	Course Title: **AUTOMOBILE ENGINEERING-1**	Course Code:15AT11T
	Credits (L:T:P) : **4:0:0**	Core/ Elective: **Core**
	Type of course: **Lectures**	Total Contact Hours: **52**
25 Marks		**100 Marks**

Prerequisites: Basic knowledge of Physics principles and English.

Course Objectives:

The course should enable the students to:

1. Explain the history and evolution of automobiles and automobile industry.
2. Identify various systems and their components of Automobile.
3. Understand the engine principles and fundamentals
4. Understand the engine constructional details and materials.
5. Compare different types of engines.

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

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Explain history and evolution of Automobile and list various Automobile manufacturing concerns.	***R***	1,2,10	06
CO2	Classify automobiles, Identify, locate and state the functions of various components of Automobile.	***R/U/A***	1,2,3,10	**06**
CO3	Understand various terms in describing engine and working principles of different engines.	***R/U/A***	1,2,3,10	**12**
CO4	Describe the constructional details of engine stationary parts, piston and connecting rod.	***U/A***	1,2,3,10	**14**
C05	Describe the constructional details of flywheel, damper and cam shaft drives.	***R/U/A***	1,2,3,10	**07**
C06	Describe the constructional details of valve, valve operating mechanism and mufflers.	U/A	1,2,3,10	07
		Total sessions		**52**

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Automobile Engineering-1	**3**	**3**	**3**	**---**	**---**	**---**	**--**	**----**	**---**	**3**

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 (5marks) PART - A			Marks weightage (%)
			R	U	A	
I	History of Automobile	**06**	**15**			**11.5**
II	General Structure of Automobile.	**06**	**5**	**10**		**11.5**
III	Hear Engines.	**12**	**10**	**25**	**5**	**23.1**
IV	Engine Construction Details- I	**14**		**30**	**5**	**27**
V	Engine construction Details- II	**07**	**5**	**10**	**5**	**13.4**
VI	Engine Constructional Details-III	**07**		**15**	**5**	**13.4**
	Total	**52**	**145 MARKS**			**100**

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

Course contents:

UNIT- 1: HISTORY OF AUTOMOBILE 06 Hrs

Automobile-Definition - history and development in abroad and in India before & after independence-different Indian and foreign Automobile manufacturing concerns of two wheeler, three wheeler, LMV and HTV – their products and plants location.

UNIT-2: GENERAL STRUCTURE OF AUTOMOBILE 06 Hrs

classification of Automobile, Major systems of an Automobile - their functions, Chassis – definition, chassis layout of two, three &four wheeler with major components - their functions , engine mounts – need – types, definition of : wheel base - wheel track - overall length - front overhung - rear overhung - height of CG point - ground clearance - gross weight and kerb weight.

UNIT-3: HEAT ENGINES 12 Hrs

Heat engines - Definition - types - comparison of IC and EC engines, engine terminology-bore – stroke – TDC – BDC – clearance volume - swept volume - total volume - compression ratio - mean effective pressure – indicated power – brake power - friction power - engine speed engine torque, classification of IC engines with respect to different parameters, Two stroke & four stroke SI engines-construction– working, Two stroke & Four stroke CI engines - construction – working,-comparison of SI and CI engines- comparison of Two stroke and Four stroke engines.

UNIT-4: ENGINE CONSTRUCTION DETAILS - I 14 Hrs

Cylinder block – types - Constructional details - materials used , Cylinder head -constructional details - materials used, crank case, oil pan , cylinder liners – types – construction - merits and demerits ,Gasket - purpose- types , Piston - functions - requirements - constructional details - materials used ,piston clearance – importance , Expansion control methods in pistons - heat dam – slots – bimetal - cam ground - taper piston - offset piston- special alloy, Piston rings – functions - types - constructional details – materials, Piston pin -construction – materials, Connecting rod and crank shaft– functions – types – construction - materials, Different methods of connecting piston with connecting rod – Explain each method.

UNIT-5 ENGINE CONSTRUCTIONAL DETAILS - II 07 Hrs

Meaning and need of firing order, firing order of three, four and six cylinder engines-functions, construction and materials for flywheel- need, types and constructional details of vibration damper-functions, construction and materials for cam shaft, different types of camshaft drives.

UNIT-6: ENGINE CONSTUCTIONAL DETAILS - III 07 Hrs

Construction and materials for poppet valve, valve seat and valve guide- overhead valve operating mechanism, over head camshaft valve mechanism- meaning and importance of valve clearance- construction of inlet and exhaust manifold- purpose of mufflers - constructional details of absorber type, baffle plate type, wave cancellation type and resonance type mufflers.

Course Delivery:

The course will be delivered through lectures and Power point presentations/ Video

Resources:

Reference books:

Slno	Title of the book	Authors name	Publishers name
1	Automobile Engineering vol-2	Kripal Singh	Standard publications
2	Automobile Engineering	R B Gupta	Satya Prakashan
3	Automotive Engines	S Srinivasan	Tata McGraw-Hill
4	Automotive Technology	H M Sethi	Tata McGraw-Hill
5	Automotive Mechanics	Crouse and Anglin	Tata McGraw-Hill
6	Automotive Engineering vol-2	Anil Chikara	Satya Prakashan
7	The Automobile	Harbans singh rayat	S Chand
8	Automobile Engineering	Er.A.K.Babu, Er Ajit Pal Singh	S Chand
9	Automobile Engineering	Er S.K.Gupta	S.Chand

Websites:

1. How stuff works.com.
2. http://en.wikipedia.org/wiki/Car
3. http://en.wikipedia.org/wiki/History_of_the_automobile
4. http://www.history.com/topics/automobiles.
5. http://en.wikipedia.org/wiki/History_of_the_automobile.
6. https://www.youtube.com/watch?v=fTAUq6G9apg.
7. https://www.youtube.com/watch?v=rWmR9UIz5iA.
8. https://www.youtube.com/watch?v=nAKTVBRNsmI.
9. https://www.youtube.com/watch?v=hV3LImCslpo.
10. https://www.youtube.com/watch?v=PYje-4D76kc.

SUGGESTED LIST OF STUDENT ACTIVITYS

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

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

1	Visit nearby garage/service station and collect information on specification of different automobiles.
2	Visit nearby garage/service station and collect information on specification of different automobile engines
3	Visit nearby garage/service station and collect information on different automobile engine components with photographs and list of materials.

MODEL OF RUBRICS FOR ASSESSING STUDENT ACTIVITY:

Note: The dimensions given in below table are only representatives; Lecturers should design/decide the Dimensions and scales based on type of activity given.

Dimension	Scale					Students Score				
	Unsatisfactory 1marks	Developing 2marks	Satisfactory 3marks	Good 4marks	Exemplary 4marks	1	2	3	4	5
1. Research and gather information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	2				
2.Full fills teams roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	3				
3.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	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	4				
4. listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	5				
					Grand Average/Total	(2+3+4+5)/4=14/4=3.5=4	4				

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment method	CIE*	IA	Students	Three IA tests (Average of three tests to be computed)	**20**	Blue books, Assignment books/sheets /charts /models	1,2,3,4,5,6
				Assignment	**05**		1,2,3,4,5,6
				Total	**25**		
	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.

FORMAT OF I A TEST QUESTION PAPER (CIE)

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th weak of sem 10-11 Am	I/II SEM		20
	Year:		
Name of Course coordinator : CO's:____			Units:__

Question no	Question	MARKS	CL	CO	PO
1					
2					
3					
4					

Note: Internal choice may be given in each CO at the same cognitive level (CL).

MODEL QUESTION PAPER (CIE)

Note: The lecturers have to fallow the question paper blue print given in above table to design CIE question papers also.

Test/Date and Time	Semester/year	Course/Course Code	Max Marks
Ex: I test/6 th week of sem 10-11 Am	I semester	Automobile Engineering	20
	Year: 2015-16	Course code:15AT11T	
Name of Course coordinator :			Units:1,2 Co: 1,2

Note: Answer all questions

Question no	Question	CL	CO	PO
1	List five inventors name related to Automobiles with their invention name, time and country of origin. 5marks	R	1	1,2,10
2	List any five two wheeler manufactures with their location and products. 5Marks or List different types of automobiles based on body style and applications. 5marks	U	1	1,2,10
3	Draw the layout of two-wheeler and label the parts. 10marks or Draw the layout of three-wheeler and label the parts. 10marks	U	2	1,2,3,10

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

MODEL QUESTION BANK

CO1: Explain history and evolution of Automobile and list various Automobile manufacturing concerns.

FIVE MARKS QUESTIONS

1. List five inventors name, time line, invention, who contributed for development of Automobile. (R)
2. Briefly explain the development of Automobile industry in India before independence. (R)
3. Briefly explain the development of Automobile industry in India after independence. (R)
4. List any five Indian two wheeler manufactures with their location and model names. (R)
5. List any five foreign two wheeler manufactures with their country of origin and model names. (R)
6. List any five Indian four wheeler manufactures with their location and model names. (R)
7. List any five foreign four wheeler manufactures with their country of origin and model names. (R)

TEN MARKS QUESTIONS

1. Briefly explain the development of automobile industry abroad. (R)
2. Briefly explain the development of automobile industry in India before and after independence. (R)

CO2: Classify automobiles, Identify, locate and state the functions of various components of Automobile.

FIVE MARKS QUESTIONS

1. Draw the layout of two-wheeler and label the parts. (R/U)
2. Draw the layout of three-wheeler and label the parts. (R/U)
3. Draw the layout of four-wheeler and label the parts. (R/U)
4. State the functions of engine mounts and list types of engine mounts. (A)
5. State the definitions of wheel base, wheel track, ground clearance and overall length. (U)
6. Compare kerb weight with gross weight. (A)

TEN MARKS QUESTIONS

1. Classify Automobiles in detail.(A)
2. Draw the layout of three-wheeler and explain the functions of different systems.(U)
3. Draw the layout of four-wheeler and explain the functions of different systems.(U)

CO3: Classify automobile engines and understand various terms in describing engine and working principles of different engines.

FIVE MARKS QUESTIONS

1. Compare IC and EC engines. (A)
2. Define bore, stroke length, TDC and BDC. (R)
3. Define swept volume and clearance volume. (R)
4. Define compression ratio with formula to determine it and range values for SI and CI engine. (R)
5. Define mean effective pressure with formula. (R)
6. Define indicated power with formula to determine it. (R)
7. Define brake power with formula to determine it. (R)
8. State the classification of Automobile engine. (A)
9. Compare two stroke and four stroke engines. (A)
10. Compare SI and CI engines. (A)
11. Draw the sketch of four stroke petrol engine and label the parts. (R/U)
12. Draw the sketch of four stroke diesel engine and label the parts. (R/U)
13. Draw the sketch of two stroke petrol engine label the parts. (R/U)
14. Draw the sketch of two stroke diesel engine and label the parts. (R/U)

TEN MARKS QUESTIONS

1. Classify heat engines in detail. (A)
2. Explain the working of four stroke petrol engine with a sketch. (U)
3. Explain the working of four stroke diesel engine with a sketch. (U)
4. Explain the working of two stroke petrol engine with a sketch .(U)
5. Explain the working of two stroke diesel engine with a sketch. (U)
6. Compare two stroke and four stroke engines. (A)
7. Compare SI and CI engines. (A)

CO4: Describe the constructional details of engine stationary parts, piston and connecting rod.

FIVE MARKS QUESTIONS

1. Explain the constructional details of cylinder block with a sketch. (U)
2. Explain the constructional details of cylinder head with a sketch. (U)
3. Explain the constructional details of oil pan with a sketch. (U)
4. State the need of gaskets and list different types of gaskets. (A)
5. State the merits and demerits of wet liner. (A)
6. State the merits and demerits of dry liners. (A)
7. State the functions of piston. (A)
8. State the requirements of a good piston. (A)

9. List types of piston head shape with their applications. (A)
10. Define piston clearance and explain its need. (A)
11. Explain the need of expansion control of piston and list different methods. (A)
12. List types of piston rings with their functions. (A)
13. Explain the constructional details of compression ring with a sketch. (U)
14. Explain the constructional details of oil control ring with a sketch. (U)
15. Explain the constructional details of cam-ground piston with a sketch. (U)
16. Explain the concept of slot in skirt of piston in controlling thermal expansion with a sketch. (U)
17. Explain the constructional details of bi metal piston with a sketch. (U)
18. Explain the constructional details of piston pin and list types of connections with connecting rod. (U)
19. Explain fully floating type piston pin and connecting rod with a sketch. (U)
20. Draw the sketch of crank shaft and label the parts. (A)
21. Explain semi floating type piston pin and connecting rod with a sketch. (U)

TEN MARKS QUESTIONS

1. Describe the constructional details of piston with a neat sketch. (U)
2. Explain the need of thermal expansion control in piston and explain any two in detail. (U/A)
3. Describe the constructional details of connecting rod with a neat sketch. (U)
4. Describe the constructional details of crankshaft with a neat sketch (U)
5. Describe any two methods of connecting piston with connecting rod with sketch. (U)

CO5: Describe the constructional details of flywheel, damper and cam shaft drives.

FIVE MARKS QUESTIONS

1. Define firing order and explain the need of firing order. (A)
2. Define firing order and state firing orders of three, four and six cylinder inline engines. (R)
3. List functions of flywheel. (R)
4. Draw the sketch of flywheel and label the parts. (R/U)
5. Explain the need of vibration damper and list different types. (A)
6. State functions of camshaft and list types of cam shaft drives. (A)
7. State functions of camshaft and explain why cam shaft turns at half the speed of crank shaft? (A)
8. Draw the gear drive between crank and cam shafts and label the parts. (U)
9. Draw the chain drive between crank and cam shafts and label the parts. (U)
10. Draw the timing belt drive between crank and cam shaft and label the parts. (U)

TEN MARKS QUESTIONS

1. Describe rubber floating type vibration damper with a sketch.(U)

2. Describe clutch and rubber bush type vibration damper with a sketch.(U)

CO6: Describe the constructional details of valve, valve operating mechanism and mufflers.

FIVE MARKS QUESTIONS

1. Describe the constructional details of poppet valve with a sketch. (U)
2. Describe the constructional details of poppet valve seat with a sketch. (U)
3. Describe the constructional details of poppet valve guide with a sketch. (U)
4. Draw the overhead valve mechanism with a sketch label the parts. (U)
5. Draw the overhead cam shaft valve mechanism with a sketch and label the parts. (U)
6. Define valve clearance and explain need of valve clearance. (A)
7. Describe the constructional details of intake manifold with a sketch. (U)
8. Describe the constructional details of exhaust manifold with a sketch. (U)
9. Describe constructional details of baffle plate muffler with a sketch. (U)
10. Describe constructional details of absorber type muffler with a sketch. (U)
11. Describe constructional details of resonator type muffler with a sketch. (U)
12. Describe constructional details of wave cancellation type muffler with a sketch. (U)

TEN MARKS QUESTIONS

1. Describe overhead valve mechanism with a sketch. (U)
2. Describe overhead camshaft mechanism with a sketch. (U)
3. List different types of mufflers and explain any one of them with a sketch. (U)

BOARD OF TECHNICAL EXAMINATION

MODEL QUESTION PAPER

AUTOMOBILE ENGINEERING-I

Max Marks: 100. **Time: 3 Hr**

Note: 1. Answer any **six** questions from **PART-A** and each question carries **five** marks.

2. Answer any **seven** questions from **PART-B** and each question carries **ten** marks.

PART-A

1. List five inventors name, time line, invention, who contributed for development of Automobile.
2. Draw the layout of two-wheeler and label the parts.
3. Define bore, stroke length, TDC and BDC.
4. Define swept volume and clearance volume.
5. Compare IC and EC engines.
6. Define firing order and state firing orders of three, four and six cylinder inline engine.
7. Explain the need of flywheel.
8. Describe the constructional details of poppet valve with a sketch.
9. Define valve clearance and explain need of valve clearance.

PART-B

1. Briefly explain the development of automobile industry in India before and after independence.
2. Draw the layout of four-wheeler and explain the functions of different systems.
3. Explain the working of four stroke petrol engine with a sketch.
4. Explain the working of two stroke diesel engine with a sketch.
5. a. Define brake power with formula to determine it. 5Marks
   b. State the requirements of a good piston. 5Marks
6. Describe the constructional details of piston with a neat sketch.
7. Explain the need of thermal expansion control in piston and explain any two in detail.
8. Describe the constructional details of connecting rod with a neat sketch.
9. Describe rubber floating type vibration damper with a sketch.
10. List different types of mufflers and explain any one of them with a sketch.