Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bangalore

	Course Title: **AUTOMOBILE ENGINEERING**		
	Scheme (L:T:P) : **4:0:0**	Total Contact Hours: **52**	Course Code: **15ME63A**
	Type of Course: **Lectures, Self Study & Quiz**	Credit **:04**	Core/ Elective: **Elective**

Prerequisites: Knowledge of Science, Work shop technology, Thermal engineering, Mechanics of Machines, EM & SOM.

Course Objectives:

To understand & apply the knowledge about various system, subsystems & their inter-relationships of the automobile for the manufacturing of advanced automotive techniques

Course Outcomes:

On successful completion of the course, the students will be able to attain CO:

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Know the different types of automobiles, basic structure of automobile and their manufacturers in India. Understand the basic engine system working	***R/U/A***	2	**10**
CO2	Understand the transmission of power in automobile	***R/U/A***	2	**10**
CO3	Familiarise with fuel supply to automobile and understand the cooling system	***R/U/A***	2	**08**
CO4	Explain the steering and braking system employed in automobiles	***R/U/A***	2	**08**
CO5	Explain the different suspension system of an automobile and selection of tyre for an automobile	***R/U/A***	2	**10**
CO6	Explain the Electrical and ignition system employed in Automobile	***R/U/A***	2	**06**
		Total sessions		**52**

Legend: R; Remember, U: Understand A: Application

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
AUTOMOBILE ENGINEERING	0	3	0	0	0	0	0	0	0	0

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.
Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Hour	Questions to be set for SEE/Marks			Marks weightage	weightage (%)
			R	U	A		
1	AUTOMOBILE ENGINE SYSTEM	10	5	15	10	30	20.68
2	TRANSMISSION SYSTEM	10	5	15	10	30	20.68
3	FUEL SYSTEMS & COOLING SYSTEM	08	5	10	-	15	10.34
4	CONTROL SYSTEM	08	5	5	10	20	13.81
5	SUSPENSION SYSTEMS, WHEELS & TYRES	10	5	10	10	30	20.68
6	AUTOMOBILE ELECTRICAL SYSTEMS	06	5	5	10	20	13.81
	Total	52	30	65	50	145	100

Legend: R; Remember, U: Understand A: Application

UNIT I: AUTOMOBILE ENGINE SYSTEM 10 HRS

Automobile-definition, types of auto mobiles-Major components of automobile-functions of automobile components-manufacturer of motor vehicles in India- automotive vehicles and their historical development. Engine -Main parts of engine-Cylinder block- Cylinder head-Piston- Connecting rod- Crank shaft- Crankcase- Cam shaft- Flywheel-Engine maintenance-dis-mounting of engine-Engine disassembly-Inspection of engine components-engine reassembly

UNIT II: TRANSMISSION SYSTEM 10 HRS

Clutch- Main parts-types of clutch- construction & working of Single plate clutch - diaphragm spring type clutch-Gear Box- Types of Gear box-construction & working of Sliding mesh Gear box-synchromesh Gear box-Constant mesh Gear box, Transmission devices- Torque converter, Overdrive, Final drive- Propeller shaft, Universal Joint - Differential-necessity-construction & working- Axle- Types of rear axle, front axle & their applications- Automatic Transmission System.

UNIT III: FUEL SYSTEMS & COOLING SYSTEM 08 HRS

Fuel supply system for petrol engine- Carburettor-Simple carburettor- fuel pump- AC Mechanical pump-SU Electrical pump- DTSI (Digital Twin Spark Ignition System)

Fuel injection for diesel engine-Fuel injection pump- - microprocessor based fuel injection system- CRDI (Common Rail Direct Injection) System.

Engine lubrication systems- High pressure Lubrication system- Petroil System

Engine cooling system -The necessity of cooling system - Types of cooling system-air cooling and water cooling. Types of water cooling system –Thermosyphon system and pump circulation system. Advantages and disadvantages of air cooling and water cooling systems. The components of water cooling system

UNIT IV: CONTROL SYSTEM 08 HRS

Steering system- Functions & Requirement of steering system. Construction and working of steering linkage. Steering gear box –Rack & Pinion Steering mechanism-Power steering - steering geometry- camber, caster, toe-in, toe-out, Kingpin inclination & their effects. Brake system- Types of brakes- Internal expanding brake - Disc brake- Hydraulic Brake.- Anti-lock braking system(ABS)

UNIT V: SUSPENSION SYSTEMS, WHEELS & TYRES. 10 HRS

Suspension system-Need for good suspension system-elements of suspension system-Leaf Springs-Helical Springs - Construction & working of McPherson & wishbone type –Air Suspension System- Construction & working of Telescopic shock absorbers-Types of Automobile wheels, their construction & working- essential requirements of wheels - Construction, working & comparison of radial, cross-ply and tubed, tubeless tyre -Tyre specifications-Factors affecting tyre life-Wheel Alignment and Balancing

UNIT VI: AUTOMOBILE ELECTRICAL SYSTEMS 06 HRS

Auto electric system-main components of auto electric system-Ignition system- construction & working of electronic ignition system-Battery ignition system- Magneto ignition system, Starting system- Charging system.

Lighting system - Power door locks features- Smart Wiper Control System - Air bags features used in automobiles.

TEXT BOOKS

Sl.No.	Title of Books	Author	Publication
1.	Automobile Engineering	Kirpal Singh	Standard Publication
2.	Automobile Engineering. (Developed at NITTTR,Bhopal)	K.K.jain R.B.Asthana	Mcgraw Hill
3.	Automobile Engineering	R.B.Guptha	-
4	Automobile Mechanics	William Crouse	Tata Mcgraw hill
5	Automotive Mechanics	Joseph Hitner	
6	Automobile Engineering	G.S.Narang	Khanna publishers

1. , LIST OF SOFTWARES/ LEARNING WEBSITES:

i. http://nptel.ac.in/courses/112105051/

ii download other power plant related videos from youtube.com for study purpose.

SPECIAL INSTRUCTIONAL STRATEGIES

UNIT NO	UNIT NAME	STARATEGIES
1	AUTOMOBILE ENGINE SYSTEM	lectures and Power point presentations/ Video/ Video movies
2	TRANSMISSION SYSTEM	Lectures/Presentations, Showing charts, Industrial visits to Automobile work shops
3	FUEL SYSTEMS & COOLING SYSTEM	Lectures/Presentations, Showing charts, Industrial visits to Automobile work shops
4	CONTROL SYSTEM	Lectures/Presentations, Showing charts, Industrial visits to Automobile work shops
5	SUSPENSION SYSTEMS, WHEELS & TYRES	Lectures/Presentations, Showing chart,
6	AUTOMOBILE ELECTRICAL SYSTEMS	Lectures/Presentations, Showing charts, Industrial visits to Automobile work shops

SUGGESTED LIST OF STUDENT ACTIVITYS

Note: the following activities or similar activities for assessing CIE (IA) for 5 marks (Any one)

- Each student should do any one of the following type activity or similar activity related to the course and before take up, get it approved from concerned Teacher and HOD.
- Each student should conduct different activity and no repeating should occur

1	Prepare list of various major automobile manufacturers of Two wheeler sand fourwheelers in India, along with their specification
2	Prepare report on Top 10 Car/MUV/2W/Heavy vehicle Manufacturers in India & their sale in last 2 Years.
3	Collect the detail specification on Top 5 models of Car Manufactured in India
4	Download technical specifications/ catalogues, videos or any other suitable presentations on Automobile engines used in four wheelers
5	Download technical specifications/ catalogues, videos or any other suitable presentations on Automobile tyres/Power steering/Suspension system
6	Visit to four- wheeler service station & any automobile manufacturing unit. Prepare hand written report on aspects they observed in service station

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE	IA	Students	Three IA tests(Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Student activities	05	Activity sheets	1,2,3,4,5,6
	SEE	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4,5,6
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5,6 Effectiveness of Delivery of instructions & Assessment Methods

CIE- Continuous Internal Evaluation SEE- Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Average marks of three tests shall be rounded off to the next higher digit.

Note to IA verifier*: *The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks and should be assessed on RUBRICS
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Methods.

- **MODEL OF RUBRICS /CRITERIA FOR ASSESSING STUDENT ACTIVITY**

RUBRICS MODEL

RUBRICS FOR ACTIVITY(5 Marks)						
Dimension	**Unsatisfactory**	**Developing**	**Satisfactory**	**Good**	**Exemplary**	**Student Score**
	1	**2**	**3**	**4**	**5**	
Collection of data	Does not collect any information relating to the topic	Collects very limited information; some relate to the topic	Collect much information; but very limited relate to the topic	Collects some basic information; most refer to the topic	Collects a great deal of information; all refer to the topic	Ex: 4
Fulfill team's roles & duties	Does not perform any duties assigned to the team role	Performs very little duties but unreliable.	Performs very little duties	Performs nearly all duties	Performs all duties of assigned team roles	5
Shares work equally	Always relies on others to do the work	Rarely does the assigned work; often needs reminding	Usually does the assigned work; rarely needs reminding	Normally does the assigned work	Always does the assigned work without having to be reminded.	3
Listen to other Team mates	Is always talking; never allows anyone else to speak	Usually does most of the talking; rarely allows others to speak	Talks good; but never show interest in listening others	Listens, but sometimes talk too much	Listens and speaks a fair amount	2
Average / Total marks=(4+5+3+2)/4=14/4=3.5=4						

Note: This is only an example. Appropriate rubrics/criteria may be devised by the concerned faculty (Course Coordinator) for assessing the given activity.

Note to IA verifier*: *The following documents to be verified by CIE verifier at the end of semester

1. Blue books (20 marks)
2. Student suggested activities report for 5 marks
3. Student feedback on course regarding Effectiveness of Delivery of instructions & Assessment Method

MODEL QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th week of sem 10-11 Am	VI SEM	AUTOMOBILE ENGG	20
	Year: 2016-17	Course code:**15ME63A**	

Name of Course coordinator : Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	MARKS	CL	CO	PO
1	a. Name the manufacturers of motor vehicles in India. b. List the functions of piston rings	**5**	**R**	**1**	2
2	Explain with sketch compression ring and oil control rings	**5**	**U**	**1**	2
3	Explain the Automatic Transmission System	**5**	**U**	**2**	2
4	Identify the role of Automatic Transmission system in automobile industry.	**5**	**A**	**2**	2

MODEL QUESTION PAPER

VI- Semester Diploma Examination

Course Title: **AUTOMOBILE ENGG**

Time: **3 Hours**] [Max Marks**: 100**

Note: Answer any **SIX from Part A** and any **SEVEN from Part B**

PART-A

6x5=30 marks

1. Define piston and List its functions
2. Explain the construction and functions of cylinder block
3. Compare between live axle and dead axle
4. Explain torque convertor with a neat sketch
5. Compare between water cooling and air cooling system
6. What are the requirements of steering mechanism
7. List the factors affecting the tyre life.
8. List the types of lights used in automobiles.
9. Explain the working of Battery ignition system with a neat sketch.

PART-B

7x10=70 marks

1. a) List the functions of cylinder head gasket.
   b) Explain the construction and working of piston
2. Select the different steps for dismounting of the engine.
3. a) Explain front axle and mention its applications
   b) Explain the Automatic Transmission System
4. Explain synchromesh Gear box with a neat sketch
5. a) Explain with sketch the construction and working principle of simple carburettor
   b) Explain CRDI System
6. Identify the necessity of the steering geometry with diagrams
7. a) Explain telescopic shock absorbers with a neat sketch
   b) Explain the elements of suspension system
8. Identify the importance of wheel alignment and balancing in a vehicle
9. Develop a Block diagram of Auto electrical system and explain.
10. Explain the working of SU Electrical pump with a neat sketch

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MODEL QUESTION BANK

Diploma in Mechanical Engineering
VI Semester
Course title: AUTOMOBILE ENGG

Note: ***The paper setter is of liberty to set the questions on his/her desecration based on cognitive levels notified for that unit. They have to follow only blue print of SEE question paper format. The model question bank is only for reference to students/course coordinator to initiate the process of teaching-learning only.***

CO1: know the different types of automobiles, basic structure of automobile and their manufacturers in india. Understand the basic engine system working

REMEMBERING

1. List the types of automobiles.
2. Name the manufacturers of motor vehicles in India.
3. List the main components of an engine
4. What is the importance of cylinder liners in an engine.
5. Name the different types of gaskets used in automobile engines
6. Define piston and mention its functions
7. List the functions of piston rings
8. What is the purpose of camshaft in an engine.
9. What is the importance of flywheel in an engine.
10. List the steps to be followed for engine disassembly
11. List the causes for reboring a cylinder.

UNDERSTANDING

1. Explain the automotive vehicles and their historical development.
2. Explain the construction and functions of cylinder block.
3. Explain the dry liners with sketch.
4. Explain with the wet liners sketch.
5. Compare between dry liners and wet liners.
6. Explain crankcase with a neat sketch.
7. Explain with sketch the cylinder head.
8. Explain the functions of cylinder head gasket.
9. Explain the construction and working of piston
10. Explain with sketch compression ring and oil control rings
11. Explain with sketch connecting rod
12. Explain the functions of a crank shaft with a neat sketch
13. Explain engine maintenance.

APPLICATION

1. Identify the main components used in an automobile.
2. Identify the functions of major components used in automobile engine.

3. Select the different steps for safe dismounting of the engine.

CO2 : Understand the transmission of power in automobile

REMEMBERING

1. What is the purpose of Clutch.
2. List the types of Clutches.
3. List the different types of gear boxes.
4. List the functions of Clutches
5. What is overdrive unit.
6. List the advantages of overdrive unit.

UNDERSTANDING

1. Explain the working of single plate clutch with a neat sketch.
2. Explain the diaphragm spring type clutch with a neat sketch.
3. Explain the working of Sliding mesh Gear box with a neat sketch
4. Explain the working of synchromesh Gear box with a neat sketch
5. Explain torque convertor with a neat sketch.
6. Explain final drive with its purpose.
7. Explain universal joints with its purpose
8. Explain Propeller shaft with its necessity.
9. Explain differential with a neat sketch.
10. Explain front axle and mention its applications
11. Explain the Automatic Transmission System.
12. Compare between live axle and dead axle.
13. Explain different types of rear axle with sketches.

APPLICATION

1. Identify the importance of spring type clutch with a neat sketch.
2. Identify the role of synchromesh Gear box to control speed with a neat sketch.
3. Identify the role of Automatic Transmission system in automobile industry.
4. Identify the necessity of overdrive unit in transmission system.

CO3: Familiarise with fuel supply to automobile and understand the cooling system

REMEMBERING

1. List the properties of air-fuel mixture
2. Define engine lubrication system and list its types.
3. Define engine cooling system and list its types.
4. List the parts of cooling system.
5. List the properties of Lubricating oil.

UNDERSTANDING

1. Explain Fuel system for petrol engine with block diagram (Layout).
2. Explain the working of AC Mechanical pump with a neat sketch.
3. Explain the working of SU Electrical pump with a neat sketch.
4. Explain with sketch the construction and working principle of simple carburettor.
5. Explain Fuel system for petrol engine with block diagram (Layout).
6. Explain fuel injection pump for diesel engine with sketch.
7. Explain DTSI System.
8. Explain CRDI System.
9. Explain water cooling system with sketch.
10. Explain air cooling system with sketch.
11. Compare between water cooling and air cooling system.

APPLICATION

1. Identify the importance of microprocessor based fuel injection system.
2. Develop a line diagram for fuel supply system for petrol engine.

CO4: Explain the steering and braking system employed in automobiles

REMEMBERING

1. List the functions of steering mechanism.
2. What are the requirements of steering mechanism.
3. Define a)Camber, b)Caster, c)Toe-in, d)Toe-out, e)Kingpin inclination
4. List the types of brakes.

UNDERSTANDING

1. Explain Construction and working of steering linkage with a neat sketch.
2. Explain Construction and working of steering gear box with a neat sketch.
3. Explain Construction and working of rack and pinion Steering mechanism with a neat sketch
4. Explain Construction and working of Power Steering mechanism with a neat sketch
5. Explain Construction and working of Drum brake with a neat sketch
6. Explain Construction and working of internal expanding brake with a neat sketch
7. Explain Construction and working of disc brake with a neat sketch
8. Explain Construction and working of Hydraulic Brake with a neat sketch
9. Explain Anti-lock braking system.
10. Compare Disc brake & drum brake.

APPLICATION

1. Identify the necessity of the steering geometry with diagrams.
2. Identify the role of steering linkage in steering mechanism.

CO5: Explain the different suspension system of an automobile and selection of tyre for an automobile

REMEMBERING

1. List the elements of suspension system.
2. List the types of Automobile wheels.
3. List the essential requirements of wheels.
4. List the factors affecting the tyre life.

UNDERSTANDING

1. Explain the elements of suspension system.
2. Explain leaf spring with a neat sketch.
3. Explain Coil spring with a neat sketch.
4. Explain telescopic shock absorbers with a neat sketch
5. Explain pressed steel disc wheels
6. Explain telescopic Wire spoke wheels.
7. Explain telescopic Cast light alloy wheels.
8. Explain radial tyre.
9. Explain cross-ply tyre.
10. Explain tubed tyres.
11. Explain tubeless tyres.

APPLICATION

1. Identify the importance of a suspension system in a vehicle.
2. Making use of a sketch explain McPherson suspension system.
3. Making use of a sketch explain wishbone suspension system.
4. Identify the importance of wheel alignment and balancing in a vehicle.

CO6: Explain the electrical and ignition system employed in automobile

REMEMBERING

1. List the main components of Auto electrical system.
2. List the types of lights used in automobiles.

UNDERSTANDING

1. Explain the working of electronic ignition system with a neat sketch.
2. Explain the working of Battery ignition system with a neat sketch
3. Explain the working of Magneto ignition system with a neat sketch
4. Explain Starting system.
5. Explain Charging system.
6. Explain Power door locks features used in automobile system.
7. Explain Smart Wiper Control System used in automobile system
8. Explain Air bags features used in automobiles.

APPLICATION

1. Develop a Block diagram of Auto electrical system and explain.
2. Identify the importance of air bags in an automobile.