2004.
2. Tool Design  
Donaldson; Tata McGraw Hill Pub.
3. Fundamentals of machining and machine tools.  
Boothroyd; CRC Publication
4. Production Technology  
HMT
5. Production Engineering  
P.C. Sharma; S. Chand Publication
6. Workshop Technology  
Raghuvanshi; Dhanpat Rai Pub.
7. Production Technology  
R.K. Jain; Khanna Pub.

**Course Outcome:**

After Learning the course the students shall be able to:

1. Apply basics of metal machining processes and details about tool signature.
2. Understand different forces acting while metal cutting and can draw Merchant circle diagram and also able to apply knowledge for economics of metal cutting.
3. Select appropriate type of gear manufacturing method, gain knowledge of gear forming and its generating methods.
4. Design jigs and fixture for different applications.
5. Select appropriate press operation and press tool.
6. Select appropriate welding process for given application.
7. Select appropriate Non-conventional machining and its application in Industries.

**List of Practical:**

1. Study of various types of cutting tools and measurement of tool geometry.
2. To understand the Effect of chosen parameters on the type of chip produced
3. Determination of chip-thickness ratio During Machining.
4. Determination of shear plane angle during machining.
5. Measurement of cutting forces in turning using Lathe Tool Dynamometer under various cutting conditions.
6. Design a Jig and Fixture for given component.
7. To study different types of press and design of punch and die, also exercise on strip layout and centre of pressure.
8. To understand the principle and performance of gas welding and gas cutting process.
9. To understand and practice of arc welding process (Tungsten Inert Gas and Metal Inert Gas Welding)
10. Study of Unconventional Manufacturing Process and simple exercise on metal removal rate using EDM.