NORTH MAHARASHTRA

UNIVERSITY, JALGAON (M.S.)

Third Year Engineering

(Automobile Engineering) Faculty of

Engineering and Technology

Course Outline

Semester- V &VI

TE Semester - V

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Heat Transfer	D	3	---	---	3	20	80	---	---	100	3
Internal Combustion Engines	D	3	---	---	3	20	80	---	---	100	3
Design of Machine Element	D	3	---	---	3	20	80	---	---	100	3
Theory of Machine - II	D	3	---	---	3	20	80	---	---	100	3
Transport Management and Safety Regulations	C	3	---	---	3	20	80	---	---	100	3
Heat Transfer Lab.	D	---	---	2	2	---	---	25	25	50	1
Internal Combustion Engines Lab.	D	---	---	2	2	---	---	25	---	25	1
Design of Machine Element Lab	D	---	---	2	2	---	---	25	25	50	1
Theory of Machine - II Lab.	D	---	---	2	2	---	---	25	25	50	1
Computer Graphics Lab.	B	1	---	2	3	---	---	50	---	50	2
Ind Training /EDP/ Special Study	D	---	---	---	---	---	---	25	---	25	2
Total	16	---	10	26	100	400	175	75	750	23	

TE Semester - VI

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
		Theory		PR	Total						
		TH Hr/W	Tut Hr/W	PR Hr/W	Total	ISE	ESE	ICA	ESE	Total	
Automobile System	D	3	--	---	3	20	80	---	---	100	3
Autotronics	D	3	---	---	3	20	80	---	---	100	3
Metrology and Quality Control	D	3	---	---	3	20	80	---	---	100	3
Finite Element Analysis	D	3	---	---	3	20	80	---	---	100	3
Project and Business Management	C	3	---	---	3	20	80	---	---	100	3
Automobile System Lab.	D	---	---	2	2	---	---	25	25	50	1
Autotronics Lab.	D	---	---	2	2	---	---	25	25	50	1
Metrology and Quality Control Lab.	D	---	---	2	2	---	---	25	25	50	1
Programming in C++	B	---	---	2	2	---	---	25	---	25	1
Minor Project	✓ D	---	---	2	2	---	---	50	---	50	2
Seminar-I	D	---	---	2	2	---	---	25	---	25	2
Total	15	---	12	27	100	400	175	75	750	23	

ISE: Internal Sessional Examination **ESE:** End Semester Examination **ICA:** Internal Continuous Assessment

Note : Out of 3 practical ESE heads, at least 1 head should be practical**.**

Course Outline

Heat Transfer HT

Course Title: Short Title Course Code

Branch - Automobile / Mechanical Engineering Year – Third Year

Course Description: This course introduces undergraduate students to Heat Transfer. The background required includes a sound knowledge of Mathematics (Calculus), Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics of second year Level. The course aims at imparting knowledge of Heat Transfer and modes of Heat Transfer.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Practical	2	14	28	1

Examination scheme:

End semester exam (ESE) 80 Marks Duration: 03 hours

Internal Sessional exam (ISE) 20 Marks

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content: This course contains:

UNIT-I

1.	Heat Conduction	No. of Lectures - 8 Marks : 16
	a	Concepts and Mechanism of heat flow: Steady and unsteady state heat transfer, Modes of heat transfer, their physical mechanism.
	b	Laws of heat transfer, thermal conductivity, heat transfer coefficient, radiation heat transfer coefficient.
	c	Isotropic and an-isotropic materials, Insulation materials, Thermal resistance and thermal conductance.
	d	Generalized one dimensional heat conduction equation and reduction to Fourier, Poisson and Laplace equations, Boundary conditions, Steady state heat conduction without heat generation in plane wall, cylinder and sphere, Thermal contact resistance, critical thickness of insulation on cylindrical bodies.

UNIT-II

2.	Heat Transfer in Extended Surfaces No. of Lectures - 8 Marks : 16	
	a	Steady state heat conduction with heat generation in plane and composite wall, hollow cylinder, hollow sphere.
	b	Extended Surface: Types of fins, governing equation for pin fin for infinite long fin and fin with negligible heat loss, Fin performance, fin efficiency, fin effectiveness, overall fin effectiveness, approximate solution of fins.
	c	Error in temperature measurement by thermometer.

UNIT-III

3.	Convection Heat Transfer No. of Lectures - 8 Marks : 16	
	a	Principle of heat convection: mechanism, natural and forced convection.
	b	Non Dimensional Numbers, Dimensional analysis for Natural and Forced Convection.
	c	convection boundary layers: laminar, turbulent, momentum and energy equation, Laminar flow over bodies, turbulent flow inside circular and non-circular ducts, Reynolds Colburn analogy for flow over flat plate and flow inside tube, coefficient of friction and friction factor
	d	Heat transfer in fully developed flow, Natural convection over vertical planes, use of empirical correlation for convection, Principle of condensation and boiling (No numerical treatment).

UNIT-IV

4.	Radiation Heat Transfer No. of Lectures - 8 Marks : 16	
	a	Thermal radiation: Concept, Black body radiation, Spectral and total emissive power, Stefan Boltzmann law, Radiation laws.
	b	Irradiation and radiosity, Surface absorption, reflection and transmission, emissivity.
	c	Radiation view factor, Properties of view factor, (No numerical treatment on view factor), radiation heat exchange between two diffuse gray surface, radiation shield.

UNIT-V

5.	Heat Exchangers No. of Lectures - 8 Marks : 16	
	a	Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement, condenser and evaporator, Overall heat transfer coefficient, fouling factor.
	b	Log-mean temperature difference method and NTU –effectiveness method of analysis for rating and sizing of heat exchangers.
	c	Requirement of good heat exchanger and heat exchanger and design and selection, practical applications, heat pipe.

- Note- Use of Heat transfer data book is allowed in the examination.
- Note for paper setter:

  Paper setter should provide the required data for numerical problems in question paper itself.

  Experiment must be set simultaneously and the no. of student in each group working on a setup should not exceed 05 (five) student.

References

1. J.P.Holman 1992 “Heat Transfer”Mc Graw Hill VII Edition.
2. P.Kothandaraman”Fundamentals of Heat and Mass Transfer”.
3. R.K.Rajput”Heat and Mass Transfer”, S.Chand & Company Ltd., New Delhi.
4. D.S.Kumar “Heat and Mass Transfer” D.S.Kumar S.K.Kataria & Sons, Delhi.
5. P.K.Nag “Heat Transfer” Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Sachdeva R.C., “Fundamentals of Heat and Mass Transfer” Wiley Eastern Limited, Third Edition.
7. Sukhatme S.P, “A Text Book on Heat Transfer” (1989), IIIrd Edition, Orient Longmans Ltd., New Delhi.
8. Arora S.C. & Domkundwar S., “A Course in Heat and Mass Transfer” (1994), Dhanpat Rai & Sons, IVth Edition.
9. Chapman A.J., “Heat Transfer” (1989), IVth Edition.
10. Yunus A. Cengel, “Heat Transfer –A Practical Approach” (Tata McGraw Hill)
11. M. M. Rathore “Engineering Heat and Mass Transfer”, 2nd Edition, Laxmi Publications, New Delhi.
12. M. Thirumalseshwar,”Fundamentals of Heat and Mass Transfer” Pearson Education.
13. R. Rudramoorthy, K. Mayilsomy, “Heat Transfer”, Pearson Education.

Lab - Course
Outline

Heat Transfer HT LAB

Course Title: Short Title Course Code

Branch - Automobile / Mechanical Engineering Year – Third Year

Course Description:

This lab includes different practical of Heat Transfer. The course aims at imparting knowledge of Heat Transfer and its modes.

Teaching Scheme:

	Hours Per Week Credits	No. of Weeks	Total Hours	Semester
Laboratory	2	14	28	1

Evaluation scheme:

Internal Continuous Assessment (ICA) 25 Marks 50 Marks

End Semester exam (ESE) (Practical) 25 Marks

Prerequisite Course(s): Mathematics (Calculus) at first year level and Engineering Thermodynamics, Applied Thermodynamics and Fluid Mechanics at Second Year Level.

Outline of Content: This course contains:

1. Determination of thermal conductivity of metal rod.
2. Determination of thermal conductivity of insulating powder.
3. Determination of thermal conductivity of composite wall.
4. Determination of heat transfer coefficient in natural convection.
5. Determination of heat transfer coefficient in forced convection.
6. Determination of temperature distribution, fin efficiency in natural and forced convection.
7. Determination of emissivity of a test surface.
8. Determination of Stefan Boltzmann constant.
9. Study of pool boiling phenomenon and determination of critical heat flux.
10. Determination of LMTD, overall heat transfer coefficient and effectiveness of heat exchanger in parallel and counter flow arrangement.
11. Determination of heat transfer from a heat pipe.
12. Calibration of thermocouple.

Note: Lab file should contain at list EIGHT experiments from above mentioned list.

ESE (Practical Examination)

The Practical Examination will comprise of performing the experiment and viva on the Practical's.

Instructions for practical Exam. :-

1. Five experiments should be selected for Practical Examination.

2. The Number of Students for each Practical set up should not be more than 5 Students.

3. Oral will be based on the Practical Performed in the examination and the experiments included in the Journal.

Internal Combustion Engine ICE

Course Title Short Title Course Code

Branch - Automobile / Mechanical Engineering Year- Third Year

Course Description:
This course provides the knowledge of Internal Combustion Engine. Course includes different engine cycles its performance analysis, various systems in IC Engine such as fuel feed, lubrication, cooling, ignition, supercharging and turbo charging. Fundamental of combustion in I C Engine, types and design of combustion chambers. Various emission control norms.

Teaching Scheme:

Lecture hours per Week	No. of Weeks	Total hours	Semester Credits
03	14	40	03

Examination Scheme:

End semester exam (ESE) 80 Marks Duration: 03 Hours

Internal Sessional Exam (ISE) 20 Marks

Prerequisite Course(s): Mathematics (calculus), Basic thermodynamics cycles, various ideal gas processes, Engineering Thermodynamics, Applied Thermodynamics.

Objectives:

1. Analysis of air standard cycles in the regard of I C Engine.
2. Understanding of induction system along with fuel feed system.
3. To impart insight in various operating systems like cooling, lubrication, Ignition system.
4. To be familiar with combustion chamber design and pollution control norms.
5. Performance analysis of I C Engine.

Unit. I

1	BASIC CONCEPTS AND ENGINE CYCLES No. of Lect.-8, Marks-16
	a)Introduction: Classification, engine components and their functions, Terminology, Work (indicated and brake), mean effective pressure, torque and power (brake and indicated), mechanical efficiency, thermal and volumetric efficiencies of engine, air fuel ratio, specific fuel consumption. b) Air Standard Cycles: Assumptions, Otto, Diesel, Dual Combustion cycle, derivation of their efficiency equation, work done and mean effective pressure. Comparison on the basis of heat input, compression ratio, Maximum pressure and temperature, Actual cycle, deviation from theoretical cycles. Pumping losses, time losses.

Unit. II

2	FUEL FEEDING SYSTEMS No. of Lect.-8, Marks-16
	a) Charge, intake valve and manifold, valve timing diagram, valve overlap, choked flow. Carburetion: Requirement, types of carburetors according to fluid flow, simple carburetor, Air fuel ratio calculation, effect of altitude, disadvantages of simple carburetor, compensating devices for starting, economy range, acceleration, compensating jet etc. additional systems in modern carburetors, Solex carburetor. Disadvantages of carburetion and gasoline injection, MPFI. b) Fuel feeding systems in CI engines: Requirement, classification, fuel feed pump, jerk type injection fuel pump, distributor type pump, injection pump governor, fuel injector and nozzles.

Unit. III

3	OPERATING SYSTEM No. of Lect.-8, Marks-16
	a) Cooling systems: requirement, types of cooling systems, thermostat and additives. b) Lubrication: Mechanism of lubrication, different methods, important properties of lubricating oils. c) Ignition Systems: requirement, battery ignition, magneto ignition, electronic ignition system, Ignition timing, spark timing advance. d) Starting methods of engines: Types of superchargers, Super charging, effect of super charging, limitations and advantages of supercharging, and turbo charging of engines.

Unit. IV

4	COMBUSTION IN SI AND CI ENGINES No. of Lect.-8, Marks-16
	a) Homogeneous and heterogeneous mixtures, Combustion in SI engines: Stages in combustion, Ignition lag, velocity of flame propagation, factors influencing flame speed, rate of pressure rise, Detonation, factors affecting the detonation, pre-ignition. Rating of SI engines fuels, Dopes, combustion chamber of SI engines. b) Combustion in CI engine; stages of combustion, factors affecting the delay period. Diesel knock, Effect of engine variables on Diesel knock , Rating of CI engine fuels: Cetane number, performance number, comparison of knock in SI and CI engines. Combustion chamber for CI engines.

Unit. V

5	ENGINE TESTING AND PERFORMANCE No. of Lect.-8, Marks-16
	a) Measurement of indicated power, brake power, Morse test, energy balance and efficiency calculations. b) BIS specification. Recent trends in internal combustion engines. Engine emission, air pollution due to engines, various Euro norms, Unburnt hydrocarbon emission in two stroke and CI engines, CO and Nox emission, particulate traps, EGR, emission control methods catalytic converters (Introductory), crank blow by losses

TERMWORK-

Practical: 2Hrs/week ICA: 25 Marks

Minimum EIGHT experiment should be performed form the following lists:

1) Study of cooling systems.
2) Study of lubrication systems.
3) Study of simple and Solex carburetors.
4) Study of fuel pump and fuel injector.
5) Trial on a petrol engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.
6) Trial of a Diesel engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.
7) Morse test and determination of bsfc and isfc.
8) Study of combustion chambers of SI engines.
9) Study of combustion chambers of CI engines.
10) Study and demonstration of mechanical and Pneumatic governors.
11) Study and analysis of exhaust emission from the engine (PUC).

RECOMMENDED BOOKS:

1) V. Ganeshan, “Internal Combustion Engines”, 2/e, Tata McGraw Hill, New Delhi.
2) R. K. Rajput , “Internal Combustion Engines”’, Laxmi Publications, New Delhi.
3) W. W. Pulkrabek , “Fundamentals of Internal Combustion Engines”, Prentice Hall of India (P) Ltd., New Delhi.
4) E. F. Obert , “Internal Combustion Engines and Air Pollution”, Harper and Row, New York.
5) Ferguson C. R , “Internal Combustion Engines”, Wiley Inc. New York.
6) Sharma R.P. and Mathur M.L., “Internal Combustion Engines”, Standard Publications, New Delhi.
7) Domkundwar, ., “Internal Combustion Engines”, Dhanpat Rai & Co. New Delhi.
8) Willard W Pulkrabek. “Internal Combustion Engines”, Pearson Education
9) Shyam K. Agrawal, “Internal Combustion Engines”, New Edge International Publication.
10) K.K. Ramalingam, “Internal Combustion Engines”, Scitech Publication.

Course Outline

Design of Machine Element DOME

Course Title Short Title Course Code

Branch - Automobile Engineering Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of Machine Design. The background required includes a sound knowledge of Mathematics, mechanics, Strength of Material, and various machine components. The course aims at imparting knowledge of Machine Design.

Course Objectives

1. To provide an opportunity for students to apply knowledge of mathematics, for solution to design engineering problems.
2. To introduce numerical and machine design approach for solving design perspectives.
3. To apply the knowledge of these methods to solve practical problems with suitable software.

Course Outcome

At the end of the course the students are able to

1. Develop the engineering model with respect to aesthetic and ergonomic consideration.
2. Apply design technique to formulate and solve structural and design problems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about mathematics, mechanics, strength of material and machine design.

Outline of Content: This course contains:

UNIT-I

1.	Fundamental of Design	No. of Lectures - 8 Marks : 16
	a	Mechanical Engineering design, Aesthetic considerations in design, ergonomic consideration in design.
	b	Man/Machine closed loop system, Standardizations.
	c	Selection of material, mechanical properties of material.
	d	Limits, fits, tolerance, factor of safety, theories of failure.

UNIT-II

2.	Design against fluctuating load	No. of Lectures - 8 Marks : 16
	a	Fluctuating stresses, S-N diagram for fatigue loading, endurance limit.
	b	Endurance strength Modifying factors, stress concentration, causes and remedies, notch sensitivity,
	c	Design of finite and infinite life under reverse stresses, cumulative damage in fatigue failure.
	d	Solderberg & Goodman diagram, Modified Goodman diagram, fatigue design for component such as shaft, bolted joints & springs under combined stresses.

UNIT-III

3.	Design of shaft keys and coupling	No. of Lectures - 8 Marks : 16
	a	Shafts: Introduction, types of shafts, design of shafts subjected to twisting moments, bending moments, combined twisting and bending moments.
	b	Keys: Types of keys, design of keys.
	c	Coupling: Design of rigid coupling & design of flexible coupling.

UNIT-IV

4.	Design of Gears	No. of Lectures - 8 Marks : 16
	a	Spurgear: Design of spur gear and helical gear, laws of gearing, terminology of spur Gear, force, analysis, face width, no. of teeth, beam strength and wear strength of gear, tooth, gear tooth failure.
	b	Helical gear: Terminology of helical gear, virtual no. of teeth, tooth

		properties, force analysis, beam strength and wear strength
	c	Design of bevel: Terminology, force analysis, beam strength and wear strength.

UNIT-V

5.	Miscellaneous design	No. of Lectures - 8 Marks : 16
	a	Design of power screw self locking of power screws, recirculating ball screw.
	b	Design of springs: Types application, materials of springs – stress deflection equation of helical springs, Wahl's factor, Leaf Spring.
	c	Design of Brakes.

Design of Machine Element Lab

Examination scheme:
End semester scheme (ESE) 25 marks
Internal Continuous Assessment (ICA) 25 marks

Teacher and Examiner should follow the following guidelines.
Teacher should facilitate any FIVE of the following lab practice.

Experiments
1. Design project report of screw jack
2. Design project report of knuckle joint
3. Assignment on design of spring
4. Assignment on design of spur gear and helical gear
5. Assignment on shafts, keys, and coupling
6. Assignment on c programming of helical compression spring
7. Assignment on c programming of coupling
8. Auto lisp-programme on knuckle joint

Guidelines for ICA:
ICA will based on Practical and Assignment submitted by student in form of journal.
Minimum three Assignments to be submitted based on theory syllabus.

References

1 Shigley J. E. and Mischke C. R. ,"Mechanical Engineering Design", McGraw Hill Publication Co. Ltd.
2 Bhandari V. B. ,"Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd.
3 Design Data", P. S. G. College of Technology, Coimbatore.
4 Juvinal R.C., "Fundamentals of Machine Components Design", John Wiley and Sons.
5 P. Kannaiah, "Machine Design", Scitech publication

Course Outline

Theory of Machines – II TOM-II

Course Title: Short Title Course Code

Branch - Automobile / Mechanical Engineering Third Year
Sem- First

Course Description:

The course under Theory of Machine-II has been designed to cover the concepts of force analysis, construction, working and applications of important components of machines. The students will understand the overall working of machines and able to understand constructional and working features of important machine elements. The students should be able to understand the basic theoretical and numerical methods, which is the pre-requisites to design and selection of these components of machines for different applications.

Course Objectives:

1. To understand various types of machine components, its working & applications.
2. To understand the force analysis of power train components gears.
3. To study the need and different methods of balancing of rotating and reciprocating masses.
4. To aware about the speed regulating components such as governors, flywheel, etc.
5. To describe graphical and analytical methods.

Course Outcomes:

Development of concepts and logics about machine components.
Development of problem solving approach by graphical and analytical methods.
Understanding of functional requirements of machine components for designing purpose.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	3	14	40	3

Examination scheme:		
End semester exam (ESE)	80 Marks	Duration : 03 hours
Internal Sessional exam (ISE)	20 Marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Mathematics (Calculus), Engineering Drawing & Element of Mechanical Engineering, Engineering Mechanics at first year level and Theory of Machine-I at Second Year Level.

Course Contents:

UNIT-I

1.	Flywheel and CAM	No. of Lectures - 8 Marks : 16
	a	Turning moment diagram and fluctuation of the crankshaft speed, D' Alemberts principle Equivalent offset inertia force
	b	Determination of flywheel size for different types of engine and machine.
	c	Types of cams and followers, Analysis of motion of follower
	d	Determination of cam profile for given follower motion
	e	Analysis of cam with specified counters – Circular arc cam, Tangent cam

UNIT-II

2.	Brakes & Dynamometer	No. of Lectures - 8 Marks : 16
	a	Brakes: Types of brakes, Force analysis of brakes, external and internal expanding shoe brakes, block brakes.
	b	Band brakes, Band and block brakes, Breaking torque.
	c	Dynamometer: Absorption dynamometers: Prony brakes, Rope brake, Band brake
	d	Transmission dynamometer- belt transmission type, Fluid coupling

UNIT-III

3.	Governor & Gyroscope	No. of Lectures - 8 Marks : 16
	a	Governor: Types of governors – Watt, Porter, Proell, Hartnell, Sensitiveness of governors, Hunting, Isochronisms, Stability.
	b	Effect of governor, Power of governor, Controlling force.
	c	Gyroscope: Angular velocity and acceleration, Gyroscopic forces and couple, Gyroscopic effect on naval ships
	d	Gyroscopic stabilization, Stability of two wheel vehicle.

UNIT-IV

4.	Balancing	No. of Lectures - 8 Marks : 16
	a	Balancing of rotating masses in one and several planes.
	b	Balancing of reciprocating masses in single and multi-cylinder engine, radial and V-types.
	c	Primary and secondary balancing analysis, Concept of direct and reverse cranks.
	d	Balancing of locomotive engines and effect of partial balancing. , Static and dynamic balancing machine.

UNIT-V

5.	Gears	No. of Lectures - 8 Marks : 16
	a	Spur Gears:- Terminology used in gears, conjugate action,.
	b	Involute and cycloidal profile, Path of contact, Arc of contact, Contact ratio.
	c	Interference, Undercutting, Methods to avoid undercutting and interface, Gear standardization,
	d	Effect of center distance variation on the velocity ratio for involute profile tooth gears, Friction between gear teeths.

References:

1. Theory of Machines, S. S. Rattan, Tata McGraw Hill, New Delhi.
2. Theory of Mechanisms & Machines, Jagdish Lal, Metropolitan Book Co.
3. Theory of Machines, Longman's Green & Co., London.
4. Theory of Machines, W. G. Green, Blackie & Sons, London.
5. Theory of Machines, V.P. Singh, Dhanpat Rai & Co.
6. Theory of Machines – II, H. G. Phakatkar, Nirali Publication.
7. Theory of Machines and Mechanisms, Shigley, J.E and Uicker, J.J, McGraw45 Hill International Book Co.
8. Mechanisms and Machines theory, Rao J.S. and Dukkipati R.V, Wiley Eastern Ltd.
9. The Theory of Machines through solved problems , J.S.Rao. New age international publishers.
10. A text book of Theory of Machines, Dr.R.K.Bansal. Laxmi Publications
11. Theory of Machines, Sadhu Singh, Pearson Publication.
12. Theory of machine, P. L. Ballaney, Khanna publication.

Lab - Course Outline

Theory of Machines -II TOM-II LAB

Course Title: Short Title Course Code

Branch - Mechanical / Automobile Engineering Year – Third Year

Course Description:

This lab includes drawing sheets related to cam profile & balancing of rotating & reciprocating masses. Experiments on determination of characteristic curves of the centrifugal governor and verification of principle of working of gyroscope are also included. In addition study of gear boxes and Balancing machine.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA)		: 25 Marks
End Semester exam (ESE) ORAL		: 25 Marks

Prerequisite Course(s): Engineering Mathematics, Theory of machine-I

Outline of Content:

This practical contains

1. To determine the characteristic curves of the centrifugal governor and find its coefficient of insensitivity and stability.
2. To study various types of gear boxes.
3. To verify the principle of working of gyroscope.
4. To study the static & dynamic balancing machine & balancing of masses in different planes.
5. To study graphical methods and prepare drawing sheets for – Drawing sheet 1:- Balancing of rotating masses and reciprocating masses. (2 Problems)
6. To study graphical methods and prepare drawing sheets for Drawing sheet 2: Draw cam profile for various types of follower motion.

Guide lines for ESE:- ESE
(Oral Examination)
The Oral Examination will comprise of viva on the above six experiments.

Course Outline

Transport Management and Safety Regulation TMSR

Course Title Short Title Course Code:

Branch - Automobile Engineering Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of central motor vehicle act, taxation, insurance, fleet management, garage layouts, and safety aspects on the road. The course aims provide knowledge of the basic transport management which is automotive engineer must take into consideration.

Course Objectives

1. To provide students with an overall understanding of the reasons for people and goods movement, patterns of travel and to gain knowledge of the evolution of transport technologies, and their feature that fulfil the desire for travel. To obtain an understanding of the techniques and theories of studying traffic flow and transport demand and supply.
2. Manage the organization, personnel, and operational requirements for a successful transportation/distribution department.
3. The administration of a business concern or public undertaking. Management includes the actions of planning, organizing, directing, coordinating, controlling and evaluating the use of people, money, materials and facilities to accomplish missions and tasks.

Course Outcome

At the end of the course the students are able to

1. Have a critical understanding of current developments in transport and logistics systems.
2. Demonstrate critical awareness of the strategic significance of Transport and Logistics systems.
3. Be able to understand the transport and logistics theoretical frameworks.
4. Be capable of interpretation, and critical analysis of transport and logistics strategies.
5. Be able to using current theories, and reflect on their work experience to produce better transport and logistics performance.
6. Be able to find, collate, synthesize and interpret literature in areas of transport and logistics research in a cohesive and analytical fashion.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about Transport Management and Safety Regulations.

Outline of Content: This course contains:

UNIT-I

1.	MotorVehicleAct-1989 No. of Lectures - 8 Marks : 16	
	a	Short Titles and definitions laws governing use of motor vehicle & vehicle transport.
	b	Licensing of drivers and conductor, Registration of vehicle, state and interstate permits.
	c	Taxation structure and methods of laving taxation, insurance type and significance.
	d	Furnishing particulars of vehicles involved in accident, award of claim tribunal.
	e	Duty of driver & conductor in case of accident, traffic rules, signals and controls, accidents causes and analysis.
	f	Liabilities and preventive measures, Design of road complex , Responsibility of driver , Public authorities, offences, penalties and procedures.
	g	Different types of forms, Government administration structure, personnel authorities and duties.

UNIT-II

2.		No. of Lectures - 8 Marks : 16
	a	Transportterminology - Important terms used in road transport organization like HMV , LMV, Fleet utilization , breakdown rate, accident rate, route, seat km etc.
	b	CostofServices- Capital cost & operating cost, fixed cost & variable cost, direct & indirect cost, excess capacity and effect on route
	c	Operationalproductivityandefficiency Productivity in road transportation organization, the environment of road transport system, Optimizing fleet and vehicle utilization, conservation of fuel and economy, control of breakdown, effective traffic operation

UNIT-III

3.		No. of Lectures - 8 Marks : 16
	a	Infrastructureinroadtransportationorganization Garages, essential requirements of garages, fleet maintenance record , bus station , bus shelter, bus stop, essential requirement, staffing, management of transport organization and its of objectives, Typical depot layout structure of passages and goods transport organization
	b	Motorindustry Manufacturing techniques and quality control of automobile components such as piston, cylinder, valves, crankshaft, camshaft, bearing.

UNIT-IV

4.		No. of Lectures - 8 Marks : 16
	a	SignificanceofRoadTransportations Road transportation as an agent of change and development ,National scene, transport policy and co-ordination, operating characteristic s in transportation, engineering flexibility ,speed and acceleration, dependability and safety performance criteria
	b	Transportplanning Strategic planning, management control, operational control

UNIT-V

5.		No. of Lectures - 8 Marks : 16
	a	RoadsafetyandHealth Driving comfort, avoiding fatigue, the road to exhaustation, poisonous car fumes, car sickness, drugs & driving first aid for motorist, first aid kits, braking & stopping interpreting the signs ,rain, floods, hot, mistcare &precaution , ice snow skidding, emergencies & road observations.
	b	Accidents Definition of accident, legal obligation, causes ofaccident, Insurance, Documantation, Analysis & preventions of accidents, Road Safety & Drivers Role , a defensive driver, driver selection test, Drivers training.
	c	Security Devices Dog Restraint, Rear fog lamp, guard lamp, reversing light, bonet, brakes locks, vibrator alarm, fog lamp, Toe bar, Rouf racks, Luggage containers.

References

1 Goverment Publication, The Motor vehicle Act, 1989.

2 Kadiyali.L.R., Traffic engineering and Transport Planning.

3 3 P.G.Patankar, “Road passenger Transport in India”, C.I.T.T. Publication

4 Santosh Sharma, “Productivity In Road Transportation”A.S.R.T.V.Publication

5 Compendum of Transport Terms- C.I.R.T.Pune

Lab - Course Outline Cover Page

Computer Graphics

CG

Course Title | Short Title | Course Code

Branch - Mechanical / Automobile Engineering | Year – Third Year

Course Description: This course includes design and drafting related to mechanical elements. Lab's related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	01	14	14	01
Practical	02	14	28	01

Purpose of Course: Degree Requirement

Prerequisite Course(s): Engineering Graphics, Essential Computer Knowledge Required.

Outline of Content: This course contains:

AUTOCAD

1	No. of Lectures – 07	
	a	Introduction to CAD. Advantages and Applications of CAD. Difference between conventional drafting methods and CAD.
	b	Introduction to Auto-cad (Latest Version). Details of various menu bars and tool bars, Drawing Area etc.
	c	Draw Toolbar- Line, Arc, Rectangle, Circle, Polygon, Text, Boundary Hatching etc.
	d	Modify Toolbar – Copy, Move, Erase, Mirror, Chamfer, Fillet, Array, Trim etc.
	e	Dimension Toolbar – Linear, Angular, Radius, Diameter, etc
	f	Properties Toolbar – Line Types, Colors, Line Weight, Text, etc
	g	Settings - Snap settings, Grid settings, parameter settings, print settings, etc

AUTO-LISP

2	No. of Lectures – 07	
	a	Introduction to Auto-LISP. Advantages and Applications of Auto-LISP .
	b	Auto-LISP commands
	c	Auto-LISP Programs for simple geometric shapes-line, circle, rectangle, pentagon, etc
	d	Auto-LISP Programs for elements geometric shapes such as circle in rectangle, triangle in rectangle, etc.
	e	Auto-LISP Programs for simple machine elements. (Nut, Bolt, Stud, Flange, etc)
	f	Auto-LISP Programs for simple machine elements. (Nut, Bolt, Stud, Flange, etc)
	g	Auto-LISP Programs for simple machine elements (Nut, Bolt, Stud, Flange, etc)

Course Objectives:

This course includes design and drafting related to mechanical elements. This lab related to elementary level knowledge of drafting and Auto-LISP program. Sketching and computer aided design tools are used to create the various types of views needed for design and documentation.

Course Outcomes: Upon successful completion of these practical the student will be able to

1. Demonstrate and understand the basic concepts of geometric modeling and computer graphics.
2. Design and Drafting of mechanical elements.
3. Programs for mechanical elements in Auto-LISP.

Assignment:

1. Two assignments on AutoCAD (preferably latest version).
2. Two assignments on Auto LISP (such as Design and drafting of any mechanical component through Auto LISP)

REFERENCES:

1. AutoCAD reference manual
2. Auto-LISP Developer's Guide
3. George Omura, ABCs of Auto LISP, BPB. Publication
4. H.G. Phakatkar, Engineering Graphics, Nirali publication

COURSE CONTENT

Industrial Training / EDP / Special Study IT/EDP/SS

Course Title Short Title Course Code

Semester-V Examination Scheme

Total Semester Credits: 02 Internal Continuous Assessment (ICA): 25 Marks

Industrial Training

Student shall undergo industrial training for a minimum period of two weeks during summer vacations between fourth semester and fifth semester.

The industry in which industrial training is taken should be a medium or large scale industry

The paper bound report on training must be submitted by the student in the beginning of Fifth semester along with a certificate from the company where the student took training.

Every student should write the report separately.

Institute / Department/T&P Cell have to assist the students for finding Industries for the training.

Students must take prior permission from Department before joining for Industrial Training.

OR

EDP (Entrepreneurship Development Program)

Student has to participate in Entrepreneurship Development Program for a minimum period of One week during summer vacations between fourth semester and fifth semester.

Every student must submit the paper bound report based on the program in the beginning of Fifth semester along with a certificate (Course / Program completion) from the program organizers.

Every student should write the report separately.

Institute / Department may arrange Entrepreneurship Development Program at their campus.

Students must take prior permission from Department before attending any Entrepreneurship Development Program.

OR

Special Study

Student has to submit name of three topics of his interest to the department.

Special study in a group shall not be allowed.

The three-member committee appointed by Head of Department shall allot one topic out of the three topics submitted by the student.

Every student must submit the paper bound report based on special study at the end of Firth semester.

Department should allot guide to all such students, for monitoring their progress and guide them for literature survey / report writing etc.
Evaluation of special study shall be done based on presentation made by student, followed by brief question answer session.

Evaluation of Industrial Training / EDP / Special Study

ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the training / EDP / Special study and based on knowledge / skill acquired by the student. The three-member committee appointed by Head of Department shall assess the reports and award marks based on following:

(a) Report		10 marks.
(b) Presentation		10 marks.
(c) Viva-voce at the time of presentation		05 marks.
	Total:	25 marks.

Course Outline

Automobile Systems AS

Course Title Short Title Course Code

Branch - Automobile Engineering Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of various automobile systems like starting, ignition & steering. The course aims provide knowledge of the basic structural layouts, electrical & air-conditioning operations of a vehicle which the automotive engineer must take into consideration.

Course Objectives

6. To provide a basic knowledge regarding the various systems of automobile.
7. To introduce about the components of various systems.

Course Outcome

At the end of the course the students are able to

3. Understand the various systems with their applications.
4. Understand the working of automobile systems.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about automobile engineering.

Outline of Content: This course contains:

UNIT-I

1.		No. of Lectures - 8 Marks : 16
	Vehiclelayoutsandspecification	
	a	Vehicle specification, vehicle layouts, types of vehicles and their applications,
	b	Two and four wheelers, cars, Light commercial vehicles, Trucks, buses, earth moving machinery, high way vehicles, agricultural tractors,
	c	Construction of automobile and various systems Of automobiles
	Chassis andframes	
	d	Frame, sub frame, integral construction, frame alignment.
	e	Body bumpers, doors, hood, articulated vehicles, trailers and safety consideration.

UNIT-II

2.	Battery	No. of Lectures - 8 Marks : 16
	a	Introduction, Principles of battery operation, battery construction.
	b	Recharging of battery, Battery rating, battery capacity and battery efficiency.
	c	Checking specific gravity of battery, battery test.
	d	Battery charging, battery failure and battery troubles shooting.

UNIT-III

3.		No. of Lectures - 8 Marks : 16
	a	Ignitionsystems Conventional Ignition systems: Function, types of Ignition systems, components, Battery Ignition systems, Magneto Ignition systems, Testing of Ignition circuits, Ignition systems trouble shooting.
	b	ElectronicIgnitionsystems Introduction, principles of Electronic Ignition systems, pulse generator, distributor less ignition system.
	c	Startingsystems: Starting motors, starting devices, bendix drive, overrunning clutch drive, starting motor switch and control switch, starting system troubleshooting.

UNIT-IV

4.	Design of Gears	No. of Lectures - 8 Marks : 16
	Wheels,Tyres,andTubes	
	a	Construction and types of wheels, wheel dimensions.
	b	Types of tyres, tyre property , tyre material, consideration in trade design, wheels and tyre trouble shooting, retrading of tyres, Tubes, Natural Rubber sand butyl flops.
	c	Rims, types, and maintenance.
	a	Construction and types of wheels, wheel dimensions.
	Frontaxleandsteering	

	d	Introduction, front axle, factors of wheel alignment, steering geometry.
	e	Steering mechanisms, cornering force, understeer and oversteer, steering linkages, steering gears, steering ratio.
	f	Special steering columns, power steering, advanced steering systems.

UNIT-V

5.	Airconditioningsystems	No. of Lectures - 8 Marks : 16
	a	Definition of basic terms of psychometry such as DBT, WBT, RH, etc. Human comfort conditions.
	b	Temperature control system, Insulation methods in auto air conditioner, Study of typical auto air conditioner, location of window air conditioner.
	c	Study of typical air conditioner systems, various parts of systems, compressor performance and its effect on overall engine performance.

Automobile System Lab

Examination scheme:
End semester scheme (ESE) 25 marks
Internal continuous assessment (ICA) 25 marks

Teacher should facilitate any SIX of the following lab practice.

S.N.
1. To study different vehicle layouts & their comparison
2. To study various battery testing & battery charging methods
3. To study battery ignition & magneto ignition system
4. To study Electronics ignition & distributor less ignition system
5. To study bendix drives and overrunning clutch type starting motors
6. To study of power steering mechanism
7. Trial on wheel alignment and wheel balancing machine
8. To study automobile air conditioning system

Guidelines for ICA:
ICA will based on Practical and Assignment submitted by student in form of journal. Minimum three Assignments to be submitted based on theory syllabus

References

1 Dr. Kripal Singh," Automobile Engineering" vol-I&II
2 R.B. Gupta, "Automobile Engineering" ;Satya prakashan, New Delhi
3 Newton, steed and Garret, "Motor vehicle", Butterworth, London
4 Narang G. B. S, "Automobile Engineering", Khanna publication, New Delhi
5 A.W. Judge ," Modern Transmission" Chapmen and Hall std 1989
6 Nakara C. P., "Basic Automobile Engineering", Dhanpat Rai Publishing co.

Course Outline

Autotronics

Atrx

Course Title Short Title Course Code:

Branch - Automobile Engineering Year – Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of Autotronics. The course aims provide combined knowledge of electrical, electronic and mechanical systems those are used in automobile subsystems, which the automotive engineer must take into consideration.

Course Objectives

4. To study the electronics system used in automobile.
5. Autotronics is involves the study of mechanics, electronics, control engineering and computing to generate new ways of designing and producing new, high performance machines and products

Course Outcome

At the end of the course the students are able to

1. It will provide Interest towards the automation.
2. Study about the electronics used in automobile.

Teaching Scheme:

	Hours Per Week	No. of Weeks	Total Hours	Semester Credits
Lectures	3	14	40	3
Tutorials	--	--	--	--

Examination scheme:

End semester scheme (ESE)	80 marks	Duration: 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Course(s): Fundamental knowledge about Electrical engineering, electronics engineering and mechanical engineering.

Outline of Content: This course contains:

UNIT-I

1.	Autotronics and Sensors in Automobiles No. of Lectures - 8 Marks : 16	
	a	Measurement systems: Basic Principles of transductions related to Resistive, Capacitive, Inductive, Piezoelectric, Thermoelectric and Photovoltaic.
	b	Stages of measurement, static characteristics of instruments, and commonly used automobile and electronics components.
	c	Electromagnetic Sensors, Optical Sensor, Temperature Sensor, Manifold Absolute Pressure Sensor, Knock Sensor, Throttle position sensor, Exhaust Gas Sensors, Air flow measurement

UNIT-II

2.	Vehicle Management System No. of Lectures - 8 Marks : 16	
	a	ABS system, its need, layout and working.
	b	Electronic control of suspension – Damping control, Electric power steering.
	c	Supplementary Restraint System of air bag system – crash sensor, seat belt tightening.
	d	Cruise control, Vehicle security systems alarms, vehicle tracking system.
	e	Collision avoidance, Radar warning system.
	f	Introduction to Global Positioning Systems, Electronic Stability control system.

UNIT-III

3.	SI Engine Management No. of Lectures – 8 Marks : 16	
	a	Feedback carburetor system, throttle body injection and multi point fuel injection system, injection system controls.
	b	Advantage of electronic ignition systems, three way catalytic converter,

		conversion efficiency versus lambda.
	c	Layout and working of SI engine management systems like Bosch Monojetronic, L-Jetronic and LHJetronic.
	d	Group and sequential injection techniques. Working of the fuel system components. Advantages of electronic ignition systems.
	e	Types of solid state ignition systems and their principle of operation.

UNIT-IV

4.	CI Engine Management	No. of Lectures - 8 Marks : 16
	a	Fuel injection system, parameters affecting combustion,
	b	Noise and emissions in CI engines.
	c	Pilot, main, advanced, post injection and retarded post injection.
	d	Electronically controlled Unit Injection system. Layout of the common rail fuel injection system.
	e	Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter,
	f	EGR valve control in electronically controlled systems.

UNIT-V

5.	Automotive Electrical	No. of Lectures - 8 Marks : 16
	a	D.C. generator and alternator.
	b	Regulation for charging.
	c	Lighting design
	d	Dashboard instruments
	e	Horn, warning system, wiring,
	f	Safety devices and testing equipment.

Autotronics Lab

Examination scheme:
End semester scheme (ESE) 25 marks
Internal Continuous Assessment (ICA) 25 marks

ESE (Oral Examination)
The Oral Examination will comprise of viva on the above Six Experiments.

Teacher and Examiner should follow the following guidelines.
Teacher should facilitate following lab experiments:

1 Demonstration and testing of auto electrical components on multifunction tester
2 Demonstration of head light aiming apparatus
3 Demonstration of dashboard panel instruments and control.
4 Study of throttle position sensor/ lambda sensor
5 Study of EGR valve control in electronically controlled systems.
6 Study of multi point fuel injection system
7 Study of Electric power steering.
8 Study of Electronic Stability control system.

Note: Lab file should contain at list six experiments from above mentioned list.

References

1 Diesel Engine Management by Robert Bosch, SAE Publications, 3rd Edition, 2004

2 Gasoline Engine Management by Robert Bosch, SAE Publications, 2nd Edition,

3 William Harry Crouse, "Automotive Electronics and Electrical Equipment", Edition 10, Gregg Division, McGraw-Hill, 1986, ISBN 0070148953, 9780070148956

4 William Harry Crouse, Donald L. Anglin, "Automotive Tune up", Automotive Technology Series, Publisher McGraw-Hill Gregg Division, 1977, ISBN 0070148104, 9780070148109

5 Ken Layne, "Automobile Electronics and Basic Electrical Systems", Volume 1, Wiley, 1989 ISBN 0471617636, 9780471617631

Course Outline

Metrology and Quality Control MQC

Course Title: Short Title Course Code

Branch - Automobile / Mechanical Engineering Year Third Year

Course Description: This course introduces undergraduate students to Metrology and Quality Control. The background required includes a sound knowledge to Measurements, (calculus), applied thermodynamics, Industrial management at second year level.

Course Objective: The course aims at imparting knowledge of metrology and quality control. The course aims at to familiarize to understand the principles metrology of screw threads, gear measurement, study of measuring machines, recent trends in engineering metrology. To learn to use standard practices and standard data, learn to use statistical concept, control chart for variables, control chart for attributes, acceptance sampling

Teaching Scheme

	Hours Per Week	No. of Week	Total Hours	Semester Credits
Lecture	03	14	42	3
Practical	02	14	28	

Examination scheme:

End semester exam (ESE) 80 Marks Duration: 03 hours
Internal Sectional exam (ISE) 20 Marks
Internal Continues Assessment (ICA) 25 Marks
End Semester Exam (ESE) 25 Marks
Practical Examination

Purpose of Course: Degree Requirement

UNIT:-I

1.	Metrology	No. of Lectures – 08, Marks: 16
	a	Definition: Measurement, precision, accuracy, sensitivity, Classification of method of measurement
	b	Linear Measurement:-Standards, line standards, end standards, classification of standards, precision measurement, precision measuring instruments and their characteristics, slip gauge
	c	Straightness, flatness and squareness:-Surface plates, measurement of straightness, flatness testing, squareness testing, roundness testing, machine tool metrology, Measurement by light wave interference:- Basic principle, sources of light, optical flats, fringe patterns and their interpretation, testing of flat, convex and concave and irregular surface, checking of slip gauges.

UNIT:-II

2.	Design of gauges &Metrology	No. of Lectures – 08, Marks: 16
	a	Design of gauges:- Types of gauges, limits, fits, tolerences, Taylor's principle
	b	Comparators:-Characteristics, application, types, construction and working of different mechanical, optical, electrical, pneumatic comparators
	c	Angle measurement:-Sine bars, Sine centers, Use of sine bar, angle gauges, autocollimator angle dekkor, constant deviation prism, Measurement of surface finish:-Types of Surface texure, elements of surface texture, measuring surface finish by stylus probe, Tomlinson & Taly-surf

UNIT:-III

3.	Metrology of Screw thread, Gear & recent trend in metrology. No. of Lectures – 08, Marks: 16
	a	Metrology of screw threads:-Terminology, errors and their effects, thread gauges, measurement of elements of external and internal threads, Gear measurement:-calipers measurements, involute testing, roller measurements, tool makers microscope, profile projectors
	b	Study of measuring machines:-Universal measuring machine, coordinate measuring machine, Errors in CMM, electronic inspection and measuring machine, Recent trend in engineering metrology:-precision instrument based on laser, probes, telemetric systems, Isometric viewing of surface defects, Machine vision

UNIT:-IV

4.	Quality control	No. of Lectures – 08, Marks: 16
	a	Introduction to quality :- factors controlling quality of design and conformance, balance between cost of quality and value of quality, Introduction to quality tools: Demings PDCA,PDSA cycles & Juran triology approach, Seven quality tools, Pareto analysis, cause &effect diagram, brainstorming, concurrent engineering
	b	Total quality management:, zero defect concept 5S,Kaizen,Kanban,,Poka yoke, TPM ,ISO 9000&TQM, Quality assurance ;-QFD, difference between inspection, quality control and quality assurance, quality survey

UNIT:-V

5.	Statistical Quality Control	No. of Lectures – 08, Marks: 16
	a	Statistic concept:-Concept of variation, variable & attribute data, the frequency distribution, quantitative description of distribution, normal curve, concept of six sigma, Control chart for variables:-definition of control chart, objective of control chart chart, R chart, Problems on X & R chart
	b	Control chart for attributes:-practical limitations of the control charts for variables charting chart chart, Problems on P & C chart
	c	Acceptance sampling:-Sampling inspection Vs hundred percent inspection, basic concept of sampling inspection, OC Curve, conflicting interests of consumer and producer, producer's and consumer's risk, AQL LTPD, Sampling plans

RecommendedBooks :

[1] R.K.Jain: Engineering Metrology: Khanna Publishers.
[2] Handbook to industrial metrology: ASTME: Printice Hall
Pub [3] G.M.Juran: Handbook of quality control, McGraw Hill
Pub. [4] M.Mahajan: Statistical quality control
[5] K.C.Jain:TQM & ISO 9000;Khanna publishers
[6] I.C.Gupta: A textbook of Engg Metrology: Khanna Publishers.
[7] M.Mahajan : A textbook of metrology :Dhanpat rai & co.

Lab - Course Outline

Metrology and Quality Control MQC

Course Title	Short Title	Course Code
Branch- Mechanical/Automobile Engineering	Year	Third Year

Course Description:
This lab includes performance practical and study practical related to metrology and quality control

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Evaluation Scheme:

Internal Continuous Assessment (ICA) 25 Marks

End Semester Exam (ESE) (Oral) 25Marks
Prerequisite Course(s): General mathematics, 11t^{h} Physics & 12th physics
Outline of content:

This practical contains following experiments

1 Determination of linear/angular dimensions of part using precision & non precision instrument.

2 Machine tool alignment tests on any machine tool like Lathe,Drilling,Milling.

3 Interferometer-Study of surfaces using optical flat.

4 Surface finish measurement.

5 Measurement of roundness/circularity using mechanical comparator.

6 Measurement of screw parameters

7 Measurement of Gear parameters i) gear tooth thickness ii)constant chord iii)PCD

8Study and applications of tool makers microscope

9 Use of profile projector

10 Study and use of control charts

Note: Any EIGHT practical from Mechanical Measurement and Metrology Lab shall be conducted during 14 weeks available during semester.

ESE (Practical Examination)
• The Practical Examination will comprise of performing the experiment and viva on the practical's.

Finite Element Analysis (Theory)

Teacher, Paper setter and Examiner should following guidelines

Unit – I

1. Teacher should facilitate learning of

This course introduces undergraduate students to imparting knowledge of Finite element methods. The background required a sound knowledge of Mathematics, Mechanics, Heat Transfer, Basic Mechanical Engineering.

1	**Introduction of FEM & Variation Methods**		**Lectures Required**
	a	Finite element method, brief History	1
	b	basic steps in FEM, advantages and disadvantages,	1
	c	Need for Studying FEM, Applications of FEM, FEM vs FDM,	1
	d	Element Shapes 1D,2D,3D Axis Symmetric elements, Co-ordinates System Governing Equations,	1
	e	System modeling (Geometric), Discretization, Node numbering, shape function.	1
	f	Rayleigh-Ritz methods,	1
	g	Methods of Weighted Residuals (Galerkin, Least-squares & Collocation methods),	1
	h	Variational formulation of 1D bar and beam elements (Euler Bernoulli and Timoshenko beam) – governing equation	1

2. Guidelines for Paper Setter :

Theoretical question (4 or 8 marks only) is to be asked on **a to h**

Paper Setter should ask theory on **a to h.**

Unit – II

2	Isoparametric Elements & Fundamental Concepts of Solid Mechanics		Lectures Required
	a	Introduction, shape functions – linear & quadratic	1
	b	displacement function – criteria for the choice of the displacement function	1
	c	polynomial displacement functions,	1
	d	displacement function in terms of nodal parameters	1
	e	Stress, Strain,	1
	f	Strain-Displacement and Stress-Strain Relationships,	1
	g	Equilibrium, Stress Strain with temperature effects.	1
	h	Numerical	1

1. Guidelines for Paper Setter :

Theoretical question (4 or 8 marks only) is to be asked on **a to h.**
Numerical should be asked only on **bar element and shape functions.**

Unit – III

3	FEA 1D Problems & Beams.		Lectures Required
	a	Natural co-ordinate and shape functions for 2 noded 1D element	1
	b	Stress displacement	1
	c	Element stiffness matrix by principal of minimum Potential energy approach	1
	d	Treatment of specified boundary conditions. Applications: Linear Elastic Spring, Torsion of Circular Shafts	1
	e	Applications: Torsion of Circular Shafts	1
	f	**Beams**: Element Formulation and Stiffness Matrices	1

	g	Potential energy and Galerkin Approaches,	1
	h	Loads and Boundary Conditions	1

1. Guidelines for Paper Setter :

Theoretical question (4 or 8 marks only) is to be asked on **a to h.**
Numerical should be asked only on **Deflection of spring and beams.**

Unit – IV

1	**Trusses and CST**		**Lectures Required**
	a	**Two Diamensional Trusses**, Introduction to two dimensional trusses	1
	b	Co-ordinate Systems and Transformations Matrix,	1
	c	Element Stiffness matrix in Global co-ordinate system,	2
	d	Element Stress Calculations	2
	e	Constant strain Triangular Elements, Introduction,	1
	f	Local and Natural Cordiantes, Matrix for CST	1
	g	Heat Transfer:- Transient Heat Conduction	
	h	Numerical	

1. Guidelines for Paper Setter :

Theoretical question (4 or 8 marks only) is to be asked on **a to h**
Numerical should be asked only on **trusses and CST.**

Unit – V

5	**Dynamic Problems and Miscellaneous Problems**		**Lectures Required**
	a	**Dynamic Problems**	1
	b	Formulation of dynamic problems	1
	c	consistent and lumped mass matrices	1
	d	**Torsion**:- Torsion of Prismatic Shaft	1

	e	**Vibration-** Free Vibration of thin Plates	1
	f	Cylindrical Shells	1
	g	Flow through Ideal Fluids	1
	h	Flow through Viscous Fluid	1

1. Guidelines for Paper Setter :
   Theoretical question (4 or 8 marks only) is to be asked on **a to h**

Course Outline

Course Title: Finite Element Analysis **Short title:** FEA

Branch: Automobile Engineering **Year** :Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of Finite element methods. The background required a sound knowledge of Mathematics, Mechanics, Heat Transfer, Basic Mechanical Engineering.

Course Objectives

1. To provide an opportunity for students to apply knowledge of mathematics, for solution to engineering problems.
2. To introduce numerical and Finite Element Methods for solving linear and non-linear equations.
3. To apply the knowledge of these methods to solve practical problems with suitable software.

Course Outcome

At the end of the course the students are able to-

1. Develop the finite element equations to model engineering problems
2. Apply finite element techniques to formulate and solve structural, fluid, and thermal problems using finite element methodology
3. Use Software's to formulate and solve structural and fluids problems using a commercial code

Teaching Scheme

	Hrs per week	No. of weeks	Total hour	Semester Credits
Lecture	03	14	40	03
Tutorial	--	--	--	--

Examination Scheme:

End semester scheme(ESE)	**80 marks**	**Duration : 03 Hrs.**
Internal Sessional Examination (ISE)	**20 marks**	

Purpose of Course: Degree Requirement

Prerequisite Courses: Fundamental knowledge about the mathematics.

Outline of the content: This course contains:

Unit- 1

1.	Title: **Introduction of FEM & Variation Methods** No. of Lecture:09 ,Marks: 16	
	a	**Introduction of FEM**: Finite element method, brief History, basic steps in FEM, advantages and disadvantages, Need for Studying FEM, Applications of FEM, FEM vs FDM, Element Shapes 1D,2D,3D Axis Symmetric elements, Co-ordinates System

		Governing Equations, System modeling (Geometric), Discretization, Node numbering, shape function.
	b	**Variational Methods Of Approximation** – Rayleigh-Ritz methods, Methods of Weighted Residuals (Galerkin, Least-squares & Collocation methods), Variational formulation of 1D bar and beam elements (Euler Bernoulli and Timoshenko beam) – governing equation,

Unit- 2

2.	Title: **Isoparametric Elements** & **Fundamental Concepts of Solid Mechanics** No. of Lecture:08 ,Marks: 16	
	a	**Isoparametric Elements** Introduction, shape functions – linear & quadratic, displacement function – criteria for the choice of the displacement function, polynomial displacement functions, displacement function in terms of nodal parameters,
	b	**Fundamental Concepts of Solid Mechanics:** Stress, Strain, Strain-Displacement and Stress-Strain Relationships, Equilibrium, Stress Strain with temperature effects.

Unit- 3

3	**FEA 1D Problems & Beams.** No. of Lecture:08 ,Marks: 16	
	a	Natural co-ordinate and shape functions for 2 noded 1D element, Stress displacement, Element stiffness matrix by principal of minimum Potential energy approach, Treatment of specified boundary conditions. Applications: Linear Elastic Spring, Torsion of Circular Shafts.
	b	**Beams**: Element Formulation and Stiffness Matrices, Potential energy and Galerkin Approaches, Loads and Boundary Conditions

Unit- 4

4.	Title: **Trusses and CST** No. of Lecture:08 ,Marks: 16	
	a	**Two Diamensional Trusses**, Introduction to two dimensional trusses, Co-ordinate Systems and Transformations Matrix, Element Stifness matrix in Global co-ordinate system, Element Stress Calculations. Constant strain Triangular Elements, Introduction, Local and Natural Cordiantes, Matrix for CST
	b	Heat Transfer:- Transient Heat Conduction,

Unit- 5

5	Title: **Dynamic Problems and Miscellaneous Problems** No. of Lecture:08 ,Marks: 16	
	a	**Dynamic Problems** Formulation of dynamic problems, consistent and lumped mass matrices **Torsion**:- Torsion of Prismatic Shaft
	b	**Miscellaneous Applications**– **Vibration-** Free Vibration of thin Plates, Cylindrical Shells. **Flow through Fluid**: Flow through Ideal Fluids, Flow through Viscous Fluid.

References:	
1	Chandrupatla T. R. and Belegunda A. D., “Introduction to Finite Elements in Engineering”, Prentice Hall India
2	Reddy, J. N., “An Introduction to The Finite Element Method”, Tata McGraw Hill,
3	J. N. Reddy,” Finite Element Method”,McGraw Hill Co.
4	Belegundupatla,” Introduction to Finite Element Method”,Prentice Hill India.
5	Cook R. D., “Finite Element Modeling for Stress Analysis”, John Wiley and Sons Inc, 1995
6	C.S.Desai and J.F.Abel.-“ Introduction to the Finite element Method” CBS Publisher and Distributers.-

Course Outline

Project and Business Management PBM

Course Title Short title Course Code

Branch: Mechanical /Automobile Engineering Year Third Year

Course Description: This course introduces undergraduate students to imparting knowledge of project & business management. The background required a sound knowledge of network technique, organization structure, Financial and material management.

Course Objectives

1. To provide about project and its management.
2. To develop knowledge about organization and impart knowledge about functioning of management.
3. To develop knowledge about financial management techniques.

Course Outcome

At the end of the course the students are able to-

1. Develop knowledge of project management and statistical tools used in its.
2. Helped to understand the various functions of management along with its types.
3. Develop knowledge about Capital cost and cost control.

Teaching Scheme

	Hrs per week	No. of weeks	Total hour	Semester Credits
Lecture	03	14	40	03

Examination Scheme:

End semester scheme(ESE)	80 marks	Duration : 03 Hrs.
Internal Sessional Examination (ISE)	20 marks	

Purpose of Course: Degree Requirement

Prerequisite Courses: Fundamental knowledge about the mathematics.

Outline of the content: This course contains:

Unit- I

1.	Title: Project Management	No. of Lecture:08 ,Marks: 16
	a	Introduction to project management, Concept of project management, Managerial function at different organizational levels, Types of projects,
	b	Project identification, scheduling, Monitoring, Control, Basic tool & techniques for projects scheduling Bar chart, Project life cycle curves, Line balancing, Problems on Line balancing.

Unit- II

2.	Title: Project statistic technique	No. of Lecture:08 ,Marks: 16
	a	Introduction of Network technique, Fundamental concept and network models, construction of network diagrams,
	b	Application of network analysis, definition of PERT and CPM, comparison between CPM and PERT, Critical path method with problem, programme evaluation and review techniques with problem, time cost problem (crash) with PERT.

Unit- III

3	Business management	No. of Lecture:08 ,Marks: 16
	a	Introduction to management, Concept of management, The function of management, importance of management Forms of business organsation, Concept of Ownership Organization, Types of ownership, Individual Ownership, Partnership organization, joint stock companies, types of stock companies,
	b	Co-operative Organisations, various types of co-operative societies, Public sector organization,State ownership, public cooperation, choice of form of organisation, comparative evaluation of different forms of business ownership.

Unit- IV

4.	Title: Financial Management	No. of Lecture:08 ,Marks: 16
	a	Introduction, Definition of financial management, functions of financial management, Sources of Funds, Capital, classification of capital, working capital, need for working capital, assessment of working capital, Factors affecting working capital, Sources of finance (Shares, debentures, loans from banks, trade credit public deposits financial institutions).
	b	Cost and cost control: Elements of cost, direct cost, indirect cost, variable and fixed cost, cost control technique, marginal costing, break even analysis.

Unit- V

5	Title: Material & Purchase Management	No. of Lecture:08 ,Marks: 16
	a	Scope of material management, function of material management, objectives of scientific purchasing, functions of purchase department, , 5R's Of Buying, Methods of buying, source selection (vendor),vendor rating, just in time purchasing
	b	Inventory management, Objective of inventory management, types of inventory, selective inventory technique (ABC,VED), Inventory model (Economic lot size with fixed price, EOQ with quantity discount).

References:

1) L.C.Jhamb ,"Production(Operation)Management", Everest publishing house
2) Chary," Theory And Problems in Production and Operations Management",2nd Reprint, Tata McGraw Hill Publishing Co. New Delhi., 1996.
3) Nair,N.G.,"Production & Operations Management",Tata McGraw Hill Publishing Co. New Delhi.,1997.
4) Chadra Presanna,"Fundamentals of Financial Management" Tata McGraw Hill New Delhi.,1994.
5) Kolter Philip,"Marketing Management",Prentice-hall of India,1988.
6) Vyuptakesh Sharan.,"Fundamental of Financial Management", Pearson Education
7) Martand telsang,"industiral engineering and production management",1st Edition reprint 2013- S.chand & company ltd. New Delhi.2013
8) S.M.Inamdar, "Cost and Management Acounting"
9) M.K.Khan &P.K.Jain,"Financial Management", Tata McGraw Hill Publishing Co. New Delhi.
10) J.P.Bose, S.Talukdar, "Business Management", New Central Agencies (P) Ltd.

Lab - Course Outline

COMPUTER PROGRAMMING IN C / C++ C/C++

Course Title Short title Course code

Branch - Mechanical / Automobile Engineering Year – Third Year

Course Description:

This course provides students with a comprehensive study of the C /C++ programming language. Introduction to program design and problem solving using the C /C++ programming language. Programming topics include control structures, functions, arrays, pointers, and file I/O.

Teaching Scheme:

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	14	28	1

Prerequisite Course(s): Algebra and Trigonometry

Outline of Content: This course contains

a) One assignment on introduction to computer

b) To develop and Run "C/C++" programs for machine elements like

(Any two on C and two on C++)

a) Design of knuckle joint or turnbuckle joint

b) Design of power screw

c) Design of helical spring

d) Design of splines

e) Design of muff coupling

f) Theories of failure etc.

Recommended Books:

1) Balgurusamy, "Programming in C" Tata McGraw Hill Publication Co. Ltd.
2) Y. Kanitkar, "Let us C" BPB Publications.
3) M. P. Grover and Zimmer, "CAD/CAM" PHI Pvt. Ltd.
4) Shigley J.E. and Mischke C.R. "Mechanical Engineering Design" McGraw Hill Publication Co. Ltd.
5) Spotts M.F. and Shoup T.E. "Design of Machine Elements" Prentice Hall International.
6) Bhandari V.B. "Design of Machine Elements" Tata McGraw **Hill** Publication Co. Ltd.
7) Balgurusamy, "Object Oriented Programming with C++" Tata McGraw **Hill,** New Delhi
8) Ravi Chandran, "Programming in C++" Tata McGraw **Hill** Publication Co. Ltd.

COURSE CONTENT

Minor Project MIP

Course Title Short Title Course Code

Semester-VI

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	10	20	2

Examination Scheme Internal Continuous Assessment (ICA): 50Marks

Every student shall undertake the Minor Project in semester VI.

Each student shall work on an approved project, a group of 05 students (maximum) shall be allotted for the each minor project.

Minor project may involve fabrication, design or investigation of a technical problem that may take design, experimental or analytical character or combine element of these areas. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.

Each student is required to maintain separate log book for documenting various activities of minor project.

The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of minor project. Maximum four minor project groups shall be assigned to one teaching staff.

Assessment of the project for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in Table-A.

Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy)in following format:

- Size of report shall be of minimum 25 pages.
- Student should preferably refer minimum five reference books / magazines/standard research papers.
- Format of report
  - Introduction.
  - Literature survey.
  - Theory (Implementation, Methodology, Applications, Advantages, Disadvantages. etc)
  - Future scope.
  - Conclusion.

Assessment of Minor Project

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Exam Seat No	Name of Student	Project Selection	Documentation	Design /Simulation/Logic	PCB/hardware/programming	Result Verification	Presentation	Total
			5	10	10	10	10	5	50

COURSE CONTENT

Seminar-I S-I

Course Title Short Title Course Code

Semester-VI

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	10	20	2

Examination Scheme Internal Continuous Assessment (ICA): 25 Marks

1. For Seminar-I every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic during the term.
2. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-I. Seminar shall be related state of the art topic of his choice approved by the committee.
3. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
4. Topic of Seminar shall be registered within a two week from commencement of VI Semester and shall be approved by the committee.
5. Maximum six seminar supervision shall be allotted to each teacher.
6. Before the end of semester, student shall deliver a seminar and submit the seminar report (paper bound copy).

ASSESSMENT OF SEMINAR-I

Assessment of the Seminar-I for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in Table- B

Title of Seminar: _____

Name of Guide: _____

Table-B

SN	Exam Seat No	Name of Student	Topic Selection	Literature survey	Report writing	Depth of understanding	Presentation	Total
			5	5	5	5	5	25