SCHEME OF EXAMINATION
B.TECH. 3rd Year Mechanical Engineering (Auto) -5th Semester

S. No	Code	Subject Name	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam
			L	T	P/D	Total	Sessional	Theory	Practical/ Viva-Voce		
1	MEA 301 E	Microprocessors and Applications	3	1	-	4	50	100	-	150	3
2	MEA 303 E	Motor Vehicle Technology	3	1	-	4	50	100	-	150	3
3	ME 305 E	Heat Transfer	3	1	-	4	50	100	-	150	3
4	ME 307 E	Industrial Engineering	3	1	-	4	50	100	-	150	3
5	ME 309 E	Machine Design-I	2		5	7	50	100	-	150	3
5	MEA 307E	Automotive Transmissions	4	1	-	5	50	100	-	150	3
7	MEA 313 E	Automotive Transmissions Lab	-	-	2	2	25	-	25	50	3
8	ME 317 E	Heat Transfer (Pr)	-	-	2	2	25	-	25	50	3
9	ME 319 E	Industrial Engineering	-	-	2	2	25	-	25	50	3
11	ME 323 E	Vocational Training	-	-	-	-	50	-	-	50	
	TOTAL		18	5	11	34	425	600	75	1100	

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted.

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)
Microprocessors and Applications
MEA 301 E

L	T	P/D	Total
3	1	-	4

Sessional: 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam: 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT - I

Introduction To Microprocessors And Microcontrollers: Introduction to Microprocessors and Microcontrollers, Number Systems and Binary arithmetic, Microprocessor Architecture (8085 and 8086) and Microcomputer Systems, memory map and addressing, memory classification, review of logic device for interfacing, Memory Interfacing, Overview of 8085 Instruction Set, stacks and Interrupts.

UNIT – II

The 8051 Architecture: 8051 Microcontroller hardware, oscillator and clock, Prog. Counter and Data Pointer, Registers and Program Status word, Internal Memory RAM, Stack and Stack Pointer, Special Function Registers, Internal ROM. Input / Output Pins, Ports and Circuits, External Memory, Counters and Timers, Serial Data Input and Output, Interrupts.

UNIT – III

Assembly Language & Programming The 8051: Assembly Language programming, Programming the 8051, Moving Data, Logical Operations, Arithmetic Operations, Branching Operations, Interrupts.

UNIT – IV

Microcontroller 8051 design: Microcontroller specification and Design, External Memory and Memory space decoding, Memory – mapped I/O, Memory Access times, Timing Subroutines, Lookup Tables for 8051, Serial Data Transmission.

Interfacing Peripheral Devices To 8051 And Applications: Interfacing A/D Converters and D/A Converters, 8255, 8259. Application to interfacing Scanned Displays, Matrix Keyboard, Memory Design, Data Acquisition System Design.

Text Books:

1. K.J. Ayala, "The 8051 Microcontroller, Architecture, Programming & Applications", Thomsom Delmer Learning.
2. RS Gaonkar, "Microprocessors Architecture, Programming and Applications", Penram International.

Reference Books:

1. M.A. Mazidi. & J.G Mazidi, "The 8051 Microcontroller & Embedded Systems", Pearson Education.
2. B.Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai and Sons.

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)
Motor Vehicle Technology

MEA 303 E

L	T	P		
3	1	-	Sessional	: 50 Marks
			Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam. :	3 Hrs.

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT-I

I.C ENGINES (INTRODUCTION):
Working and difference between SI and CI Engines, Two and four stroke cycles, Theoretical heat cycles, ideal and actual Otto and diesel cycle, mixed cycle; Numerical, Working of two and four stroke SI and CI engines, Scavenging methods of two-stroke petrol engines, Comparison of two and four stroke cycle engines.

ENGINE PERFORMANCE:
Bore and stroke, swept and clearance volume, compression ratio, effect of C.R, engine torque, mean effective, bmep, bhp, Ihp, fhp, Engine efficiencies - air standard, mechanical, thermal, indicated thermal, brake thermal, volumetric, requirements of high volumetric efficiency, Factors.; Specific fuel consumption, Numerical

UNIT-II

ENGINE COMPONENT PARTS:
Cylinder block Types, Crankcase, liners: wet and dry, Gaskets, Timing covers, oil pan, cylinder head; SI engines combustion chambers: types and comparison, CI engine combustion chambers: Direct and Indirect injection, Intake & exhaust ports, lubricating passages, Intake & Exhaust valves and mechanisms, Camshafts, Side & overhead, advantages and disadvantages, Valve seat and conical angles, Valve seat insert, Valve springs, locks, Rocker-shaft, rocker arm, push rod, Cam followers-types, Timing of valves, Intake and exhaust manifold, Mufflers-types, Crankshaft :Nomenclature; Flywheel-functions; Oil seals; Engine Bearings : Thrust, ball, taper roller, needle, split, journal; Bearing materials, properties; Connecting rod; Piston : function, types, materials, piston rings: types, design details, Piston Pins, Component material chart :All engine components.

UNIT-III

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REAR AXLES AND TYRES:
Axle Casing, types, rear axle shafts - stresses and load taken, semi floating, ¾ floating and fully floating; Comparative data : axles; Automobile wheel :loads, torques and stresses, types of wheels, requirements, specifications, Types of rims, Advantages of smaller wheels; Requirement of tyres. Types : conventional, radial and tubeless, Inner tubes; Merits of

tubeless tyres over pneumatic tyres; Pneumatic tyres: constructional details: plies, tread designs, characteristics, aspect ratio, inflation pressure : comfort, braking, cornering, cost, fuel consumption, tyre materials; Tyre specifications; Points to increase tyre life : load, vehicle handling, speed, wheel balancing, tyre rotation, wheel alignment Procedure: Tyre retreading.

UNIT-IV

PROPELLER SHAFT AND DIFFERENTIAL:

Propeller shaft : requirement, construction, maintenance, critical speed vibration, double propeller shaft, Maruti half shafts; Universal Joints : types, rubber doughnut, hookes, constant velocity (Birfield), speed variation of hookes coupling, coupling with driven shaft; Numericals, Differential: requirements, principle, construction and working; Bevel gears, hypoid gear, worm and warm wheel, Differential lock, limited slip differential, double reduction. Numericals

CHASSIS AND BODY:

Types - unitized and separate body and chassis, Advantages, Designs: chassis frame; Chassis side and cross member, sections and joints; Body: requirements, main parts, Material composition, Body shape-aerodynamic design, CD for different types of vehicles; Vehicle component's attachments, Front and Rear wheel drive component locations: advantages and disadvantages; Rear mounted engine and rear wheel drive : advantages; Definitions : wheel base, wheel track, minimum radius, front and rear overhang, ground clearance, grade ability, laden and unladen weight; Car seat and seat belt mounting and adjustment.

TEXT BOOK:

Crouse, W.H, "Automobile Technology", Tata Mc Graw Hill

REFERENCE BOOKS

Sethi, H. M, "Automotive Technology", Tata McGraw Hill, 2003

Gupta R. B, "Automobile Engineering", Dhanpat Rai & Sons, 1998

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)

Heat Transfer

ME 305 E

L	T	P/D	Total	
				Sessional: 50 Marks
				Theory : 100 Marks
3	1	-	4	Total : 150 Marks
				Duration of Exam: 03Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Definition of heat; Modes of Heat Transfer; Basic Laws of heat transfer, Electrical Analogy of heat conduction; Conduction through composite Walls; Overall heat transfer coefficient. The general conduction equation in Cartesian, cylindrical and spherical coordinates Steady one dimensional heat conduction without internal heat generation; The plane slab; The cylindrical shell; The spherical shell; Critical thickness of insulation; Variable thermal conductivity, Steady one dimensional heat conduction with uniform internal heat generation the plane slab; Cylindrical and spherical systems; Fins of uniform cross section; Governing equation; Temperature distribution and heat dissipation rate; Efficiency and effectiveness of fins.

UNIT II

Free and forced convection; Newton's law of cooling, Convective heat transfer Coefficient; Nusselt number; Dimensional analysis of free and forced convection; Analytical solution to forced convection problems; The concept of boundary layer; Hydrodynamic and thermal boundary layer; Momentum and Energy equations for boundary layer; Exact solution for laminar flow over an isothermal plate using similarity transformation; The integral approach; Integral momentum and energy equations; Solution of forced convection over a flat plate using the integral method. Analysis of free convection; governing equations for velocity and temperature fields. Relation between fluid friction and heat transfer, Reynolds analogy Dimensionless numbers; Reynolds, Prandtl Nusselt , Grashoff and Stanton Numbers and their significance, Heat transfer with change of phase; Nusselt theory of laminar film Condensation.

UNIT III

Theories of thermal radiation; Absorption, Reflection and transmission, Monochromatic and total emissive power; Black body concept; Planck's distribution law; Stefan Boltzman law; Wien's displacement law; Lambert's cosine law; Kirchoff's law; Shape factor; Heat transfer between black surfaces.

UNIT IV

Introduction; Classification of heat exchangers; Logarithmic mean temperature Difference; Area calculation for parallel and counterflow heat exchangers; Effectiveness of heat exchangers; N T U method of heat exchanger design; Applications of heat exchangers.

Reference and Text books:

A Text book of Heat Transfer by S.P Sukhatme, university press Heat transfer by Holman, TMG
Heat and Mass transfer by D.S Kumar

B. Tech. (Fifth semester) Mechanical engineering
INDUSTRIAL ENGINEERING
ME 307 E

L	T	P/D	Total	
3	1	–	4	

Theory : 100 Marks
Sessional: 50 marks
Duration of Exam : 03 hours

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction to work study; Method study; Basic procedure; Recording techniques (charts and diagrams); Elemental breakdown; Micro-motion studies; Therbligs; SIMO-chart; Principles of motion economy.

Introduction; Objectives; technique; (time) information recording; methods of timings; Time study allowances; Work sampling technique; Performance rating and its determination PMTS; M. T. M.; Work factor.

UNIT II

Principles of organization, Importance and characteristics of organization, Organization theories; Classical Organization theory; Neo-Classical organization theory, Modern organization theory; Types of organization, Military or line organization, Functional organization, Line and staff organization, Committees.

Objectives of PPC; Functions of PPC; Preplanning and planning; Routing; Estimating; scheduling-master schedule; Daily schedule; Gantt chart; Dispatching – centralized vs. decentralized; Control; Follow up and progress reporting.

Introduction; Product development; Product characteristics; Role of product development; 3Ss – Standardization; Simplification and Specialization.

UNIT III

Introduction, Objectives and importance of sales forecasting, Types of forecasting, Methods of sales forecasting-Collective opinion method, Delphi technique, economic indicator method; Regression analysis, Moving average method, Time series analysis.

Introduction, Functions of inventory; Types of inventory; Control importance and functions, Inventory costs, Factors affecting inventory control, Various inventory control models. A. B. C. analysis, Lead-time calculations.

UNIT IV

Introduction; Objectives; Concept and life cycle of a product and V.E.; Steps in VE., Methodology and techniques, Fast diagram, Matrix method.

Various concepts in industrial engineering

a) WAGES AND INCENTIVES; -Concept; Types; Plans; Desirable characteristics.
b) ERGONOMICS; - its importance; Man-machine work place system;

Human factors considerations in system design.

c) SUPPLY CHAIN MANAGEMENT; - its definition, Concept, Objectives, Applications, benefits, Some successful cases in Indian Industries.
d) JIT; - Its definition, Concept, Importance, Misconception, Relevance, Applications, Elements of JIT (brief description).

e) MRP;-Introduction, Objectives, factors, Guide lines, Techniques Elements of MRP system, Mechanics of MRP, MRP-II

f) TIME MANAGEMENT;-Introduction, Steps of time management, Ways for saving time, Key for time saves.

Reference and Text books:

- Production planning and control by S.Elion
- Modren production Management by S.S Buff
- Industrial engg. and management manufacturing system by Surender kumar, Satya prakashan
- Essence of Supply Chain Management by R.P mohanty and S.G Deshmukh
- Industrial engg. and management by S Sharma and Savita sharama

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)
Machine Design- 1
ME 309 E

L	T	P/D	Total
2	-	5	7

Sessional: 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam: 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Properties: Chemical, Physical, Mechanical and Dimensional; Ferrous metals, Non-ferrous metals, Plastics, Composite materials etc.; Selection of Engineering Materials. Design methodology; Design criterion based on fracture; Deformation and elastic stability design stresses; Factor of safety; Significant stress and significant strength; Stresses-concentration; Causes and mitigation; Endurance limit; Effect of concentration; Notch sensitivity; Size and surface finish; Goodman diagram; Gerber's parabola and Soderberg line.

UNIT II

Supports and retainment of rotating assemblies; manufacturing considerations of design, design of castings and weldments.Riveted joints for boiler shell according to I. B. R.; riveted structural joint; and riveted joint with eccentric loading; Types of welded joints; strength of welds under axial load; Welds under eccentric loading; Designation of various types of bolts and nuts, Design of bolted joints, Bolts of uniform strength, Bolted joints with eccentric loads, Design of Keys, Cotter joint and knuckle joints.

UNIT III

Design of shafts subjected to pure torsion; Pure bending load; Combined bending and torsion; Combined torsion; Bending and axial loads.
Introduction, hand and foot levers, cranked lever, lever for a lever safety valve, Bell crank lever. Miscellaneous levers.

UNIT IV

Types of shaft couplings, Design of sleeve or muff coupling; Flange coupling and bush type flexible couplings.Introduction, Design of circular, oval shaped and square flanged pipe joints. Function, types of power screws, stresses in screws, design calculations.

References and text books:

Design of machine element By Bhandari
Machine design by Malvee and Hartmann, CBS publication Machine design by Sharma and Aggarwal
PSG Design Data Book by PSG College of Engg PSG Publication
Machine Design an integrated Approch Robert l Norton, prentice hall
Fundamental of machine component design R.C Juvinnal, Johan wiley& sons

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)
Automotive Transmissions
MEA 307 E

L	T	P/D	Total
4	1		5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction of transmission system

Need for transmission system. Tractive effort and resistances to Motion of a vehicle. Requirements of transmission system. Classification of Transmission systems. Single, two or four wheel drive systems. Multi axle drives. Chain, Shaft and Electric drives. Location of transmission system. Different transmissions in scooter, car, MUVs and transport vehicles of Indian make.

UNIT II

Gear box

Necessity of gearbox, Overdrive, torque converter: principle and performance curves; Automatic gearbox; synchronizing rings : materials and construction, Continuously variable transmission(CVT), Gear box lubrication, Grade of oil, topping : up procedure, leakage prevention : static and dynamic seals; Final drive :Hotch Kiss and Torque tube.

Determination of gear ratios for vehicles. Performance characteristics in different speeds. Need for double declutching. Power and economy modes in gearbox. Transfer box. Transaxles. Overdrives. Gear shifting mechanisms – mechanical link and wire types

UNIT III

Hydrodynamic drive

Fluid coupling- principle of operation, constructional details. Torque capacity. Performance characteristics, Reduction of drag torque. Torque converter-working, constructional details converter coupling, multistage torque converters and Polyphase torque converters with applications.

Hydrostatic drive

Hydrostatic drive - Various types of hydrostatic systems - Principles of hydrostatic drive system, Advantage and limitations, Comparison of hydrostatic drive with hydrodynamic drive - Construction and working of typical Janny hydrostatic drive.

UNIT IV

Electric drive

Electric drive Principle of early and modified Ward Leonard Control system. Advantage & limitations. Performance characteristics. Study of drive system in an electric and hybrid vehicle.

Automatic transmission applications

Chevrolet "Turboglide" Transmission, Powerglide Transmission Toyota "ECT-i" Automatic

Transmission with Intelligent Electronic controls system, Hydraulic Actuation system.

References:

1. Heldt.P.M., " Torque converters ", Chilton Book Co.
2. Newton and Steeds, " Motor vehicles ", llliffe Publishers.
3. Judge.A.W., " Modern Transmission systems ", Chapman and Hall Ltd.
4. SAE Transactions 900550 & 930910.
5." Hydrostatic transmissions for vehicle applications", I Mech E Conference,1981-88.
6. Crouse. W.H., Anglin., D.L., " Automotive Transmission and Power Trains construction ", McGraw-Hill.
7. Automobile Engineering Vol-1 by Kirpal Singh.

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)
Automotive Transmissions Lab
MEA 313 E

P/D	Total
2	2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration of Exam: 3 Hrs

List of Experiments:-

1. Study of a layout of transmission system for a front wheel drive, rear wheel drive and a four wheel drive arrangement
2. Trouble shooting in different types of friction clutches
3. Study of layout of gears and shafts in a manual type gearbox and a transaxle.
4. Trouble shooting in manual type of gearbox and a transaxle
5. Study of layout in a manual & automatic gearbox for a two wheeler
6. Trouble shooting in gearbox of two wheeler of previous experiment
7. Study of layout of an automatic gearbox.
8. Study of gear shifting controls in an automatic gearbox
9. Trouble shooting in an automatic gearbox
10. Study of performance of an automatic gearbox.
11. Study of a manual and electric Transfer Case.
12. Trouble shooting in Transfer Case of previous experiment.
13. Study of an electric drive in an Electric vehicle

Note: At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

B. Tech. (Fifth Semester) Mechanical Engineering (Auto)
Heat Transfer (Practical)
ME 317 E

L	T	P/D	Total
-	-	2	2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50 Marks
Duration of Exam: 03 Hrs

List of Experiments

1. Determination of thermal conductivity of a metal rod
2. Determination of thermal conductivity of an insulating powder
3. Determination of thermal conductivity of a liquid using Guard plate method
4. Determination of thermal resistance of a composite wall
5. Temperature distribution of a pin fin in free-convection
6. Temperature distribution of a pin fin in forced-convection
7. Forced convection heat transfer from a cylindrical surface
8. Determination of Electiveness of a Heat exchanger
9. Determination of Stefan-Boltzman constant
10. Performance of Solar still
11. Determination of critical heat flux
12. Performance of solar water heater
13. Measurement of solar radiation using solar integrator.

Note: Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.

B. Tech. (Fifth semester) Mechanical engineering (Auto)
Industrial Engineering (Practical)
ME 319 E

L	T	P/D	Total	
-	-	2	2	Theory: 25 Marks Sessional: 25 marks Duration of Exam: 03 hours

List of Experiments

1. To study various Rating Factor systems and find standard time for making small sand mould.
2. To study various plat layouts and suggest improvements in existing Machines Shop layout.
3. To study and draw organizational structure of a nearby industry and suggest changes.
4. To draw X and R charts for a given sample of products to check their acceptance.
5. To draw p chart for a given product lot and verify its acceptance
6. Draw a flow process chart with time estimates for a simple welding process.
7. Draw a two handed process chart for a simple process of a job preparation on a lathe.
8. To study various purchase procedures and draw organizational structure of college purchase department.
9. A case study on ABC/VED analysis.
10. A case study on Quality Improvement Techniques (e.g. Hostel Mess/ Workshop / Canteen etc.)
11. A market survey and analysis.
12. A "preliminary project report" preparation for any small-scale unit.

Note: Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.