NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.) Syllabus for Final Year Automobile Engineering Faculty of Engineering and Technology



Teachers, Paper Setters and Examiners Guidelines Manual SEMESTER – VII and VIII W.E.F 2015 – 2016

North Maharashtra University, Jalgaon Syllabus Structure for Final Year Automobile Engineering w.e.f year 2015-16 Semester –VII

		Т	eachin	ne							
Name of the Course	Group	The	eory	PR	Total	I	Theory	7	PR/OR		Credits
	-	TH	Tut	PR	Total	ISE	ESE	ICA	ESE	Total	
		Hr/W	Hr/W	Hr/W							
Automobile Service & Repair	D	3			3	20	80			100	3
Automobile System Design	D	3			3	20	80			100	3
Interdisciplinary Elective	E	3			3	20	80			100	3
Elective-I	E	3			3	20	80			100	3
Vehicle Testing & Evaluation	D	3			3	20	80			100	3
ASR	D			2	2			25	25 (PR)	50	1
ASD	D			2	2			25	25 (OR)	50	1
Elective-I	E			2	2			25	25 (OR)	50	1
Project-I	D			2	2			25	25 (OR)	50	2
Seminar-II	D			2	2			25		25	2
Industrial Visit	D							25		25	1
Total		15		10	25	100	400	150	100	750	23

ISE: Internal Sessional Examination

ESE: End Semester Examination

ICA: Internal Continuous Assessment

- Interdisciplinary Elective shall be offered by the department to the students of other departments. Students from one department cannot register for Interdisciplinary Elective of the same department.
- At least 15 students should register for offering any elective.

	Interdisciplinary Elective		Elective – I
1	Transport Management and Motor Industry	1	Vehicle Body Engineering
2	Automobile Systems	2	Tribology
		3	Numerical Analysis and Computational Method
		4	Advanced Engine Technology

North Maharashtra University, Jalgaon Syllabus Structure for Final Year Automobile Engineering w.e.f year 2015-16

Semester -VIII

Name of the Course Group		1	`eachin	g Schen	ne	Evaluation Scheme					
		Theory		PR Total		Theory			PR/OR		Credit
		TH	Tut	PR	Total	ISE	ESE	ICA	ESE	Total	S
		Hr/W	Hr/W	Hr/W							
Automobile Dynamics	D	3			3	20	80			100	3
Special Purpose Vehicles	D	3			3	20	80			100	3
Elective-II	E	3			3	20	80			100	3
Elective-III	E	3			3	20	80			100	3
Auto Dynamics	D			2	2			25	25	50	1
SPV	D			2	2			25	25 PR	50	1
Elective-II	E			2	2			25	25	50	1
Industrial Lecture*	С			1*	1			50		50	2
Project-II	D			4	4			75	75	150	6
Total	·	12		11	23	80	320	200	150	750	23

ISE: Internal Sessional Examination

ESE: End Semester Examination

ICA: Internal Continuous Assessment

	Elective-II		Elective – III
1	Computer Aided Design and Computer Aided Manufacturing	1	Computational Fluid Dynamics
2	Analysis and Synthesis of Mechanism	2	Advanced Welding Technology
3	Automobile Painting and Collision Repairs	3	Noise Vibration and Harshness in Automobiles
		4	Automotive Materials

- Minimum 6 lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.
- At least 15 students should register for offering any elective

Automobile Service & Repair

Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr No	UNIT L'Engine Denair & Maintains	Lecture
51. NO	UNIT-I: Engine Repair & Maintains	required
۸	Introduction, Engine removal, Engine head, Removing cylinder head,	2
A	Cleaning & inspection	
В	Refitting the cylinder head. Valve & valve mechanism,	2
С	Piston connecting rod assembly, Cylinder block	1
D	Reinstalling the assembly in the cylinder, Crank shaft & main bearing	2
Е	Engine reassembly, Precautions	2
Guidelines fo	or the examiners and paper setters:	
Questions sh	ould not be asked on introductory part of syllabus.	

Unit-II

Sr. No.	Unit- II: Tuning	Lecture required		
А	Tuning procedure, Crankshaft thumping, Connecting rod noise	2		
В	, Piston noise, Piston pin noise, Valve & tappet noise	1		
С	Abnormal oil consumption, Ignition timing	2		
D	Servicing of propeller shaft & differential assembly	2		
Е	Assembling & dissembling of steering assembly	2		
Guidelines for the examiners and paper setters:				
Questions sh	ould not be asked on introductory part of syllabus.			

Sr. No.	Unit-III: Chassis Drive Line Components Service	Lecture required		
А	Introduction, Suspension systems & springs of rigid & independent types	2		
В	Dissembling of leaf spring, coil spring & its service	2		
С	Dissembling of clutch system (mechanical & hydraulic types) repair, maintenance & trouble shooting	2		
D	Removal of gear-box assembly, Procedure of gearbox dismantling, trouble shooting & refitting.	2		
Guidelines for the examiners and paper setters:				
Questions s	hould not be asked on introductory part of syllabus.			

Sr No	Unit – IV: - Invortors and DWM tochniques	Lecture			
51. 110.	Unit - IV: - Inverters and r www.techniques	required			
а	Brake Testing, Brake Service, Bleeding Of Brakes, Brake Padel Adjustment, Brake Adjustment,	2			
b	Relining Wheel Brake, Reconditioning Master & Wheel Cylinder Fast	2			
	raking By Means Of Accelerated Speed				
C	Servicing Of Parking Brake, Wheel & Tyre Servicing Causes Of Tyre	2			
Ũ	Wear & Its Remedies, Tyre Maintenance	-			
d	Wheel Balance, Static Balancing Of Front Wheel, Dynamic Balancing Of	2			
u	Front & Rear Wheel, Trouble Shooting.	2			
Guidelines for the examiners and paper setters:					
Questions sh	Questions should not be asked on introductory part of syllabus.				

Unit – V

Sr. No	Unit – V:- AC motor drives	Lecture required		
А	Servicing & Its Necessity, Types Of Servicing, Cleaning Of Motor Vehicle & Its Part	2		
В	Steam Cleaning, Engine De-Coking, Precaution To Minimize Carbon	2		
С	Method of De- Carburizing, Greasing Of Motor Vehicle., Garage & Fleet Management	2		
D	Introduction, Specimen Of Job Card, Work Charge, Procedure & Records, Garage, Tools & Equipments	2		
Guidelines for the examiners and paper setters:				
Questions sl	hould not be asked on introductory part of syllabus.			

- 1. Crouse & Anglin "Automotive Mechanics", Tata McGraw Hill Publications.
- 2. Dr.Kirpal Singh "Automobile Engineering" (VOL –I & II), Standard Publishers Distributors
- 3. Dr.V.M.Domkundwar "Automobile Engineering", Dhanpat Rai & Company, Reprint 2014.
- 4. G.B.S Narang "Automobile Engineering", Khanna Publishers.

Automobile System Design

Teachers, Paper setters and Examiners should follow the guidelines as given below. **Unit-I**

Sr. No	UNIT-I: Design of Piston and Connecting Rod	Lecture required				
А	Material Selection, Construction Of Piston, Types Of Piston Manufacturing Process	2				
В	Design Of Piston, Design Of Piston Pin, Design Of Piston Rings	2				
С	Material Selection And Construction Of Connecting Rod,	2				
D	Types Of Connecting Rod, Manufacturing Process	1				
Е	Design Calculation Of Split Type Connecting Rod And Its Drawing	2				
Guidelines for the examiners and paper setters:						
Questions sh	Questions should not be asked on introductory part of syllabus.					

Unit-II

Sr. No.	Unit- II: Design of Crank Shaft and Flywheel	Lecture required		
А	Material Selection, Construction Of Crank Shaft, Types Of Crank Shaft,	2		
В	Manufacturing Process ,Design Calculation And Drawing	2		
С	Material Selection and Construction Of Flywheel	2		
D	Types of Flywheel, Manufacturing Process	1		
Е	Design Calculation And Drawing.	2		
Guidelines for the examiners and paper setters:				
Questions sh	nould not be asked on introductory part of syllabus.			

Sr. No.	Unit-III: Design of Cam Shaft, Valve operating Mechanism	Lecture		
		required		
А	Material Selection & Construction Of Cam Shaft, Types Of Cam Profile,	2		
В	Manufacturing Processes Design For-1. Tangent Cam	2		
С	2.Generated Cam Design Calculation & Drawing	2		
D	Calculation & Drawing Of Valve Operating Mechanism Like Rocker Arm, Valves & Springs.	2		
Guidelines for the examiners and paper setters:				
Questions should not be asked on introductory part of syllabus.				

Sr. No.	Unit – IV: - Design of Drive Line	Lecture
		required
а	Design Of Propeller Shaft & Universal Joint & Material Selection	2
b	Design Of Differential,	2
С	Numerical Problems On Steering Systems	2
d	Design Of Front & Rear Axles.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus.		

Unit – V

Sr. No	Unit – V:- Statistical Consideration in Design	Lecture
		required
А	Statistics Consideration In Design, Statistics In Design	2
В	Design For Natural Tolerance, Statistical Analysis, Mechanical	2
Ъ	Reliability.	2
С	Optimum Design Introduction To Optimum Design To Mechanical	2
	Element, Adequate & Optimum Design	
D	Johnsons Method Of Optimum Design, Simple Problems In Optimum	2
	Design	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus.		

- 1. Joseph E Shigley & Larry D. Mitchell, "Mechanical Engg. Design" (IV Edition), Mc-Graw Hill International Book Company.
- 2. M.F.Spotts & T.E.Shout, "Design of machine element" (7th Edition), Tata Mc Graw Hill, New Delhi.
- 3. V.B.Bhandari, "Design of machine element", Tata Mc Graw Hill, New Delhi.
- 4. R.C.Johnson, "Optimum design of mechanical element", John Willey & Sons.
- 5. J.S.Arora, "Introduction to optimum design", Mc Graw Hill Book Company.
- 6. R.B.Gupta, "Auto Design", Satya prakashan, Delhi.

Automobile Engineering Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr. No	UNIT-I: Basics of Automobile Engineering	Lecture required
А	Introduction, Classification Of Power Developing System, Four Stroke Cycle Engine (Petrol & Diesel), Valve Timing Diagrams.	2
В	Two Strokes Cycle Engine(Petrol & Diesel), Valve Timing Diagrams	2
C	Comparison of Four Stroke & Two Stroke Engine, Comparison Of SI & CI Engine	1
D	Details of Different Engine Components & Their Components	2
E	Air Standard Cycles: Assumptions, Otto Cycle, Diesel Cycle, Dual Combustion Cycle	2
Guidelines for the examiners and paper setters:		
Questions sh	hould not be asked on introductory part of syllabus	

Unit-II

Sr. No.	Unit- II: Fuel Supply System & Ignition System	Lecture required
А	Carburetor:- Introduction, Types Of Carburetor ,	2
В	Different System Of Carburetor, MPFI	1
С	Fuel Supply System For Diesel Engine: - BOSCH Pump, Fuel Injectors	2
D	Electronic Injection System For Diesel Engine.	2
Е	Ignition System:- Introduction, Types Of Ignition System, Advancing System	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit-III:	Lecture required
А	Engine Cooling:- Necessity, Types of Cooling,	2
В	Engine Radiators, Hot & Cold Weather Precautions	2
С	Engine Lubrication System:- Necessity, Properties of Lubricating Oil,	2
D	types of Lubrication System, Oil Filters, Crankcase Ventilation	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit – IV: - Automobile Emissions & Its Control	Lecture required
а	Major Pollutants & Their Emissions Control, Pollutant Formation In SI Engine	2
b	Diesel Engine Combustion & Smoke	2
С	Emission Control System:- Crankcase Emission, Evaporative Emission Control System, EGR	2
d	Catalytic Convertors, Impact Of Green House Effect	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

Unit – V

Sr. No	Unit – V:- Automobile Electrical System	Lecture required
А	Battery Configuration & Operating Principle	2
В	Dynamo & Alternator, Starting Mechanism	2
С	Lighting System	2
D	Other Electrical Equipment:- Warning Devices, Electric Horn, Fuel Indicator, Oil Pressure Indicator, Water Temperature Indicator, Security Alarm Devices	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

- 1. Dr. V. M. Domkundwar," Auto mo bile Engineering" Dhanpat Rai & Company, Reprint 2014.
- 2. Dr.Kirpal Singh "Automobile Engineering" (VOL –I & II), Standard Publishers Distributors
- 3. G.B.S Narang "Automobile Engineering", Khanna Publisher

Transport Management Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr. No	UNIT-I: Motor vehicle Act	Lecture required
	Vehicle Layouts And Specification, Short Titles And Definitions Laws	
А	Governing Use Of Motor Vehicle & Vehicle Licensing Of Drivers And	2
	Conductor,	
P	Registration Of Vehicle, State And Interstate Permits., Taxation	1
D	Structure And Methods Of Laving Taxation	1
C	Insurance Type And Significance., Furnishing Particulars Of Vehicles	2
L	Involved In Accident, Award Of Claim	2
	Tribunal, Duty Of Driver & Conductor In Case Of Accident, Traffic	
D	Rules, Signals And	2
	Liabilities And Preventive Measures, Design Of Road Complex ,	
Е	Responsibility Of Driver, Public Authorities, Offences, Penalties And	
	Procedures. Different Types Of Forms, Government Administration	2
	Structure, Personnel, Authorities And Duties	
Guidelines fo	or the examiners and paper setters:	
Questions sh	nould not be asked on introductory part of syllabus	

Unit-II

Sr. No.	Unit- II: Introduction to Transportation	Lecture required
А	Transport Terminology - Important Terms Used In Road Transport Organization Like HMV, LMV, Fleet, Utilization , Breakdown Rate, Accident Rate, Route, Seat Km Etc.	2
В	Cost Of Services- Capital Cost & Operating Cost, Fixed Cost & Variable Cost, Direct & Indirect Cost, Excess Capacity And Effect On Route	2
С	Operational Productivity And Efficiency, Productivity	1
D	In Road Transportation organization, The Environment Of Road Transport System,	2
Е	Optimizing Fleet And Vehicle Utilization, Conservation Of Fuel And Economy, Control Of Breakdown, Effective Traffic Operation	2
Guidelines fo	or the examiners and paper setters:	
Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit-III: Transport Vehicle Maintenance and Management	Lecture required
А	Infrastructure In Road Transportation Organization, Garages, Essential Requirements Of Garages, Fleet Maintenance Record, Bus Station ,Bus Shelter, Bus Stop, Essential Requirement, Staffing,	2
В	Management Of Transport Organization And Its Of Objectives, Typical Depot Layout	2
С	Structure Of Passages And Goods Transport Organization	2
D	Motor Industry Manufacturing Techniques And Quality Control Of Automobile Components Such As Piston, Cylinder, Valves, Crankshaft,	2

	Camshaft, And Bearing	
Guidelines f	or the examiners and paper setters:	
Questions s	hould not be asked on introductory part of syllabus	

Sr. No.	Unit – IV: - Transportation Policy	Lecture required
а	Significance Of Road Transportations Road Transportation As An Agent Of Change And Development ,National Scene, Transport Policy And Co-Ordination,	2
b	Operating Characteristic S In Transportation Engineering Flexibility ,Speed And Acceleration, Dependability And Safety	2
С	Performance Criteria, Transport Planning, Strategic Planning,	2
d	Management Control, Operational Control Types Of Suspension, Methods	2
Guidelines fo Questions sh	or the examiners and paper setters: would not be asked on introductory part of syllabus	

Unit – V

Sr. No	Unit – V:- Road Safety	Lecture required
А	Road Safety And Health 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.	2
В	Accidents Definition Of Accident, Legal Obligation, Causes Of Accident, Insurance, Documentation, Analysis & Preventions Of Accidents	2
С	Road Safety & Drivers Role, A Defensive Driver, Driver Selection Test, Drivers Training.	2
D	Security Devices Dog Restraint, Rear Fog Lamp, Guard Lamp, Reversing Light, Bonnet, Brakes Locks, Vibrator Alarm, Fog Lamp, Toe Bar, Roof Racks, And Luggage Containers.	2
Guidelines f Ouestions sl	or the examiners and paper setters: hould not be asked on introductory part of syllabus	

- 1. Government Publication, the Motor vehicle Act, 1989.
- 2. Kadiyali. L.R., Traffic engineering and Transport Planning.
- 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

Vehicle Body Engineering Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr. No	UNIT-I: Vehicle Bodies & Materials	Lecture required
А	Classification, nomenclature of car body, different types of car body	2
В	Basic Requirements & Structures Of Different Vehicle Bodies Regulations & Standards	2
С	Constructional Trends & Styling Forms.	1
D	Timber, Reinforced Plastic Molding, Sandwich Construction, Light Alloys, Expanded Metals, Fasteners, Adhesives, Glass, Steel Sheets, Insulating Materials	2
Е	Use Of Aluminum Structure For Bus Body Building.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit-II

Sr. No.	Unit- II: Private Car Body Work	Lecture required
А	Sheet Metal Construction, Body Work Aerodynamics (Drag & Lift, Pitching, Yawing & Rolling)	2
В	Forces & Moments, Sideways Forces, Hull Sealing	1
С	Commercial Vehicle Body Design - Bus & Truck Body Weight Analysis, Pay Load, Methods Employed In Loading & Discharge	2
D	Body Builders Drawing, Body Mounting,	2
Е	Wood Working Joints, Roof Construction Floor Construction	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit-III: Body Mechanism	Lecture required
А	Design Of Windows, Door Construction, Design Of Pluggage Carrier, Design Of Spare Wheel Carrier, Design Of Passenger Seats	2
В	Driver Seats, Comfort Factors, Circle Of Riding Comfort, Effect Of Discomfort, Safety Consideration	2
С	Body Work Drafting :- Full Size Layout On Draft, Proportional Developments,	2
D	Timber Framing For Composite Body Work , Body Draughtsman Curves	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit – IV: - Auto Body Repairs & Testing	Lecture required
а	Broad Review Of Manufacturing Processes & Equipments, Manufacture Of Prototype, Static & Dynamic Testing	2
b	Sources Of Body Noises, Testing & Elimination, Leakage Testing, Testing For Safety & Road Testing	2
С	Sheet Metal Working Tools, Timber Body Repairs, Light Alloy & Steel Body Repair	2
d	Repairs To Reinforced Plastics Body Work, Corrosion Repairs	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit – V

Sr. No	Unit – V:- Painting & Anti-Corrosion Finishes	Lecture required
А	Introduction, Cleaning, Pretreatment, Priming, Finish Coating, Stoving,	2
В	Internal Corrosion & Sealing, Materials Of Construction	2
С	Painting Processes, Protection Of A Finished Cars, Water Leaks, Water Drainage, System	2
D	Windscreens, Apron Panel & Heating/Ventilation, Rear Drip, Tail Gate	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

- 1. G.Y Wong "Theory of Ground Vehicle'; John Willey & Sons.
- 2. Raza N Jazzar, "Vehicle Dynamics"; Springler.
- 3. Hans-Joachim Streitberger "Automobile Paints & Coatings, Wiley _ VCH Verlay GmbH & Co. KGaA
- Hans-B Pacejka, Tyre & Vehicle Dynamics.
 Jason c.Brown, A.John Robertson, "Motor Vehicle Structure "; Butterworth Heinemann.

Tribology Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr. No	UNIT-I: Tribology	Lecture required
А	Introduction, Applications, Tribology In Industry Tribology In Design, Economic Considerations	2
В	Friction: - Introduction, Kinds Of Friction Laws Of Friction, Causes Of Friction	2
С	Friction Measurement, Stick Slip Oscillations & Its Elimination.	1
D	Wear: -Introduction, Types Of Wear, Various Factors Affecting Wear Theory Of Wear,	2
Е	Measurement Of Wear, Wear Between Solids And Flowing Liquids, Theory Of Wear	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit-II

Sr. No.	Unit- II:	Lecture required
А	Lubricants: - Lubricant Properties - Physical And Chemical.	1
В	Lubrication - Introduction, Basic Modes Of Lubrication. Flow Of Viscous Fluid Through Rectangular Slot. Seals-Mechanical And Dynamic Seals	2
С	Hydrostatic Bearings: Basic Concept, Operations, Advantages And Limitations	2
D	Hydrostatic Conical And Spherical Bearings, Load Carrying Capacity And Flow Of Lubricants.	2
Е	. Bearing Power And Film Thickness, Bearing Temperature And Power. Compensators And Their Action. Optimum Design Step Bearing.	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit-III: Hydrodynamic Bearing	Lecture required
А	Theory Of Hydrodynamic Lubrication,	2
В	Mechanism Of Pressure Development In Oil Film	2
С	Two Dimensional Reynolds Equation, Infinite Tapered Shoe Slider Bearings	2
D	Infinite Long Journal Bearing. Short Bearing Theory Applied To Journal Bearing	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

Sr. No.	Unit – IV: - Hydrodynamic Thrust Bearing	Lecture required
а	Introduction, Flat Plate Thrust Bearing, Step Thrust Bearing, Tapered Land Thrust Bearing,	2
b	Tilting Pad Thrust Bearing, Spring Mounted Thrust Bearing, Hydrodynamic Pocket Thrust Bearing	2
С	Friction And Power Losses In Journal Bearings: Ratio Of Heat Conducted,	2
d	Evaluation Of Friction Loss In Concentric & Eccentric Journal Bearing & Quantity Of Oil Flow With Circumferential Groove And Hole.	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

Unit – V

Sr. No	Unit – V:-	Lecture required
А	Hydrostatic Squeeze Film, Circular & Rectangular Plates,	2
В	Impact Conditions Between Lubricated Solids, Applications To Journal Bearing	2
С	Air Lubricated Bearings: -Tilting Pad Bearings, Electromagnetic Bearing, Hydrodynamic Thrust Bearing With Air Lubrications. Lubrication Practice,	2
D	Quality Control & Management -Characteristics Of Lubricating Methods, Lubricating Devices & Systems, Organizing Application Charts	2
Guidelines for the examiners and paper setters: Questions should not be asked on introductory part of syllabus		

- 1. B. C. Majumdar "Introduction Tribology and Bearings", H. Wheeler and Company Pvt. Ltd.
- 2. Cameron A. "Basic Lubrication Theory, Wiley Eastern Ltd.
- 3. Fuller D. D., "Theory and Practice of Lubrication for Engineers". John Wiley and Sons.
- 4. Halling J. "Principles of Tribology", McMillan Press Ltd.
- 5. Hrassan & Powel, "Gas Bearing"..

Numerical Analysis and Computational Methods Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr. No	UNIT-I: Software Development Principles	Lecture required
А	Software Development Principles	1
В	Mathematical Modeling Problem Solving	2
С	Transcendental Equation: Bisection Method, False Position,	2
D	Successive Approximation Method, Newton Rap Son Method,	2
E	Horner's Method, Rate Of Convergence.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit-II

Sr. No.	Unit- II: Integration & Differential Equation	Lecture required	
А	Numerical Integration Methods: Trapezoidal Rule	2	
В	Simpsons 1/3rd Rule, Simpson's 3/8 Rule,	2	
С	Gauss Quadrature Technique	1	
D	Ordinary Differential Equation :Taylor's Series Method, Euler's Method,	2	
E	Improved & Modified Euler's Method, Fourth Order Range - Kutta Method	2	
Guidelines fo	Guidelines for the examiners and paper setters:		
Questions sh	nould not be asked on introductory part of syllabus		

Sr. No.	Unit-III: Interpolation & Curve Fitting	Lecture required
А	Interpolation: - Linear And Quadratic Interpolation, Lagrange's Interpolation, Newton's Forward Interpolation,	2
В	Newton's Backward Interpolation, Newton's Divided Difference Interpolation, Striling Interpolation	2
С	Curve Fitting: - Linear & Quadratic Regression,.	2
D	Logarithmic Curve Fitting, Exponential Curve Fitting	2
Guidelines Questions s	for the examiners and paper setters: hould not be asked on introductory part of syllabus	

Sr. No.	Unit – IV: - Linear Algebraic & Iterative Method	Lecture required
а	Linear Algebraic Equation:- Gauss Elimination Method, Gauss Jordan Method	2
b	LU - Decomposition Method	2
С	Jacobi Iteration Method, Gauss Seidel Interactive Method,	2
d	Cholesky Method, Convergence Analysis, Choice Of Method.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit – V

Sr. No	Unit – V:- Finite Difference Method	Lecture required
А	Finite Difference Method :- Solution Of Ordinary Differential, Solution Of Elliptical Equation For Various Boundary Condition,	2
В	Solution Of Parabolic Equation By Explicit, Implicit And Crank- Nicolson Method	2
С	Finite Element Method :-Finite Element Method Introduction, Comparison With Finite Difference Method,	2
D	General Approach, Interpolation Function, Finite Element Application On One Dimensions.	2
Guidelines f Ouestions sl	or the examiners and paper setters: hould not be asked on introductory part of syllabus	

- 1. Chapra Canale, "Numerical Method for Engineer", McGraw Hill Co.
- 2. Joh. H. Mathews, "Numerical Methods", Pearson Education
- 3. P. Kandaswamy, "Numerical Methods", S. Chand & Co. New Delhi.
- 4. J.N. Reddy, "Finite Element Method", McGraw Hill Co.
- 5. Jain, Jain & Iyangar, "Numerical Method for Scientist & Engineering Computation", New Age Interpolation Pvt., Ltd.
- 6. S.S.Shashri, "Introductory Method of Numerical Analysis", Prentice Hill India.
- 7. Belegundupala, "Introduction to Finite Element Method", Prentice Hill India.
- 8. P.K. Dey, Programming in " C ", Oxford, New Delhi.
- 9. Y. Kanitkar, "Let us C", BPB Publications
- 10. Balgurusamy, "Programming in C", TMH
- 11. Kaye, "An Introduction to Quantum Computing", OUP.
- 12. Reddy, "An Introduction to Nonlinear Finite Element Analysis", Oxford, Delhi

Vehicle Testing & Evaluation Teachers, Paper setters and Examiners should follow the guidelines as given below. Unit-I

Sr. No	UNIT-I: Testing Of Vehicles	Lecture required
А	Scope, Test Procedure, Vehicle Performance Trials,	2
В	Instrumentation Calibration, Performance Evaluation Tests For Maximum Speed	2
С	Brake Tests, Steering Torque Measurement,	2
D	Engine Test,	1
E	Use Of Chassis Dynamometer For Vehicle Test	2
Guidelines fo	or the examiners and paper setters:	
Questions sh	ould not be asked on introductory part of syllabus	

Unit-II

Sr. No.	Unit- II:	Lecture required
А	National Proving Ground, Various Testing Tracks :- High Speed Track, Belgian Pave Track, Corrugated Track,	2
В	Deep Wading Through, Shallow Water Trough, Mud Track,	1
С	Steering Pad, Serpentine Courses, Gradient Track.	2
D	Evaluation & Measurement. :- Evaluation And Measurement Of Various Parameters Speed, Distance And Acceleration, Fuel Consumption,	2
Е	Vibration, Noise And Sound, Radio Interference, Exhaust Emission And Miscellaneous	2
Guidelines fo Questions sh	or the examiners and paper setters: hould not be asked on introductory part of syllabus	

Sr. No.	Unit-III: Component Testing	Lecture required
А	Material Selection & Construction Of Cam Shaft, Types Of Cam Profile, Importance Of Component Testing Methods Of Testing And Correlation To Field Failure, Feedback, Failure Pattern	2
В	Performance Evaluation And Endurance, Testing Of Aggregates Such As – Engine And Its Aggregates / Components. Gear Box	2
С	Clutch, Axles, Shock Absorber, Springs, Rubber Components, Auto Transmission, Various Filters, Head lamps,	2
D	Spark Plug, Tyres, Radiators, Injectors, Pumps, Electrical Item Brakes.	2
Guidelines	for the examiners and paper setters:	
Questions s	hould not be asked on introductory part of syllabus	

Unit – IV		
Sr. No.	Unit – IV: - Vehicle Safety in Design / Manufacture	Lecture required
а	Vehicle Configuration Requirements And Function Safety. Performance And Safety Suspension System, Steering System, Crach Worthiness.	2
b	Morphology Of Vehicles General Layout Of Passenger Cars And Commercial Vehicles.	2
С	Effects Of Shocks And Vibrations On Human Being, Comfort Criteria	2
d	Safety Regulation Of EEC And Central Motor Vehicles Rules	2
Guidelines fo Questions sh	or the examiners and paper setters: hould not be asked on introductory part of syllabus	

Sr. No	Unit – V:- Visibility & Lighting	Lecture required
А	Illumination And Glare Front Rear And Side Visibility, Safety Glasses, Warning And Signaling Devices. Antitheft Devices, Child Protection Devices	2
В	Study Of Various Kinds Of Collisions And Impacts Such As Frontal Side And Rear. Crush Zone, Bumpers, Roll Over.	2
С	Stability & Safety, Seat Belts And Passenger Restraint Systems	2
D	Methods Of Measurement Of CO, HC & (NO) X By Infrared, FID - Flame ionization Detector And Chemiluminescence's Methods	2
Guidelines f Questions sl	or the examiners and paper setters: nould not be asked on introductory part of syllabus	

- 1. Birch, "Automotive Chasis system"
- 2. CIRT & VRDE manuals
- Giles, "Vehicle operation and performance"
 Giles , "Motor Vehicle inspection"

Automobile Service & Repair (Lab Course Contents)

Teacher should facilitate learning following lab experiments:

C NI	Lab Exporimont	Hours
5.IN.		required
1	Dismantle and assemble a four stroke multi cylinder engine.	02
2	Dismantle and assemble a two stroke petrol engine.	02
3	Aclcesmann steering geometry verification	02
4	Brake system trouble shooting (Hydraulic brake, air brake and disc brake).	02
5	Study of servicing procedures of different types of rear axle assembly (Light duty and heavy duty vehicles)	02
6	Tran's axle assembly and servicing	02
7	Servicing of clutches (single plate, multi plate).	02
8	Servicing of constant mesh, sliding mesh and synchromesh gear boxes.	02
9	Study of wheel alignment and balancing.	02
10	Observe and sketch figures of various garage tools used in automobile garage	02

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

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE Practical Examination will comprise of performing the experiment the student may be asked questions on practical. Evaluation will be based on answers given by students in oral examination.

Instructions for Practical Exam:-

- 1. Eight 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.

Automobile System Design (Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S N	Lah Experiment	Hours
5.14.		required
1	It shall consist of two A-2 size sheets based on design of any one system mentioned below: Piston connecting rod assembly, Propeller shaft & Universal joint, Front axle, Rear axle, Cam & valve actuating mechanism.	08
2	Components drawing of the above assembly in A-2 size sheet.	04
3	Three assignment based on curriculum of this course.	06

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on the prescribed certified journal Evaluation will be based on oral examination.

Vehicle Body Engineering (Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S N	I ab Experiment	Hours
5.IN.	Lab Experiment	required
1	Term work shall consist of minimum eight assignments based on above syllabus.	16

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on the prescribed certified journal Evaluation will be based on oral examination.

Tribology (Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	
	•	required
1	Practical on Journal Bearing apparatus	02
2	Practical on Tilting pad thrust bearing apparatus	02
3	Friction in Journal Bearing	02
4	Practical on Brake line friction test rig.	02
5	Practical using Pin on disc test rig.	02
6	03 assignments include in the course based on curriculum of this course.	06

Note: Any 03 experiments should be performing from above list and 03 assignments include in the course based on curriculum of this course.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on the prescribed certified journal Evaluation will be based on oral examination.

Elective-I Numerical Analysis and Computational Methods (Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	Term work shall consist of minimum eight assignments based on curriculum of this course.	16

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on the prescribed certified journal Evaluation will be based on oral examination.

Project-I (Lab Course Contents)

Every student of Final Year shall undertake the Project-I in semester VII. It is expected			
that the broad area of Project-I shall be finalized by the student in the beginning of the			
VII semester and extension of Minor project undertaken may be of Project-I.			
A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same			
project group for Project-II.			
Project-I 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 group is required to maintain log book for documenting various activities			
of Project-I and submit group project-I report in the form of thermal bound.			
The three-member committee appointed by Head of the department shall be			
constituted for finalizing the topics of Project-I. Maximum four Project-I groups shall be			
assigned to one teaching staff.			

Guide lines for ICA: The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in Table-A.

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report.

Assessment of Project-I

Table-A

S N	Name of Stude nt	Problem Identificati on and project objectives	Literatu re Survey	Project Methodology/Design/P CB/ hardware/ simulation/	Progre ss Status	Presentati on	Tota l
		-		programming			
			5	5	5	10	25

	Seminar-I
1	For Seminar-II 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 at the end of
	term.
2	The three-member committee appointed by Head of the department shall be
	constituted for finalizing the topics of Seminar-II. 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 VII
	Semester and shall be approved by the committee.
5	Maximum six seminar supervision shall be allotted to each teacher.
6	Every student should deliver a seminar as scheduled (specified in time table)and
	submit the seminar report (paper bound copy/Thermal bound)in following format:
	a. Size of report shall be of minimum 25 pages.

b. Student should preferably refer minimum five reference books /
magazines/standard research papers.
c. Format of report
i. Introduction.
ii. Literature survey.
iii. Theory 1) Implementation 2) Methodology
3) Application 4) Advantages, Disadvantages.
iv. Future scope.
v. Conclusion.

Guide lines for ICA : ICA shall be based on topic selection , presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done by the guide and a departmental committee jointly, as per the guidelines given in Table- B

	Name of G	uide:						
	Table-B							
SN	Name of	Seminar	Topic	Literature	Report	Depth of	Presen-	Total
	Student	Topic	Selection	survey	writing	under-	tation	
						standing		
			5	5	5	5	5	25

Industrial Visit

1	During B.E. First Term /During vacation after TE. Second Term every student shall visit					
	industry, major power plant arranged by colleges and accompanied by teachers. There					
	shall be at least one teacher for a group of 20 students, lady teachers for girls and at					
	least one non-teaching staff accompanied with the students.					
2	The colleges should obtain appropriate certificates of visit from the concerned					
	organizations just after the visits.					
3	Every Student should submit Industrial Visit report individually at the end of					
	Semester-VII(First Term of Final Year)					
4	The report should contain information about the following points:					
	a. The organization - activities of organization and administrative setup					
	technical personnel and their main duties.					
	b. The project <i>I</i> industry brief description with sketches and salient technical					
	information.					

с.	The work <i>I</i> processes observed with specification of materials, products,
	equipments etc. and role of engineers in that organization.
d.	Suggestions (if any) for improvement in the working of those organizations.
e.	The evaluation of the report of technical visits will be made by panel of
	three teachers appointed by principal based on following points:
	i. Coverage aspect: All above points should be covered.
	ii. Detailed observations: System <i>I</i> Process / Product explained with
	data, diagram specifications.
	iii. Quality of presentation: Report should be very objective and should
	consist of clear and systematic organization of topics and
	information.
	iv. Viva - voce: A viva -voce shall be conducted on the technical visit
	report by the teachers to assess the specific knowledge gained by
	the students for technical applications.

Guide lines for ICA: ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done by departmental committee jointly based on viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

Assessment of Industrial Visit

Table-C

SN	Exam Seat No	Name of Student	Name of Industry	Report writing	Depth of Understanding	Total
				15	10	25

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.) Syllabus for Final Year Automobile Engineering Faculty of Engineering and Technology



Teachers, Paper Setters and Examiners Guidelines Manual SEMESTER –VIII W.E.F 2015 – 2016

Automobile Dynamics (Theory)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I: Performance of Automobile	Lecture required			
А	Power for Propulsion, Traction And Tractive effort,	1			
В	Relation between Engine Revolutions, N and Vehicle Speed, V.	1			
С	Road Performance curves: Acceleration, Gradiability and Drawbar Pull.	1			
D	Calculation of Equivalent Weight, We. Gear Ratio for Maximum Acceleration.	1			
Е	Distribution of Weight, Stability of Vehicle on Slope.	1			
F	Calculation of maximum Acceleration, Maximum Tractive Effort and Reactions for Different Drive.	2			
G	Dynamic of Vehicle Running on a Banked Track.	1			
Н	Stability of Vehicle Taking a Turn.	1			
Theoretical/Numerical question is to be asked on a to h					
Paper Setter should ask theory/ Numerical on a to h .					

Unit-II

Sr. No.	Unit- II: Vehicle Vibration	Lecture required			
А	Some Definitions.	2			
В	Vehicle Vibration and Human Comfort.	2			
С	Vehicle Vibration with Single Degree of Freedom.	2			
D	Vibration with two Degree of Freedom.	3			
Theoretical question (4 or 8 marks only) is to be asked on A to D .					
Numerical sl	Numerical should be asked				

Sr. No.	Unit-III: Frame, Suspension, Springs and Wheel	Lecture required
А	The Frame, Vehicle Dynamics and Suspension Requirement, Suspension System.	2
В	Suspension Control Devices, Suspension Services, Chassis Springs.	2
С	Theory of Chassis Springs, Mechanics of an Independent Suspension System.	1
D	The Roll Axis and the Vehicle Under the Action of Side Forces, The Wheel.	1
E	Tyre, Tyre Construction and Manufacturing.	1
F	Tyre Design Consideration and Features, tyre Operation and Service.	1
Theoretical question (4 or 8 marks only) is to be asked on A to F.		
Numerical s	should be asked	

Sr. No.	Unit – IV: - Handling Characteristic	Lecture required
а	Steering Geometry, Fundamental condition of true rolling	2
b	Ackerman steering gear, Davis steering gear.	3
С	Steady state handling , neutral steering, over steering, over steering	1
d	steady state response, yaw velocity, lateral acceleration, curvature response and directional stability	2
Theoretical question (4 or 8 marks only) is to be asked on A to D also numerical will be based on above topic		

Unit – V

Sr. No	Unit – V:- Braking Performance	Lecture required
А	Braking of vehicle –	1
В	Braking applied to gear wheels front wheels and all four wheels on straight and curved paths	2
С	Mass transfer & its effects, Braking Efficiency, Stopping distance reaction time.	1
D	Brake Locking and antilock devices	1
Е	Calculation of mean lining pressure and heat generation during braking, Braking of vehicle moving in a curved path	3
Theoretical above topic	question (4 or 8 marks only) is to be asked on A to E also numerical will b	e based on

- 1. Wong J. Y, "Theory of Ground Vehicles", John Willey & Sons Inc. 3rd edition.
- 2. Giri N.K., "Problems in Automobile Dynamics"
- 3. Gillespie, "Fundamentals of vehicle dynamics"
- 4. Grover, "Mechanical vibration"
- 5. Eills, "Vehicle dynamics".

Special Purpose Vehicle (Theory)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I: Heavy Machinery	Lecture required
А	Introduction:- General classification & application of earth moving machinery	1
В	earth moving machinery in open cast mining & other places	1
С	Operations involved in such application	1
D	Constructional & working features of different types of earth moving machinery, such as drills, rippers, shovels	2
Е	wheel loaders, lifts, tractors, brake vehicles	1
F	brake vehicles ,Excavators, Dampers, Dozers, Cranes	1
G	Dozers, Cranes ,Crushers, Feeders & compressors	1
Н	Feeders & compressors	1
Theoretical of	question is to be asked on a to h.	

Unit-II

Sr. No.	Unit- II: Automobile System	Lecture required
А	Study of working principles & design considerations of different systems involved like power systems, Transmission	2
В	Final drive, Lubrication, electrical, braking	2
С	steering & pneumatic & hydraulic control circuits	2
D	Study of instrumentation applied to such machines	3
Theoretical	question (4 or 8 marks only) is to be asked on a to d .	

Sr. No.	Unit-III: Intra-plant transporting & Equipment	Lecture required
А	Intra-plant transporting & handling equipment:- Types & principles groups of materials handling equipment	2
В	choice of hoisting equipments surface & overhead equipments	2
С	Components & theory of Hoisting equipments:- Chains & ropes, Pulleys suckcket drums	2
D	load handling attachments, arresting gear & brakes	2
Theoretical	question (4 or 8 marks only) is to be asked on a to d.	

Sr. No.	Unit – IV: Vehicle Drives & Cranes	Lecture required
а	Drives:- Hand drive & operating levers, Power driver	2
b	Hoisting mechanisms traveling gear slowing, jib & lifting gears	2
С	Mobile cranes:- Basic characteristic of truck cranes, stability & design features	2
d	control systems & safety devices	2
Theoretical	question (4 or 8 marks only) is to be asked on a to d .	

Unit – V

Sr. No	Unit – V: Elevators	Lecture required
А	Elevators:- Cage elevators, portable air operated hoist, portable hydraulic jacks	2
В	car lift, stacker, handling & safety	2
С	Battery operated electric vans:- principles of operation	2
D	special features	2
Theoretical question (4 or 8 marks only) is to be asked on a to d .		

- 1. N. Rudenko," Material Handling Equipments", M.R. Publishers
- 2. Truck Cranes", M.R. Publishers
- 3. Sheldon, R. "Shacket, Electric Vehicles", Domus Book, New York
- 4. Y.Fokras & M. Tushnyakov, "Construction Equipments operation & maintenance", (MIR Moscow.)
- 5. A. Astskhov,"Truck cranes ", (MIR)
- 6. E.G. Poninson ,Motor Grader , (MIR)

Computer Aided Design and Computer Aided Manufacturing

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	Introduction To CAD/CAM And Networking	Lecture
		required
Α	Define CAD/CAM, Product Life Cycle & CAD/CAM	1
В	Application of Computers for Design Process, Selection of a CAD	1
	system	
С	Desirable relationship of CAD/CAM database, Benefits & Application	2
	of CAD.	
D	Hardware in CAD, Introduction	1
Е	The Design Work Station, The graphics terminal, Operator	1
	input/output devices,	
F	Computer communication, Principle of networking	1
G	Classification of network, Transmission media & interface, LAN	2
	system.	
Guidel	ines for the examiners and paper setters:	
Questic	ns should not be asked on introductory part of syllabus	

Unit-II

Sr. No	Computer Aided Graphics	Lecture
		required
А	Introduction, Graphic Primitives, Point plotting, Drawing of lines	1
В	Co ordinate system used in graphic element, Transformation in graphics.	1
С	2D transformation, Homogeneous transformation.	2
D	Concatenate co ordinate transformation, Translation, Rotation, Scaling, Mirror, and Reflection.	2
Е	Inverse co ordinate transformation, clipping.	1
F	3D transformation, View Port, Windowing, Standardization in graphics IGES files.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit-III

Sr. No	Computer Aided Modeling & Automation	Lecture
		required
A	Requirement of Geometric Modeling, Geometric Model	1
В	Geometric Model Construction Method: Wire Frame Modeling,	2
	Surface Modeling, Solid Modeling	2
С	Representation of Curve & Surfaces, Design of curve shape, Cubic	2
	Spline, Bezier curve, B-spline curve	2
D	Concept of Automation, Types of Automation	1
Е	Advantages & limitations of Automation, Levels of Automation,	2
	Advanced Automation Function.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit-IV

Sr. No	Computer Aided Manufacturing	Lecture
		required
А	Continuous control system, Discrete control system	1
В	Computer process control, Forms of CPC, Computer process Monitoring	2
C	Direct Digital Control, Numerical Control & Robotics, Programmable logic controller	2
D	Distributed Control & Personnel Computers	1
E	Axis of CNC Machines, Manual Part Programming using G and M codes Adoptable to Fanuc Controller for Lathe.	2
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

Unit-V

Sr. No	Introduction to FMS, GT and Robotics	Lecture
		required
А	Introduction, Components of FMS, Types of FMS	1
В	Application & Benefits, Planning & implementation issue, Typical	2
	FMS layout.	2
С	GT – Part families, Part classification & coding, optic coding system,	2
	Multiclass coding system, Application of GT.	2
D	Robotics – Robot Anatomy, Robot Control System	2
Е	End effectors, Sensors, Industrial Robot, Application and its selection.	1
Guidelines for the examiners and paper setters:		
Questions should not be asked on introductory part of syllabus		

- 1. Ibrahim Zeid and R. Sivasubramanian CAD/CAM Theory and Practice Tata McGraw Hill Publishing Co. 2009
- 2. Ibraim Zeid, "Mastering CAD/CAM" Tata McGraw Hill Publishing Co. 2000
- 3. Chandrupatla T.R. And Belegunda A.D. -Introduction to Finite Elements in Engineering" -Prentice Hall India
- 4. Segerling L.J. Applied Finite Elements Analysis" John Wiley and Sons.
- 5. Rao P.N., Introduction to CAD/CAM Tata McGraw Hill Publishing Co.
- 6. Groover M.P.-Automation, production systems and computer integrated manufacturing" -Prentice Hall of India
- 7. Yoram Koren Robotics McGraw Hill Publishing Co.
- 8. James G. Keramas, Robot Technology Fundamentals, Delmar Publishers.
- 9. S.R.Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill.
- 10. Lakshiminarayana H. V. Finite Element Analysis (Procedures in Engineering), University Press, 2004.
- 11. Chandrupatla T. R., Finite Element Analysis for Engineering and Technology, University Press, 2009.
- 12. Seshu P. Text book of Finite Element Analysis, PHI Learning Private Ltd. New Delhi, 2010.
- 13. P. Radhkrishnan, S. Subramanyam, V. Raju ,"CAD/CAM/CIM" , New Age Publication.
- 14. Mikell P. Grover, Emory W. Zimmers," Computer Aided Design and Manufacturing", P.H.I.
- 15. Zeid,"CAD/CAM",T.M.H.
- 16. B.S.Pabla, M.Adithan,"CNC Machine ", New Age International (P) Ltd.
- 17. Rao, Tiwari, Kundra,"Computer Aided Manufacturing", T.M.H.
- 18. CAD/CAM & AUTOMATION by FarazdakHaidri

Analysis and Synthesis of Mechanism (Elective-II)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I: Kinematics	Lecture required
А	Kinematics element in pair mechanisms with lower & higher pairs.	3
В	Geometry of motion type number of synthesis of mechanisms.	3
С	Chebyshov- polynomials, spacing of accuracy points.	3
Theoretical/Numerical question is to be asked on A to C .		
Paper Setter should ask theory/ Numerical on A to C.		

Unit-II

Sr. No	UNIT-II: Coupler Curve	Lecture required
А	Four bar coupler point curves.	3
В	Equation of coupler curves, Robert Chebyshov theorem.	3
С	Doybke oiubts & symmetry- Euler savary equation & cubic of stationary curvature.	3
Theoretical/ Numerical/ Graphical question is to be asked on A to C .		
Paper Setter should ask theory/ Numerical/ Graphical on A to C.		

Sr. No.	Unit-III: Synthesis of Planner of Mechanisms	Lecture required
А	Geometry method of synthesis of planar mechanisms, two finitely separated link positions.	2
В	Three finitely separate link positions- poles and relative poles.	2
С	Synthesis with three accuracy points, four finitely separated link positions.	2
D	Pole triangle, image poles- opposite poles, quadrilateral circle point and center point curves- synthesis with four accuracy points.	2
Theoretical/ Numerical/ Graphical question is to be asked on A to D .		
Paper Setter should ask theory/ Numerical/ Graphical on A to D .		

Sr. No.	Unit – IV: - Algebra method of synthesis of planar mechanisms	Lecture required
а	Displacement equations of the four bar linkage- with four accuracy points-	2
b	Synthesis with three accuracy points- synthesis with prescribed velocity & acceleration synthesis	3
С	Compatibility synthesis with five accuracy points structural error curve respecting analysis of mechanical error in linkages.	3
Theoretical/Numerical question is to be asked on A to C .		
Paper Setter should ask theory/ Numerical on A to C.		

Unit – V

Sr. No	Unit – V: Spatial Mechanisms	Lecture required
А	Synthesis of spatial linkages.	1
В	Displacement analysis matrix method of analysis function generators for symmetric function.	2
С	Application of spatial mechanisms to robotics.	2
D	Kinematics analysis of as industrial robots manipulators.	2
Е	Gripper theory.	1
Theoretical/Numerical question is to be asked on A to E .		
Paper Setter should ask theory/ Numerical on A to E.		

- 1. Arthur G. Erdman and George. N. Sandor "Mechanisms Design Analysis and Synthesis Vol. I & II", Prentice hall of India.
- 2. J.E.Shigley "Kinematic analysis of Mechanisms", Mc Graw Hill, New York.
- 3. J.E.Shigley and J, J.Vicke Theory of Machines & Mechanisms, International students edition, Mc Graw Hill, New York.

Automobile Painting and Collision Repairs (Theory)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I: Painting techniques	Lecture
	onn ni uning toomiquos	required
А	Painting techniques & Topcoat refinishing, definition & objectives of painting.	1
В	Elements of paint, pigments, resin, solvent, paint drying, paint drying characteristics, drying forms & film mesh works.	2
С	Automobile paints, topcoat paints, special paint, painting method, spraying.	1
D	Immersion, painting new vehicles, body components, new vehicle painting process, global refinish system.	2
Е	HVLP recommendations, sanding recommendations, wet sanding, dustless dry sanding.	1
F	Vehicle protective coating, unpainted surfaces, filling dented or irregular surfaces.	2
Theoretical question is to be asked on A to F .		
Paper Setter should ask theory on A to F .		

Unit-II

Sr. No	UNIT-II: Painting Equipments	Lecture required
А	Refinishing facilities, equipments & tools & repainting process refinish & OE paint.	2
В	Types, individual characteristics, painting & drying facilities, drying equipments.	1
С	Color matching scales, air spray gun, electrostatic painting equipments.	1
D	Accessories, repainting, types of paints & repainting process.	1
E	Spray gun, surface treatment, primer surface & sanding.	1
F	Fundamental of color, match masking, top coat process.	1
G	Whole body & block repainting, spot repainting, waxing, repainting of bumpers.	1
Н	Metallic color appearance charger due to painting conditions.	1
Theoretical question is to be asked on A to H .		
Paper Setter	should ask theory on A to H.	

Sr. No.	Unit-III: Paint Defects & Causes	Lecture required
А	Paint defects, causes & correction.	1
В	Small body paint repair, correction for paint finish defects.	1

С	Defects occurring during painting, seeds fish eyes.	1
D	Orange peels, runs, blushing, shrinkage, bleeding	1
Е	Lin holes, pretty traces, abrasion mane, blisters, peeling.	1
F	Spotting discoloration, chalking, yellowing, nibs, loss of gloss.	1
G	Repairing a hole small dert, cout truck bed.	1
Н	Defects occurring with time, fale (absorption).	1
Theoretical question is to be asked on A to H .		
Paper Setter should ask theory on A to H.		

Sr. No.	Unit – IV: Health Effects & Safety	Lecture required
а	Safety & cleanliness minor body repair, paint & solvent toxicity & its prevention, paint & solvent toxicity.	2
b	Toxicity prevention, five hazards, fire extinguishing, health & safety, organic solvents, heavy metals.	2
С	Acute chronic effects, respiratory sensitization, skin & eye effects, stability of isocyanates.	2
d	Storage, incompatibility, hazardous decomposition, body filters, door dig repairs, scratch repair, drip repair.	2
Theoretical question is to be asked on A to D .		
Paper Setter should ask theory on A to D.		

Unit – V

Sr. No	Unit – V: Paint Selection	Lecture required
А	Paint mixing systems, OEM color selection process.	1
В	Paint codes, tints, mixing, paint mixing.	1
С	Single stage paint, three stage paint, two tone paint.	1
D	Troubleshooting, painting plastic parts.	1
Е	Flexible paint additives, painting new plastic parts.	1
F	Repairing plastic parts, compressed air supply equipments.	1
G	Air & fluid control equipment, hose & connections	1
Н	Air systems maintenance.	1
Theoretical question is to be asked on A to H.		
Paper Setter should ask theory on A to H.		

- Anil Chikara, "Automobile Paint Techniques", (Satya prakashan, New Delhi).
 Micheal Crandell, "Painting For Collision Repair"

Computational Fluid Dynamics (Theory) (Elective-III)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr No	UNIT-I: Introduction	Lecture
51.110		required
А	Conservation Equations	1
р	Derivation of Mass Momentum and Energy equations in differential	1
D	and integral forms	
С	General scalar transport equation	1
D	Application to simple control volumes	2
Е	Mathematical classification of PDEs	1
F	Mathematical classification of elliptical	1
G	Mathematical classification of parabolic	1
Н	Mathematical classification of hyperbolic	1
Theoretical/Numerical question is to be asked on A to H		
Paper Setter should ask theory/ Numerical on A to H.		

Unit-II

Sr. No	UNIT-II: Numerical Methods	Lecture required
А	Overview, Discretization Methods overview FDM, FVM, FVM	3
В	Solution of Discretization equation: Direct Methods, Iterative Methods	3
С	Accuracy, consistency, stability and convergence	3
Theoretical question (4 or 8 marks only) is to be asked on A to D.		
Numerical should be asked		

Sr. No.	Unit-III: Finite Difference Method	Lecture required
А	Taylor Series expansion	1
В	finite approximation of first order derivatives using FDS, BDS, CDS	2
С	Transient conduction, 2D diffusion equation Discretization.	2
D	Boundary conditions: Drichlet, Neumann and mixed.	1
Е	Implicit, Explicit and Crank-Nicholson scheme	2
Theoretical question (4 or 8 marks only) is to be asked on A to E .		
Numerical should be asked		

Sr. No.	Unit – IV: - Solution of linear system of equations	Lecture required
а	Direct and iterative methods	2
b	Jacobi, Gauss-Siedel	2
С	Tri Diagonal Matrix Algorithm	2
d	Alternating Direction Implicit methods	2
Theoretical question (4 or 8 marks only) is to be asked on A to D also numerical will be based on		
above topic		

Unit – V

Sr. No	Unit – V:- Finite Volume Method & Essentials of CFD analysis	Lecture required
А	2D Convection diffusion equation	1
В	Lax-Wendroff and Maccormak methods	1
С	Central and Upwind differencing	1
D	Pressure Correction- SIMPLE algorithm	1
Е	Practical guidelines for CFD simulation processes	1
F	Grid Generation types	1
G	problem setup, types of boundary conditions	1
Н	solution process, post-processing	1
Theoretical question (4 or 8 marks only) is to be asked on A to H also numerical will be based on		
above topic.		

- 1. Suhas V Patankar, "Numerical Heat Transfer and Fluid Flow", Taylor & Francis
- 2. J. D. Anderson, "Computational Fluid Dynamics The Basics With Applications", McGraw Hill
- 3. C T Shaw, "Using Computational Fluid Dynamics"
- 4. H K Versteeg, W Malalasekera ,"An introduction to Computational Fluid Dynamics"
- 5. P S Ghoshdastidar, "Computer simulation of flow and heat transfer"
- 6. Jiyuan Tu, Guan Heng Yeah, C Liu, "Computational Fluid dynamics", Elsevier
- 7. T. J. Chung, "Computational Fluid dynamics", Cambridge University Pres
- 8. Charles Hirsch, "Numerical Computation of Internal and External Flows", Vols. I and II, Wiley
- 9. Sengupta Tapan K., Fundamentals of Computational Fluid Mechanics, University Press, 2005

Advanced Welding Technology (Theory) (Elective-III)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr No	UNIT-I: Wolding	Lecture
51.110	ONT-1. werunig	required
А	Introduction, Arc & Resistance welding, Classification of welding process. Advantages, Disadvantages of welding	2
В	Gas welding – Definitions, Principle, Oxyacetylene welding, Types of welding	1
С	Types of welding flames, Gas welding techniques, Application of gas welding	1
D	Air-acetylene welding, definition, Principle of operation & applications	1
E	Arc welding Process – TIG, MIG	2
F	CO2 welding, carbon Arc welding	1
G	Plasma Arc welding, Arc spot welding	1
Theoretical question is to be asked on A to G .		

Unit-II

Sr. No	UNIT-II: Resistance Welding	Lecture required
А	Definition, Fundamentals of electric resistance welding, variables in resistance welding, Advantages of resistance welding, Disadvantages & Applications	3
В	Spot welding – Introduction, Use, Definition, Procedure, Heat Shrinkage, Heat balance Spot weld able materials	3
С	Spot welding methods, Advantages applications, Seam welding, Definition, Principles of operations, Applications.	3
Theoretical question (4 or 8 marks only) is to be asked on A to C.		

Sr. No.	Unit-III: Radiant Energy Welding Processes	Lecture required
А	Electron beam welding, Introduction, definition, Principle of operation, Application, Advantages & Disadvantages	2
В	Laser Beam Welding – Definition, Principle & Theory of operation, forms of lasers, Applications, Advantages & Disadvantages,	2
С	Under Water welding process – Introduction, Problems encountered in under water welding, Types,	2
D	Characteristics of a good under water welding process, under water welding processes applications	2
Theoretical question (4 or 8 marks only) is to be asked on A to D .		

Sr. No.	Unit – IV: - Weld Ability & Weld Ability Testing	Lecture required
а	Definition & Concept & Weld ability, Effect of alloying elements on weld ability, purpose	2
b	types of weld ability tests, Hot cracking tests, Root cracking tests, Hydrogen induced cracking tests	3
С	Welding of Cast iron, Welding of carbon steels, Welding of tool steels etc	3
Theoretical question (4 or 8 marks only) is to be asked on A to C .		

Unit – V

Sr. No	Unit – V:- Computer Aided Welding Design & Automation	Lecture required
А	Computer Systems for welding engineering introduction, computer systems, software for welding engineers.	2
В	Introduction, Welding analysis, Engineering design V/s welding design solutions to the welding design problems, computer aided welding analysis, Computer aided welding design.	2
С	Welding robots, Introduction, Robotic welding system, Types of welding robots, Design of welding robots.	2
D	Welding Automation – concept, welding operations, welding operations, basic operations, programming operations, control operations, classification of welding automation	2
Theoretical	question (4 or 8 marks only) is to be asked on A to D .	

- O. P. Khanna, :" Welding Technology", Dhanpat Rai Publications
 R. K. Jain ," Production Technology"
 M. Lal ," Fabrication Technology"
 P. N. Rao ," Manufacturing Tech. Vol I & II"
 P.C. Sharma ,:" Production Engineering"

Noise, Vibration & Harshness in Automobile (Elective-III)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Unit-I

Sr. No	UNIT-I: Introduction to NVH & Vibration Analysis	Lecture
A	Noise, Vibration and Harshness (NVH) and its role in automotive design and development	2
В	Physiological effects of noise and vibration, sources of vibration and noise in automobiles	1
С	Basic concepts, mathematical models	1
D	formulating the equations of motion - linear and torsional system	2
Е	characteristics and response – damped and undamped single & two degree of freedom systems under harmonic force	2
F	coordinate coupling, generalized coordinates and modal analysis	1
Theoretical/	Numerical question is to be asked on A to F .	

Unit-II

Sr. No	UNIT-II: Vibration Control Techniques	Lecture required
А	Vibration isolation, tuned absorbers	3
В	untuned viscous dampers, damping treatments, Applications	3
С	isolation of the engine from vehicle structure and control of torsional oscillation amplitudes in engine crankshaft	3
Theoretical question (4 or 8 marks only) is to be asked on A to C.		

Sr. No.	Unit-III: Noise Fundamentals	Lecture required
А	Fundamentals of acoustics – general sound propagation	1
В	structure borne sound & air borne sound, Plane wave propagation - wave equation, specific acoustic impedance, acoustic intensity,	2
С	Spherical wave propagation – acoustic near and far fields, Reference quantities	1
D	The decibel scale, relationship among sound power, sound intensity and sound pressure level, summation of pure tones, Decibel addition, subtraction and averaging	2
E	Effects of reflecting surfaces on sound propagation, octave band analysis	1
F	Anatomy of Human Ear, Mechanism of hearing, loudness, weighting	1

networks, equivalent sound level	
Theoretical/Numerical question (4 or 8 marks only) is to be asked on A to F .	

Sr. No.	Unit – IV: - NVH Measurements	Lecture required
а	Vibration and Noise Standards – Pass/Drive by noise, noise from stationary vehicles	2
b	interior noise in vehicles, NVH measurement tools and techniques	3
С	Modal parameter (natural frequency, mode shape and damping) estimation techniques, signal and system analysis	3
Theoretical/Numerical question (4 or 8 marks only) is to be asked on A to C.		

Unit – V

Sr. No	Unit – V:- Automotive Noise Sources and Control Techniques	Lecture required
А	Methods for control of engine noise	2
В	Transmission Noise, Intake and Exhaust Noise, Aerodynamic Noise, Tyre Noise	2
С	Brake noise. Noise control strategy, noise control at source – along the path – isolation	2
D	damping, balancing, resonators, absorption, barriers and enclosures	2
Theoretical question (4 or 8 marks only) is to be asked on A to D .		

- 1. Bell, L. H. and Bell, D. H., "Industrial Noise Control Fundamentals and Applications", Marcel Dekker Inc, New York, 1994
- 2. Ambekar, A. G., "Mechanical Vibrations and Noise Engineering", Prentice Hall of India, New Delhi, 2006.
- 3. Beranek, L. L. and Ver, I, L., "Noise and Vibration Control Engineering Principles and Application", John Wiley & Sons, Inc, 1992
- 4. Wilson, C. E., "Noise Control Measurement , Analysis, and Control of Sound and Vibration", Harper & Row Publishers, New York, 1989
- 5. Thomson, W. T., "Theory of Vibrations with Applications", CBS Publishers Delhi
- 6. Norton, M.P., "Fundamentals of Noise and Vibration Analysis for Engineers", Cambridge University Press, Cambridge, 2003.
- 7. Irwin, J. D. and Graf, E. R., "Industrial Noise and Vibration Control", Prentice Hall, Englewood Cliffs, New Jersey
- 8. Kewal Pujara "Vibrations and Noise for Engineers, Dhanpat Rai & Sons, 1992
- 9. Moser, M., "Engineering Acoustics An Introduction to Noise Control", Springer, Indian Edition, 2009
- 10. Matthew Harrison, "Vehicle Refinement Controlling Noise and Vibration in Road Vehicle", Butterworth-Heinemann, Indian Edition,2011
- 11. Smith, J. H., "An Introduction to Modern Vehicle Design", Butterworth Heinemarm, 2002

Automotive Materials (Elective-III)

Teachers, Paper setters and Examiners should follow the guidelines as given below.

Sr. No	UNIT-I: Elastic and plastic behavior of materials & Heat treatment and surface treatment	Lecture required
A	Elasticity-forms - Stress and strain relationship in engineering materials - Deformation mechanism -Strengthening material - Strain hardening, alloying, polyphase mixture, martensitic precipitation, dispersion, fibre and texture strengthening - iron carbon diagram	3
В	Strength and stiffness – failure modes – analysis of laminated composites – stress-strain variation in a laminate.	1
С	Heat treatment of steel - Annealing - Types, normalizing, Types, hardening and tempering with specific relevance to automotive components,	2
D	surface hardening techniques, Induction, flame and chemical hardening, coating of wear and corrosion resistance,	1
Е	Electroplating. Phosphating, Anodizing, hot dipping, thermal spraying, hard facing and thin film coatings	2
Theoretical/Numerical question is to be asked on A to E .		

Unit-I

Unit-II

Sr. No	UNIT-II: Selection of materials	Lecture required
А	Criteria of selecting materials for automotive components viz Cylinder block, Cylinder head, Piston, Piston ring,	2
В	Gudgeon pin, Connecting rod, Crank shaft, Crank case, Cam, Cam shaft, Engine valve, Gear wheel, Clutch plate	2
С	Gear wheel, Clutch plate, Axle, Bearings, Chassis, Spring, body panel - Radiator, Brake lining etc.	3
D	Application of non-metallic materials such as composite, ceramic and polymers in automobile	2
Theoretical question (4 or 8 marks only) is to be asked on A to D .		

Sr. No.	Unit-III: Introduction, lamina constitutive equations &	Lecture
	manufacturing	required
А	Definition –Need – General Characteristics, Applications. Fibers, flake and particulate composites – Glass, Carbon, Ceramic and Aramid fibers. Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers and matrices. Lamina Constitutive	3
В	Equations: Lamina Assumptions – Macroscopic Viewpoint. Generalized Hooke"s Law. Reduction to Homogeneous Orthotropic Lamina – Isotropic limit case, Orthotropic Stiffness matrix (Qij), Typical Commercial material properties, Rule of Mixtures. Generally Orthotropic Lamina – Transformation Matrix, Transformed Stiffness.	3

С	Manufacturing: Bag Moulding – Compression Moulding – Pultrusion – Filament Winding	2
Theoretica	1/Numerical question (4 or 8 marks only) is to be asked on A to F	

Sr. No.	Unit – IV: - Manufacturing & testing methods	Lecture required
а	Manufacturing methods: Production of various fibers	1
b	matrix materials and surface treatments – fabrication of composites	1
С	fabrication of thermosetting resin matrix Composites	1
d	fabrication of thermoplastic resin matrix composites – short fiber Composites	1
е	fabrication of metal matrix and ceramic matrix composites	1
f	Testing aspects of composites: Experimental characterization of composites – uniaxial tension, compression and shear tests	1
g	determination of interlaminar fracture toughness damage identification through non-destructive evaluation techniques – ultrasonic, acoustic emission and X-radiography	2
Theoretical/Numerical question (4 or 8 marks only) is to be asked on A to G.		

Unit – V

Sr. No	Unit – V:- Special laminates	Lecture required
А	Symmetric laminates, uni-directional, cross-ply and angle-ply laminates, quasi-isotropic laminates	1
В	Recent trends in composite materials – carbon composites, Bucky Papee	1
С	Application of composite materials in aerospace, automotive, defence and industry	1
D	damping, balancing, resonators, absorption, barriers and enclosures	2
Е	Mechanical behavior of UD composites: Longitudinal strength and stiffness – transverse strength and stiffness	2
F	Failure modes – analysis of laminated composites – stress-strain Variation in a laminate.	1
Theoretical question (4 or 8 marks only) is to be asked on A to F .		

- 1. Khanna.O.P., "Material Science and Metallurgy ", Dhanpat Rai & Sons, 1992
- 2. B. D. Agarwal, L. J. Broutman, Analysis and Performance of Fibre Composites, John Wiley.
- 3. Kapoor, "Material Science and Processes ", New India Publishing House, 1987
- 4. Dieter.G.E. Mechanical Metallurgy, McGraw Hill, New York, 1972.
- 5. Avner.S.H. Introduction to physical metallurgy, McGraw Hill, New York., 1982
- 6. Raghavan.V. Physical Metallurgy, Principle and Practice, Prentice Hall, 1995
- 7. R. F. Gibson, Principle of Composite Material Mechanics, McGraw Hill
- 8. M. M. Schwartz, Composite Materials Handbook, McGraw Hill. Inc
- 9. R. M. Jones, Mechanics of Composite Materials, McGraw Hill. Inc

Automobile Dynamics Lab

Teacher and Examiner should follow the following guidelines.

1. Teacher should facilitate any FIVE of the following lab practice and at least three assignments.

CN		
5.N.	Automobile Dynamics Lab	Lab Hours
		Required
		nequireu
1	Tractive effort measurement.	02
2	Acceleration time test	02
-		
2	Eval concumption test at different speeds	02
3	rue consumption test at uniferent speeds.	02
4	Brake efficiency test.	02
5	Measurements of turning circle radians.	02
0		
6	Numerical Assignment on Unit 1 (Minimum Five Problems)	02
0		02
7	Numerical Assistant on Unit II and III (Minimum Fire Duchlance)	0.2
/	Numerical Assignment on Unit II and III (Minimum Five Problems)	02
-		
8	Numerical Assignment on Unit IV and V (Minimum Five Problems)	02

Note: Lab file should consist of minimum five experiments.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

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

Special Purpose Vehicle Lab

Teacher and Examiner should follow the following guidelines.

1. Teacher should facilitate all FIVE of the following lab practice.

S.N.	Special Purpose Vehicles Lab	Lab Hours Required
1	Study of different types of earth moving machinery	02
2	Study of different types of power system	02
3	Study of different types handling and hoisting equipments	02
4	Study of different types of drives & mobile cranes	02
5	Study of different types of elevators	02

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on the prescribed certified journal Evaluation will be based on oral examination.

Computer Aided Design and Computer Aided Manufacturing (Lab Course Contents)

Teacher should facilitate learning following lab experiments:

S.N.	Lab Experiment	Hours required
1	2D drawing using sketcher- 2 Drawings	02
2	3D modeling using 3D features (Modeling of Screw jack, Brake Pedal, Clutch, Steering linkages, Carburetor, F.I.P., <i>any four components</i>)	02
3	Assembling and drafting (Any 2 above mentioned assemblies) with proper mating conditions and interference checking	02
4	Surface Modeling (Any 2 of the above assemblies). 4 Hrs.	04
5	Manual Part programming on CNC Lathe and CNC Milling to generate tool Path, NC Code and optimization of tool path (to reduce machining time) Using any cam software. 4 Hrs.	04

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on prescribe journal. Evaluation will be based on answers given by students in oral examination.

Analysis and Synthesis of Mechanism Lab

Teacher and Examiner should follow the following guidelines.

7	Teacher should facilitate the following assignments.			
S.N.	Analysis And Synthesis of Mechanism Lab	Lab Hours Required		
1	Assignment on Unit I (Minimum Five Problems)	02		
2	Assignment on Unit II (Minimum Five Problems)	02		
3	Assignment on Unit III (Minimum Five Problems)	02		
4	Assignment on Unit IV (Minimum Five Problems)	02		
5	Assignment on Unit V (Minimum Five Problems)	02		

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on prescribe journal. Evaluation will be based on answers given by students in oral examination.

Automobile Painting & Collision Repair Lab

Teacher and Examiner should follow the following guidelines.

S.N.	Analysis And Synthesis of Mechanism Lab	Lab Hours Required
1	Assignment on Unit I	02
2	Assignment on Unit II	02
3	Assignment on Unit III	02
4	Assignment on Unit IV	02
5	Assignment on Unit V	02
6	Assignment on Unit VI	02
7	Assignment on Unit VII	02
8	Assignment on Unit VIII	02

Teacher should facilitate minimum Eight Assignments based on above syllabus.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:-

In ESE the student may be asked questions on prescribe journal. Evaluation will be based on answers given by students in oral examination.

Industrial Lecture (Course Contents)

1	There is a need to create avenues for a close academia and industry interaction through				
	all the phases of technology development, starting from conceptualization down to				
	commercialization.				
2	Minimum 6 lectures to be delivered by experts from the industry in alternate weeks.				
	Next week group discussion on the lecture delivered.				
3	Student should submit assignment in hard copy on the topic of industry lecture. The				
	number of assignment should be equal to number of industry lecture.				

ASSESSMENT OF Industrial Lecture

Guide lines for ICA: Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in Table- D Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	DeptofUnderstanding(03MarksperLecture)	Report Writing	Total
		25	15	10	50

Project-II (Lab Course Contents)

1	Every student of Final year shall undertake the Project-II in semester VIII.				
2	Each student shall work on an approved project, a group of 05 students (maximum)				
	shall be allotted for the each Project-II as same group for Project-I.				
3	Project-II 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, testing, their result and				
	conclusion.				
4	Each student group is required to maintain log book for documenting various activities				
	of Project-II.and submit group project report at the end of Semester-VIII.				

Guide lines for ICA: ICA shall be based on continuous evaluation of students' performance throughout semester in project-II and report submitted by the students' project group in the form hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-E**.

Guide lines for ESE:-

In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project:	
Name of the Guide: _	
Table-E	

		Assessment by Guide (50 Marks)			Assessment by Committee (25 Marks)			
SN	Name of Student	Attendance , Participati on and team work	Material procureme nt/ assembling /Designing/ Programmi ng	Case study/ Executio n	Projec t Repor t	Dept of Understa nding	Presentati on	Tota l
Mar	ks	10	15	15	10	10	15	75