

MALAVIYA NATIONAL INSTITUTE OF TECHNOLOGY JAIPUR
DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech. (Mechanical Engineering)
Semester V

Syllabus

DUGC Convener

Curriculum Committee Convener
Date:

SUGB Chairman

Program: UG	Department: Mechanical Engineering
Course Code: MET-301	Course Name: Automobile Engineering
Credit: 3	L-T-P: 3-0-0
Syllabus	
<p>Power plants for automotive vehicles, Layout of different kinds of vehicles, Resistance to vehicle motion and need for a gear box, various types of gear boxes including automatic transmission systems, clutches including fluid couplings, torque converters, rear axle and final drive - differential, front axle construction, steering systems, suspension systems, tyres, springs and shock absorbers, brakes and their actuations, ignition systems recent developments. Vehicle electrical & electronic systems. Automotive pollution and its control strategies.</p>	
Books for Reference:	
<ol style="list-style-type: none"> 1. Newton, K., Steeds, W., & Garret, T.K., The Motor Vehicle, Butterworth Heinemann, Oxford, UK, 1997. 2. Reimpell, J., and Stall, H., Automotive Chassis Engineering Principles, Society of Automotive Engineers Inc., USA, 1998. 3. Judge, W., Motor Manuals; Vol.1 - Automobile Engines in Theory, Design, Construction, Operation and Testing, Chapman and Hall -London, 1973. 4. Crouse, W.H., Automotive Mechanics, International Student Edition, McGraw Hill Inc., USA, 1970. 	

Program: B.Tech. Mechanical Engineering	Department: Mechanical Engineering
Course Code: MET-302	Course Name: Turbo machines
Credit: 4	L-T-P: 3-1-0

Detailed Syllabus:

Examples of turbo machines; Momentum, and moment of momentum theory applied to moving blades; Change in total enthalpy and total pressure; Velocity triangles for radial and axial flow turbomachines; Basic aerofoil theory applied to axial flow blades; Non-dimensional performance parameters; Specific speed, flow coefficient and head coefficient. Steam and gas turbines; Steam flow through nozzles, critical pressure ratio, and choking of nozzles; Throat and exit areas for optimum discharge; Impulse and reaction stages; Flow of steam through turbine blades; velocity diagrams, stage and other efficiencies, condition for maximum efficiency of a single stage turbine; Compounding of steam turbines; Axial flow gas turbines; Turbine characteristics and performance.

Centrifugal compressors; Work required, polytropic efficiency, pressure rise, slip, effect of blade shape, two dimensional flow through impeller; Vaned diffuser and volute casing; Surging and choking of compressors; Compressor performance and characteristic curves.

Axial flow compressors; Cascade analysis, vortex theory, work required, polytropic efficiency, pressure rise, degree of reaction; Simple design calculations; Surging and stalling of compressors; Compressor performance and characteristic curves.

Fans and Blowers; Construction and classification; Power required, pressure rise, efficiency calculations; Applications in boilers, cooling towers, and other industrial applications.

Text books:

1. Fluid Mechanics and Thermodynamics of Turbomachinery, Fifth Edition [Paperback] S. Larry Dixon
2. An Introduction to energy conversion, Volume III – Turbo machinery, V. Kadambi and Manohar Prasad, New Age International Publishers (P) Ltd.
3. “Turbines, Compressors & Fans”, S. M. Yahya, Tata-McGraw Hill Co., 2nd Edition (2002).
4. “Principles of Turbo Machinery”, D. G. Shepherd, The Macmillan Company (1964)
5. Fundamentals of Turbomachinery: William W Perg, John Wiley & Sons, Inc. 2008.
6. A Text book of Turbomechanics- M.S.Govindgouda&A.M.Nagaraj-M.M.Publications- IV Edition-2008
7. “Turbo Machineries” B. K. Venkanna, PHI.

UG/PG:UG	Department: ME
Course Code: MET-303	Course Name: Design of Machine Elements
Credit: 3	L-T-P: 3-0-0
Pre-requisite course: Engineering Mechanics, Mechanics of Solids, Kinematics	
Syllabus	
<p>Selection of materials and processes; Standard numbering system including BIS designations of materials. Static failure theories and its application to design; Design for strength; Allowable stresses, factor safety, Stress concentration. Causes and mitigation; Design of elements subjected to simple loading: screws including power screws, bolted joints including eccentrically loaded joints, brakes, and clutches. Fatigue consideration in Design: Variable load, load factor, Endurance strength; Endurance limit and modifying factors; Notch sensitivity and stress concentration. Goodman & Soderberg lines; Design of machine members subjected to combined steady & alternating stresses.</p> <p>Design for finite life. Bolts and shafts under fatigue loading; Design of gear tooth: Force analysis of spur, helical, bevel and worm gears; Bearing reactions due to gear tooth forces, Lewis and Buckingham equations; wear and dynamic load consideration. Design of sliding & journal bearing; Selection of antifriction bearings for different loads and load cycles.</p>	
Text Books:	
<ol style="list-style-type: none"> 1. V.B.Bhandari, Design of Machine Elements, 2nd Edition Tata McGraw Hill Publishing Co. Ltd. 2. R.L. Norton Machine, Design-An Integrated Approach, 3rd Edition, Pearson Education. 3. MF Spotts and Others, Design of Machine Elements, 8th Edition, Pearson Education. 4. J.E.Shingle, Mechanical Engineering Design, 6th International Edition, McGraw Hill Books Co 	

UG	Department: Mechanical Engineering
Course Code:MET-304	Course Name: Operation & Planning Control
Credit: 3	L-T-P: 2-1-0
Syllabus	
<p>Forecasting models, Facilities Location & Layout Planning, Scheduling, routing, sequencing, Aggregate Production planning, Capacity planning, Inventory Control, Material requirement Planning, Just in Time, Enterprise Resource Planning.</p>	
Reference Books	
<ol style="list-style-type: none"> 1. Factory Physics: Foundations of Manufacturing Management, third edition, 2008. 2. Russel, R.S. and Taylor III, B.W., Operations Management, 4th Edition, Pearson Education, 2003. 3. Chase, R.B., Aquilano, N.J., and Jacobs, F.R., “Operation Management for Competitive Advantage”, 9th Edition, Tata McGraw-Hill, Delhi, 2002. 4. Adam, E.E and Ebert, R.J., Production & Operations Management, 5th Ed., PHI, 1993. 5. Krajewski, L. J., and Ritzman, L.P., “Operations Management: Strategy and Analysis”, 6th Edition, Pearson Education Asia, India, 2003 	

UG/PG : UG	Department: Mechanical Engineering						
Course Code: MET-305	Course Name: Mechanical Measurement and Control System						
Credit: 4	L-T-P: 3-1-0						
Pre-requisite course: Material Science, Mechanical Workshop							
Syllabus							
<p>UNIT 1 METROLOGY:Need for measurement - Precision and Accuracy - Reliability - Errors in Measurements - Causes – Types; Measurement of Engineering Components – limits and fits, Comparators, Slip gauges, Rollers, Limit gauges - Design and Applications - Auto collimator - Angle measurement - Alignment telescope - Sine bar - Bevel protractors; Laser metrology, Tool Maker’s microscope, Profile projector, CMM, Non-contact methods.</p>							
<p>UNIT 2 AUTOMATION: Introduction, Definition and components of Automation, Economics of Automation, Automation for Productivity and cost reduction. Hard and soft Automation, Control Engineering in Production System, Basic control actions, and different type of controllers; Pneumatic, hydraulic & electronic controllers, Introduction to Mechatronic, Introduction to Control Systems Engineering, PLC programming, Robotics in manufacturing, low cost automation.</p>							
<p>UNIT 3 CONTROL SYSTEMS, FEED BACK DEVICES AND TOOLING: Description of a simple CNC control system, Interpolation systems. Features available in a CNC system – introduction to some widely used CNC control systems. Types of measuring systems in CNC machines – Incremental and absolute rotary encoders, linear scale – resolver – Linear induction – Magnetic Sensors for Spindle Orientation. Qualified and pre-set tooling – Principles of location – Principles of clamping – Work holding devices.</p>							
<p>Books:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">1. Metrology for Engineers</td> <td>Gaylor, Shotbolt, Sharp</td> </tr> <tr> <td>2. Computer Numerical Control Machines</td> <td>P. Radahkrishnan</td> </tr> <tr> <td>3. Automation, Production systems and Computer Integrated Manufacturing</td> <td>M.P. Groover</td> </tr> </table>		1. Metrology for Engineers	Gaylor, Shotbolt, Sharp	2. Computer Numerical Control Machines	P. Radahkrishnan	3. Automation, Production systems and Computer Integrated Manufacturing	M.P. Groover
1. Metrology for Engineers	Gaylor, Shotbolt, Sharp						
2. Computer Numerical Control Machines	P. Radahkrishnan						
3. Automation, Production systems and Computer Integrated Manufacturing	M.P. Groover						

UG	Department: Mechanical Engineering
Course Code: MET-306	Course Name: Operations Research
Credit: 3	L-T-P: 2-1-0
Syllabus	
<p>Introduction to optimization, LP model, The Simplex Method, Duality, Dual Simplex Method, Post optimal Analysis, The transportation Algorithm, The Assignment Model, Goal Programming, Integer programming, Game theory, Waiting time queuing theory, Genetic algorithm</p>	
Books	
<ol style="list-style-type: none"> 1. Hamdy A Taha, Operations Research: An Introduction, Pearson Education/PHI, 8/E, 2007. 2. Singiresu S Rao, Engineering Optimization: Theory and Practice, New Age International (P) Limited, Third Edition, 1996 3. F S Hillier and G J Lieberman, Introduction to Operations Research, TMH, 8/E, 2006. 4. Winston,W.L., Operations Research: Applications and Algorithms, Thomson Learning, 4th Edition, 2004 	

UG/PG	Department: ME
Course Code: MEP-307	Course Name: Machine Design Lab
Credit: 2	L-T-P: 0-0-4
Syllabus	
<ol style="list-style-type: none">1. Review of stress calculation2. Problems on Static failure theories3. Problems on Stress concentration and Design for Fatigue4. Problems on power screws and threaded fasteners5. Design of threaded joints6. Design of shafts, keys and couplings7. Selection of rolling contact bearings8. Design of sliding contact bearings	

DUGC Convener

Curriculum Committee Convener
Date:

SUGB Chairman

Program: UG	Department: Mechanical Engineering
Course Code: MEP-308	Course Name: Automobile Engineering Lab
Credit: 1	L-T-P: 0-0-2
<p><u>List of Experiments</u></p> <ol style="list-style-type: none"> 1. Study of Dodge car 2. Study of cut section model of Bajaj Super scooter running system 3. To study different type of clutches used in automobiles 4. To study Universal Joints and Differential 5. To study steering gear and tyre of vehicles 6. To study the suspension system of a vehicle 7. To study the braking system of different vehicles 8. To study different electrical circuits used in automobiles 9. To study the causes and controlling measures of emissions from automobiles 	

DUGC Convener

Curriculum Committee Convener
Date:

SUGB Chairman

UG/PG : UG	Department: Mechanical Engineering
Course Code: MEP-309	Course Name: Mechanical Measurement and Control System Laboratory
Credit: 1	L-T-P: 0-0-2
Pre-requisite course: Material Science, Mechanical Workshop	
<p>List of Experiments</p> <ol style="list-style-type: none"> 1. Measurement of Taper angle using sine bar, bevel protractor, Tool Makers Microscope. 2. Measurement of various elements of gears and screw thread using Tools Makers Microscope. 3. Calibration of optical comparator and measurement of dimension 4. Determining the accuracy of electrical and optical comparator. 5. Measurement of surface roughness. 6. Straightness measurement using Autocollimator. 7. Measurement of dimensions using Vernier Height Gauge. 8. CMM programming 9. Festo kit exercises on automation for hydraulics & pneumatics. 10. MTAB kit exercises on automation for modular automation. <p>List of facilities required</p> <ol style="list-style-type: none"> 1. Festo kit for automation for hydraulics & pneumatics. 2. Computer Workstations 3. MTAB kit for modular automation 4. CMM 5. Measuring Instruments & Equipments 	