	Course Title: **AUTOMOBILE ENGINEERING-II**	Course Code: **15AT21T**
	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 automotive engines.

Course Objectives:

The course should enable the students to:

1. Understand the fuel feed system in SI and CI engines.
2. Understand the cooling system.
3. Understand the lubrication system.

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

Course Outcome		CL	Linked PO	Teaching Hrs
CO1	Understand functions of components of different types of SI Engine fuel feed system.	***R/U***	1,2,3,10	09
CO2	Explain the requirements, construction and working of different types of carburetors.	***R/U/A***	1,2,3,10	07
CO3	Understand functions of components of different types of *CI* Engine fuel feed system.	***R/U/A***	1,2,3,10	07
CO4	Explain the functions, construction and working of different types of FIP's,Nozzles and governors.	***R/U/A***	1,2,3,10	11
C05	Understand functions of components of different types of Engine cooling system.	***R/U/A***	1,2,3,10	07
C06	Understand functions of components of different types of Engine lubrication system.	R/U/A	1,2,3,10	11
		Total sessions		**52**

COURSE-PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Automobile Engineering-II	**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	Fuel feed systems in SI engines	09	**5**	**15**	**5**	**17.2**
II	Carburetors	07	**5**	**10**	**5**	**13.8**
III	Fuel feed systems in CI engines	07	**5**	**10**	**5**	**13.8**
IV	Fuel injection pumps in CI engines	11	**5**	**20**	**5**	**20.7**
V	Cooling system	07	**5**	**10**	**5**	**13.8**
VI	Lubrication system	11	**5**	**20**	**5**	**20.7**
	Total	**52**	**145 MARKS**			**100**

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

Course contents:

UNIT- 1: FUEL FEED SYSTEMS IN SI ENGINES 09 hours

Fuel feed systems- function – types, Gravity feed system – layout – construction, Pump feed system – layout – construction, Fuel tank, Fuel filter - need , Air filters – need – types, Wet & Dry type – construction - working , AC mechanical fuel pump – construction – working, SU electrical fuel pump - construction – working.

UNIT-2: CARBURETORS 07 hours

Carburization, Atomization, Vaporization, Air fuel ratio requirements – Carburetor - requirements, Simple carburetor – Principle – construction – working – limitations, Classifications of carburetors based on various parameters , S U carburetor - construction – working.

UNIT-3: FUEL FEED SYSTEMS IN CI ENGINES 07 hours

Fuel injection systems – requirement – function – types, Layouts of - Individual pump injection system - Distributor type injection system – common rail injection - unit injection system, Water separator - Construction – working, Fuel filters - primary filter - secondary filters - purpose - construction – working of each type.

UNIT-4: FUEL INJECTION PUMPS IN CI ENGINES 11 hours

Plunger type Fuel feed pump - construction – working, Fuel injector - construction – working, Fuel nozzles – types - construction – working, Governors –necessity - classification - mechanical and pneumatic governor - construction - working of each type.

UNIT-5: COOLING SYSTEM 07 hours

Cooling system-purpose-types, Air cooling system –construction-working- merits and demerits, Pump circulation water cooling system - necessity - construction-working -merits and demerits, Water Pump - construction - working, Radiator-necessity, Radiator pressure cap-need-construction - working , Expansion tank- necessity, Thermostat valve- necessity- types-construction – working, Anti-freeze solutions-purpose, Anti-rust solutions-purpose.

UNIT-6: LUBRICATION SYSTEM 11 hours

Lubricants - types – properties - SAE ratings – applications , Lubrication system-purpose-types, Petrol ,Splash Lubrication-construction- working, Force feed lubrication system- construction-working, Gear pump - Construction- working, Rotor pump - Construction- working, Vane pump - Construction- working, Full flow filtering system – layout - working, By-pass flow filtering systems - layout- working,

Bearings – need - types, Shell bearings - Ball bearings - Thrust bearings – necessity - Construction and working of each type.

Resources:

Reference books:

Sl no	Title of the book	Authors name	Publishers name
1	Automobile Engineering vol-2	Kirpal 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

Websites:

1. How stuff works.com
2. https://www.youtube.com/watch?v=9BYm0HnLGRU
3. https://www.youtube.com/watch?v=5W1ucQsksSA
4. https://www.youtube.com/watch?v=wyspAHrMbb8
5. https://www.youtube.com/watch?v=zUuVQfvWSnI
6. https://www.youtube.com/watch?v=V7inC4lOpGs
7. https://www.youtube.com/watch?v=f45kAmjAOYA
8. https://www.youtube.com/watch?v=_HclvBmwWgQ
9. https://www.youtube.com/watch?v=DG-STqFiCg0
10. https://www.youtube.com/watch?v=mmmcj53TNic
11. https://www.youtube.com/watch?v=eFe43SnBlMI
12. https://www.youtube.com/watch?v=qUzvNA2b4ms
13. https://www.youtube.com/watch?v=MOoQMT9EfnQ
14. https://www.youtube.com/watch?v=EbjDH7fr_J8
15. https://www.youtube.com/watch?v=9-GSNR7W73M
16. https://www.youtube.com/watch?v=F6wmSCgVWOM
17. www.youtube.com/watch?v=jHZ4giLdbtc
18. http://lh5.ggpht.com/_dSeRrhZ5pEA/TdrCh5n7X2I/AAAAAAAAAOM/cNk-nB96CVU/Howmechanicalpumpworks_thumb4.jpg?imgmax=800
19. https://www.youtube.com/watch?v=0ycvbFxB87s
20. https://www.youtube.com/watch?v=BaEHVpKc-1Q

21. https://www.youtube.com/watch?v=c6gwU7IHtlo
22. https://www.youtube.com/watch?v=t6RiX5HDKQg
23. https://www.youtube.com/watch?v=BnvzPoNSXCg
24. https://www.youtube.com/watch?v=Zom_hp_M6IE
25. https://www.youtube.com/watch?v=MYvbDaHoxRg

SUGGESTED LIST OF STUDENT ACTIVITYS

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

7. 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.
8. Each student should conduct different activity and no repeating should occur

1	Visit nearby garage/service station and collect information on specification of components of different automobile fuel feed systems.
2	Visit nearby garage/service station and collect information on specification of components of different automobile cooling system systems.
3	Visit nearby garage/service station and collect information on specification of components of different automobile lubrication systems.

MODEL OF RUBRICS FOR ASSESSING STUDENT ACTIVITY:

Note: The dimensions and scales have to be decided by the teacher based on the type of activity.

Dimension	Scale					Students Score				
	Unsatisfactory (1 marks)	Developing (2marks)	Satisfactory (3marks)	Good(4 marks)	Exemplary (5marks)	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	1				
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	2				
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	3				
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	4				
Grand Average/Total=(1+2+3+4)/4=10/4=2.5=3						3				

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	1,2,3,4,5
				Assignment	**05**	Assignment books	1,2,3,4,5
				Total	**25**		
	SEE*	End Exam		**End of the course**	**100**	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2, 3,4, 5 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1, 2,3,4,5 and effectiveness of delivery 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.

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 : Units:__

CO's:____

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	II semester	Automobile Engineering-II	20
	Year: 2015-16	Course code:15AT21T	

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

Note: Answer all questions

Question no	Question	CL	CO	PO
1	Draw the layout of gravity feed system and labels the parts. 5mark Or List different types of air filters. 5mark	R	1	1,2,10
2	Explain the constructional details of fuel tank with a sketch. 5mark Or Explain the constructional details of fuel filter with a sketch. 5mark	U	1	1,2,10
3	Describe the working principle of simple carburettor with a sketch. 10mark Or List various fuel circuits of S U carburettor and explain idling circuit with a sketch. 10mark	U	2	1,2,3,10

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

MODEL QUESTION BANK

CO1: Understand functions of components of different types of SI Engine fuel feed system.

FIVE MARKS QUESTIONS

1. Draw the layout of gravity feed system and labels the parts. (R/U)
2. Draw the layout of pump feed system and labels the parts. (R/U)
3. Explain functions of fuel feed system. (A)
4. Explain the constructional details of fuel tank with a sketch. (U)
5. Explain the constructional details of fuel filter with a sketch. (U)
6. Explain the need of air and fuel filter. (A)
7. List different types of air filters. (R)
8. Differentiate between wet and dry air filter. (A)
9. Compare gravity feed system with pump feed system. (A)
10. Explain how A C mechanical pump stops pumping fuel, when float chamber fills up? (A)

TEN MARKS QUESTIONS

1. Explain pump feed system with a neat sketch. (U)
2. Explain the AC mechanical fuel pump with a neat sketch. (U)
3. Explain Electrical fuel pump with a neat sketch. (U)

CO2: Explain the requirements, construction and working of different types of carburettors.

FIVE MARKS QUESTIONS

1. Define and explain need of good carburisation. (A)
2. Define carburisation and atomisation. (R)
3. Define Atomisation and vaporisation. (R)
4. Define and explain need of good Atomisation. (A)
5. Define and explain need of good Vaporisation. (A)
6. List the requirements carburettor. (A)
7. Explain the limitations of simple carburettor. (A)
8. Explain the meaning of stochiometric, rich and lean mixture. (R/U)
9. Explain the need of rich mixture during idling. (A)
10. Explain the need of rich mixture during acceleration. (A)
11. Explain the importance of choke in carburettor. (A)
12. Explain the need of damper in S U Carburettor. (A)

TEN MARKS QUESTIONS

1. Describe the working principle of simple carburettor with a sketch. (U)
2. Explain the air fuel ratio requirements for different engine operating conditions with a speed vs air-fuel ratio graph. (U/A)
3. List various fuel circuits of S U carburettor and explain cold start circuit with a sketch. (U)
4. List various fuel circuits of S U carburettor and explain idling circuit with a sketch. (U)

CO3: Understand functions of components of different types of *CI* Engine fuel feed system.

FIVE MARKS QUESTIONS

1. Draw the layout of individual pump fuel feed system and labels the parts. (R/U)
2. Draw the layout of CRDI fuel feed system and labels the parts. (R/U)
3. Draw the layout of distributor pump fuel feed system and labels the parts. (R/U)
4. Draw the layout of unit injection fuel feed system and labels the parts. (R/U)
5. Compare individual pump injection system with distributor fuel feed system. (A)
6. Compare individual pump injection system with CRDI fuel feed system. (A)
7. Compare individual pump injection system with Unit injection system. (A)
8. Draw the sketch of water separator and label the parts. (R/U)
9. Draw the sketch of diesel filter and label the parts. (R/U)

TEN MARKS QUESTIONS

1. Describe the construction and working of water separator with a sketch. (U)

CO4: Explain the functions, construction and working of different types of FIP's, Nozzles and governors.

FIVE MARKS QUESTIONS

1. Draw the sketch of Plunger type fuel feed pump and label the parts. (R/U)
2. Describe the need of governor in diesel engines. (A)
3. Draw the sketch of fuel injector and label the parts. (R/U)
4. Distinguish between Pintle and pintaux nozzles. (A)
5. Explain the working principle of Mechanical governor. (U)

TEN MARKS QUESTIONS

1. Explain the working of fuel feed pump with a sketch. (U)
2. Describe the working of single unit jerk type fuel pump with a sketch. (U)
3. Explain the working of fuel injector with a sketch. (U)

4. Explain the working of pneumatic governor with a sketch.(U)
5. Explain the working of mechanical governor with a neat sketch.(U)

CO5: Understand functions of components of different types of Engine cooling system.

FIVE MARKS QUESTIONS

1. Explain the purpose of cooling system.(A)
2. State factors affecting rate of cooling in air cooling system.(R/A)
3. Compare air cooling system with water cooling system.(A)
4. Describe the need of thermostat valve.(A)
5. Describe the need of pressure cap.(A)
6. State the purpose of anti freeze and anti rust additives.(A)
7. List different anti freeze and anti rust additives.(R)
8. Explain the need of radiator expansion tank.(U/A)

TEN MARKS QUESTIONS

1. Describe air cooling system with a sketch.(U)
2. Describe water cooling system with a sketch.(U)
3. Explain the working of water pump with a sketch.(U)
4. Explain the working of radiator with a sketch.(U)
5. Explain the working of radiator pressure cap with a sketch.(U)
6. Explain the working of wax type thermostat valve with a sketch.(U)
7. Explain the working of bellows type thermostat valve with a sketch.(U)

CO6: Understand functions of components of different types of Engine lubrication system.

FIVE MARKS QUESTIONS

1. Explain the SAE ratings of oil with examples.(U)
2. List grade of lubricants used in different components of Automobile.(R)
3. Explain the functions of lubrication system.(A)
4. Explain petroil lubrication system.(U)
5. Compare full flow filtering system with bypass-flow oil filtering system.(A)
6. List different types of bearings used in Automobile.(R)
7. Compare shell and ball bearings.(A)
8. Describe shell bearing with a sketch.(U)
9. Describe ball bearing with a sketch.(U)
10. Define viscosity and fire point of lubricating oil.(R)
11. Define flash and fire point of lubricating oil.(R)
12. Define viscosity and flash point. (R)

FIVE MARKS QUESTIONS

1. Explain the working of pump feed lubrication system with a sketch.(U)
2. Explain the working of gear type oil pump with a sketch.(U)
3. Explain the working of vane type oil pump with a sketch.(U)
4. Explain the working of rotor type oil pump with a sketch.(U)

BOARD OF TECHNICAL EXAMINATION
MODEL QUESTION PAPER

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

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

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

PART-A

1. Draw the layout of gravity feed system and labels the parts.
2. State functions of fuel feed system.
3. Explain the construction of fuel tank with a sketch.
4. Define Vaporisation and carburisation.
5. List the requirements carburettor.
6. Draw the layout inline fuel feed system and labels its parts.
7. Describe the need of governor in diesel engines.
8. List different types of governors and fuel injector nozzles.
9. List different antifreeze and antirust additives used with coolant.

PART-B

1. Explain Electrical fuel pump with a neat sketch.
2. Explain the air fuel ratio requirements for different engine operating conditions with a speed v/s air-fuel ratio graph.
3. Describe the construction and working of water separator with a sketch.
4. Explain the working of fuel feed pump with a sketch.
5. Describe the working of single unit jerk type fuel pump with a sketch.
6. Explain the working of radiator pressure cap with a sketch.
7. Explain the working of pump feed lubrication system with a sketch.
8. Explain the working of gear type oil pump with a sketch.
9. a. Compare air cooling system with water cooling system.
   b. Compare shell and ball bearings.
10. a. Explain the purpose of primary and secondary filters in diesel fuel feed system.
    b. Explain the SAE ratings of oil with examples.