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| SKIT | Teaching Process | Rev No.: 1.0 |
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COURSE PLAN – CAY 2019-20

BE-6-ME-SKIT-Ph5b1-F02-V2.2

File No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BENGALURU



COURSE PLAN

Academic Year 2019 – 20

| | |
|----------------------|------------------------|
| Program: | B E |
| Semester: | 6/A |
| Course Code: | 17ME655 |
| Course Title: | Automobile Engineering |
| Credit / L-T-P: | 3/3-0-0 |
| Total Contact Hours: | 40 |
| Course Plan Author: | APPESE S D |

#29, Hesaraghatta Main road, Chimney Hills, Chikkabanavara P.O.,
Bengaluru – 560090, Karnataka, INDIA
Phone / Fax:+91 80 23721477 -STD- 080-23721477
Web: <http://www.skit.org.in/>,
e-mail: skit1princi@gmail.com / principal@skit.org.in



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Note : Remove “Table of Content” before including in CP Book

Each Course Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels



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17ME655: AUTOMOBILE ENGINEERING

A. COURSE INFORMATION

1. Course Overview

| | | | |
|----------------------|------------------------|----------------|------------|
| Degree: | BE | Program: | ME |
| Year / Semester: | 2020/6 | Academic Year: | 2019-20 |
| Course Title: | AUTOMOBILE ENGINEERING | Course Code: | 17ME655 |
| Credit / L-T-P: | 3/3-0-0 | SEE Duration: | 180 Min |
| Total Contact Hours: | 40 | SEE Marks: | 60 |
| CIA Marks: | 40 | Assignment | 1 / Module |
| Course Plan Author: | APPESE S D | Sign | Dt: |
| Checked By: | NAVEEN KUMAR PATTAR | Sign | Dt: |

2. Course Content

| Module | Module Content | Teaching Hours | Module Concepts | Blooms Level |
|--------|--|----------------|-----------------------------------|--------------|
| 1 | Spark Ignition (SI) & Compression Ignition (CI) engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, methods of a Swirl generation, choice of materials for different engine components, engine positioning. Concept of HCCI engines, hybrid engines, twin spark engine, electric car. Cooling requirements, types of cooling- thermo siphon system, forced circulation water cooling system, water pump, Radiator, thermostat valves. Significance of lubrication, splash and forced feed system. | 8 | Engine components and It's Parts. | L2 |
| 2 | Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints ,Differential and rear axle, Hotchkiss Drive and Torque Tube Drive. Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Anti lock –Braking systems, purpose and operation of anti-lock-braking system, ABS Hydraulic Unit, Rear-wheel anti-lock & Numerical. | 8 | Transmission & Control system | L3 |
| 3 | Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Suspension, Torsion bar suspension systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel, Air suspension system. Battery Ignition system, Magneto Ignition system, electronic Ignition system. | 8 | Steering and Ignition system. | L2 |



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| | | | | |
|---|--|---|---------------------------|----|
| 4 | Naturally aspirated engines, Forced Induction, Types of superchargers, Turbocharger construction and operation, Inter-cooler, Turbocharger lag. Conventional fuels, alternative fuels, normal and abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& C.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors. Electronic Injection system, Common Rail Direct Injection System. | 8 | Power Boosters and Fuels. | L2 |
| 5 | Different air pollutants, formation of photo-chemical smog and causes. Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas re-circulation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter. Euro I, II, III and IV norms, Bharat Stage II, III, IV norms. Motor Vehicle Act. | 8 | Emission controls | L2 |

3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video; one per concept; to understand the concepts; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

| Module | Details | Available |
|-----------|---|-----------------------------|
| A | Text books (Title, Authors, Edition, Publisher, Year.) | |
| 1,2,3,4,5 | 1. Automobile engineering, Kirpal Singh, Vol I and II (12 th Edition) Standard Publishers 2011 2. Automotive Mechanics, S. Srinivasan, (2 nd Edition) Tata McGraw Hill 2003. | In Library |
| B | Reference books (Title, Authors, Edition, Publisher, Year.) | |
| 1,2,3 | 1. Automobile Engineering, Mahator and Sharma. 2. Automobile Engineering, by V Ganesh. 3. Fundamentals of Automobile Engineering, K.K.Ramalingam, Sci-tech Publications (India) Pvt. Ltd. 6. Automobile Engineering, R. B. Gupta, Satya Prakashan, (4 th Edition) 1984. | In dept library/ Library |
| C | Concept Videos or Simulation for Understanding | |
| | PPT and Notes | Available |



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4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learn the following Courses / Topics with described Content .

| SNo | Course Code | Course Name | Module / Topic / Description | Sem | Remarks | Blooms Level |
|-----|-------------|-------------|---|-----|---------|--------------|
| 1 | 18ME15 | EME | Basic concepts of Elements of Mechanical Engineering. | I | - | L2 |

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area.

Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NP-TEL Videos, h. Sway-am videos etc.

| Modules | Topic / Description | Area | Remarks | Blooms Level |
|---------|--|--------------|--|--------------|
| 1 | A recent trend in automobile engineering | Higher Study | A seminar on recent trend in automobile engineering. | L2 |

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

| # | Course Outcomes At the end of the course, student should be able to... | Teach. Hours | Concept | Instr Method | Assessment Method | Blooms' Level |
|-----------|---|--------------|-----------------------------------|---------------------------|----------------------------|---------------|
| 17ME655.1 | Outline the layout and arrangement of principal parts of an automobile and the arrangement of cooling and lubricating system. | 08 | Engine components and It's Parts. | Chalk and 4 Board Methods | Assignment, IA, Unit Tests | L2 |
| 17ME655.2 | Explain the working of transmission systems, braking systems of automotive operating and control systems. | 08 | Transmission & Control system | Chalk and 4 Board, PPT | Assignment, IA, Unit Tests | L2 |
| 17ME655.3 | Explain the working of steering, suspension systems and illustrate the different ignition system. | 08 | Steering and Ignition system. | Chalk and Board | Assignment, IA, Unit Tests | L2 |
| 17ME655.4 | Explain the working of Superchargers and Turbocharger & classify fuels and injection systems. | 08 | Power Boosters and Fuels. | Chalk and Board | Assignment, IA, Unit Tests | L2 |
| 17ME655.5 | Relate the cause of automobile emissions and its effects on environment also summarize | 08 | Emission controls | Chalk and Board | Assignment, IA, Unit Tests | L2 |



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| | | | | | | |
|---|----------------------------------|----|---|-------|---|---|
| | methods to reduce the emissions. | | | Video | | |
| - | Total | 40 | - | - | - | - |

2. Course Applications

Write 1 or 2 applications per CO.

Students should be able to employ / apply the course learning to..

| SNo | Application Area | CO | Level |
|-----|---|-----|-------|
| 1 | Electric and Plug-in hybrid electric power train is an expanding technology in the contemporary automotive industry. | CO1 | L2 |
| 2 | Possibilities to influence the cooling process in different Machining operations. | CO1 | L2 |
| 3 | The transmission systems mainly used today are automatic transmissions with 4 or 5 speeds and manual transmissions with 4, 5 or 6 speeds. A small number of automated manual transmissions (AMT) and continuously variable transmissions (CVT) are in production. | CO2 | L2 |
| 4 | An Anti-lock Braking System (ABS) is a safety feature in vehicles that helps the driver maintain control during emergency braking situations. | CO2 | L3 |
| 5 | Most modern cars use the rack and pinion steering mechanism. | CO3 | L2 |
| 6 | Spark ignition engines are critically dependent on repeatable, reliable ignition to produce good performance and low pollutant emissions. | CO3 | L2 |
| 7 | superchargers can be used to improve low speed transient response in downsized and down speed engines. | CO4 | L2 |
| 8 | Electronic Fuel Injection System to a Single Cylinder, Four Stroke Engine. | CO4 | L2 |
| 9 | Vehicle emissions control Unit is the study of reducing the emissions produced by motor vehicle, especially IC Engines. | CO5 | L2 |

3. Articulation Matrix

(CO – PO MAPPING)

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

| - | - | Course Outcomes | Program Outcomes | | | | | | | | | | | | Level |
|---|-----------|---|------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|
| | | | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | |
| 1 | 17ME655.1 | Outline the layout and arrangement of principal parts of an automobile and the arrangement of cooling and lubricating system. | √ | √ | - | - | - | √ | - | - | √ | - | - | √ | L2 |
| 2 | 17ME655.2 | Explain the working of transmission systems, braking systems of automotive operating and control systems. | √ | √ | - | - | - | - | - | - | - | - | - | - | L2 |
| 3 | 17ME655.3 | Explain the working of steering, suspension systems and illustrate the different ignition system. | √ | - | - | - | - | - | - | - | - | - | - | - | L2 |



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| | | | | | | | | | | | | | | | | |
|---------|-----------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| 4 | 17ME655.4 | Explain the working of Superchargers and Turbocharger & classify fuels and injection systems. | √ | √ | - | - | - | - | - | - | - | - | - | - | - | L2 |
| 5 | 17ME655.5 | Relate the cause of automobile emissions and its effects on environment also summarize methods to reduce the emissions. | √ | √ | - | - | - | √ | √ | - | - | - | - | - | - | L2 |
| | | Average attainment (1, 2, or 3) | | | | | | | | | | | | | | |
| PO, PSO | | 1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; PSO1.Apply basic engineering knowledge with modern tools in solving problems of design, production and thermal; PSO2. Mould and develop the students to serve in industries as professionals. PSO3. Prepare the students to undertake higher learning and research. | | | | | | | | | | | | | | |

4. Mapping Justification

CO – PO Mapping with mapping Level along with justification for each CO-PO pair.

To attain competency required (as defined in POs) in a specified area and the knowledge & ability required to accomplish it.

| Mapping | | Justification | Mapping Level |
|-----------|-----------|--|---------------|
| CO | PO | 'Area': 'Competency' and 'Knowledge' for specified 'Accomplishment' | - |
| CO1 | PO1 | 'Engineering Knowledge:' - Acquisition of Engineering Knowledge of Automotive parts of an automobile is essential to accomplish solutions to complex engineering problems in automobile Engineering. | L2 |
| CO1 | PO2 | Acquisition of Engineering Knowledge of the different principle parts of an automobile is needed. | L2 |
| CO1 | PO6 | Problem Analysis': Analyzing problems require knowledge / understanding of IC ENGINE to accomplish solutions to complex engineering problems in Automobile engineering. | L3 |
| CO1 | PO9 | Engineering Knowledge is required for lab experiments. | L2 |
| CO1 | PO12 | Because in the broadest context of technological way it is simple to engage in independent and life long learning. | L2 |
| CO2 | PO1 | Knowledge of engineering science to understand the transmission system. | L2 |
| CO2 | PO2 | Knowledge of engineering science is required to understand the steering system. | L2 |
| CO3 | PO1 | Knowledge of basic concepts of engineering fundamentals is required to know the nature of ignition process. | L2 |
| CO4 | PO1 | Knowledge of basic non conventional energy is required to understand the tidal and wave energy. | L2 |
| CO4 | PO2 | Analyzing the problems in the different forms of chargers. | L2 |



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|-----|-----|---|----|
| CO5 | PO1 | Knowledge of basic engineering fundamentals required to understand the concepts of fuel emissions. | L2 |
| CO5 | PO2 | Analyzing the different fuel emission principles. | L2 |
| CO5 | PO6 | Apply the knowledge of Automobile emissions and effect on environment to assess societal and safety responsibilities relevant to the professional engineering Practice. | L3 |
| CO5 | PO7 | Understand the Impact of automobile emission on environment. | L2 |

5. Curricular Gap and Content

| SNo | Gap Topic | Actions Planned | Schedule Planned | Resources Person |
|-----|--------------------|-----------------|----------------------|------------------|
| 1 | Automotive sensors | Seminar | 2 nd Week | Self |

6. Content Beyond Syllabus

| SNo | Gap Topic | Actions Planned | Schedule Planned | Resources Person |
|-----|---|--|---|------------------|
| 1 | ANSYS software for designing automobile parts | Placement, GATE, Higher Study, Entrepreneurship. | Presentation by students & Mini Project | Self |

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

| Module # | Title | Teaching Hours | No. of question in Exam | | | | | | CO | Levels |
|----------|---|----------------|-------------------------|----------|----------|----------|-----------|-----------|-----|--------|
| | | | CIA-1 | CIA-2 | CIA-3 | Asg | Extra Asg | SEE | | |
| 1 | Engine Components & It's Principle Parts & Cooling and Lubrication. | 8 | 2 | - | - | 1 | 1 | 2 | CO1 | L2 |
| 2 | Transmission Systems & Brakes. | 8 | 2 | - | - | 1 | 1 | 2 | CO2 | L2 |
| 3 | Steering & Suspension systems & Ignition System. | 8 | - | 2 | - | 1 | 1 | 2 | CO3 | L2 |
| 4 | Superchargers and Turbochargers & Fuels, Fuel Supply systems for SI & CI Engines. | 8 | - | 2 | - | 1 | 1 | 2 | CO4 | L2 |
| 5 | Automotive Emission Control Systems & Emission Standards. | 8 | - | - | 4 | 1 | 1 | 2 | CO5 | L2 |
| - | Total | 40 | 4 | 4 | 4 | 5 | 5 | 10 | - | - |



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2. Continuous Internal Assessment (CIA)

Assessment of learning outcomes for Internal exams. Blooms Level in last column shall match with A.2.

| Evaluation | Weight age in Marks | CO | Levels |
|---------------------------------------|---------------------|------------|--------|
| CIA Exam – 1 | 30 | CO1,CO2 | L2 |
| CIA Exam – 2 | 30 | CO3, C04 | L2 |
| CIA Exam – 3 | 30 | CO5 | L2 |
| Assignment – 1 | 5 | CO1,CO2 | L2 |
| Assignment – 2 | 5 | CO3, C04 | L2 |
| Assignment – 3 | 5 | CO5 | L2 |
| Seminar – 1 | 2.5 | CO1,CO2 | L2 |
| Seminar – 2 | 2.5 | CO3, C04 | L2 |
| Seminar – 3 | 2.5 | CO5 | L2 |
| Other Activities – define – Slip test | 2.5 | CO1 to CO5 | L2 |
| Final CIA Marks | 40 | - | - |

D1. TEACHING PLAN – 1

Module – 1

| Title: | Engine Components & It's Principle parts and Cooling and Lubrication. | Appr Time: | 08 Hrs |
|-----------------|---|------------|---------------------|
| a | Course Outcomes | - | Blooms Level |
| - | The student should be able to: | - | |
| 1 | Outline the layout and arrangement of principal parts of an automobile and the arrangement of cooling and lubricating system. | CO1 | L2 |
| b | Course Schedule | - | - |
| Class No | Module Content Covered | CO | Level |
| 1 | Spark Ignition (SI) & Compression Ignition (CI) engines | CO1 | L2 |
| 2 | cylinder – arrangements and their relatives merits | CO1 | L2 |
| 3 | Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams | CO1 | L2 |
| 4 | Types of combustion chambers for S.I.Engine and C.I.Engines | CO1 | L2 |
| 5 | Methods of a Swirl generation, choice of materials for different engine components, engine positioning. | CO1 | L2 |
| 6 | Concept of HCCI engines, hybrid engines, twin spark engine, electric car. | CO1 | L2 |
| 7 | Cooling requirements, types of cooling system. | CO1 | L2 |
| 8 | Thermo siphon system forced circulation water cooling system, water pump | CO1 | L2 |
| 9 | Radiator, thermostat valves. Significance of lubrication. | CO1 | L2 |
| 10 | Splash and forced feed system. | CO1 | L2 |



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| c | Application Areas | CO | Level |
|----------|---|-----------|--------------|
| 1 | Electric and Plug-in hybrid electric power train is an expanding technology in the contemporary automotive industry. | CO1 | L2 |
| 2 | Possibilities to influence the cooling process in different Machining operations. | CO1 | L2 |
| | | | |
| d | Review Questions | - | - |
| 1 | Draw the valve time diagram for a 4 – stroke Spark Ignition (Si) engine and explain? | CO1 | L2 |
| 2 | Why cooling is necessary for I.C engines? Explain thermo siphon cooling with neat sketch. | CO1 | L2 |
| 3 | What is Swirl? Explain the different methods of Swirl generation. | CO1 | L2 |
| 4 | Explain wet and dry liners with the help of diagrams. | CO1 | L2 |
| 5 | With a neat sketch, explain pump circulation system of water cooling. | CO1 | L2 |
| 6 | Explain single row overhead valve mechanism with a neat sketch. | CO1 | L2 |
| 7 | Explain the splash lubrication, with a neat sketch | CO1 | L2 |
| 8 | Draw the valve timing diagram for a 4 stroke petrol engine indicating clearly the position of following and also briefly explain them. i) IVO ii) IVC iii) Ignition iv) EVO v) EVC. | CO1 | L2 |
| 9 | With neat sketches, explain the construction and purpose of dry and wet liners. | CO1 | L2 |
| 10 | List advantages of Aluminium alloy pistons. | CO1 | L2 |
| | | | |
| e | Experiences | - | - |
| 1 | | CO1 | L2 |
| 2 | | | |

Module – 2

| Title: | Transmission Systems and Brakes. | Appr Time: | 08 Hrs |
|-----------------|---|------------|---------------------|
| a | Course Outcomes | - | Blooms Level |
| - | The student should be able to: | - | |
| 1 | Explain the working of transmission systems, braking systems of automotive operating and control systems. | CO2 | L2 |
| | | | |
| b | Course Schedule | - | - |
| Class No | Module Content Covered | CO | Level |
| 1 | Clutch-types and construction, gear boxes- manual and automatic. | CO2 | L2 |
| 2 | gear shift mechanisms, Over drive, transfer box. | CO2 | L2 |
| 3 | fluid flywheel, torque converter. | CO2 | L2 |
| 4 | propeller shaft, slip joints, universal joints. | CO2 | L2 |
| 5 | Differential and rear axle, Hotchkiss Drive and Torque Tube Drive. | CO2 | L2 |
| 6 | Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems. | CO2 | L2 |
| 7 | construction and working of master and wheel cylinder. | CO2 | L2 |



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| 8 | brake shoe arrangements, Disk brakes, drum brakes. | CO2 | L2 |
| 9 | Anti lock –Braking systems, purpose and operation of anti lock-braking system, ABS Hydraulic Unit, Rear-wheel anti lock | CO2 | L2 |
| 10 | Numerical. | CO2 | L3 |
| | | | |
| c | Application Areas | CO | Level |
| 1 | The transmission systems mainly used today are automatic transmissions with 4 or 5 speeds and manual transmissions with 4, 5 or 6 speeds. A small number of automated manual transmissions (AMT) and continuously variable transmissions (CVT) are in production. | CO2 | L2 |
| 2 | An Anti-lock Braking System (ABS) is a safety feature in vehicles that helps the driver maintain control during emergency braking situations. | CO2 | L2 |
| | | | |
| d | Review Questions | - | - |
| 1 | Explain the working principle of Automatic transmission. | CO2 | L2 |
| 2 | With the neat sketch, explain the working of constant mesh gear box. | CO2 | L2 |
| 3 | With neat sketch, explain the working principle of Single plate and Multi plate clutches. | CO2 | L2 |
| 4 | Explain the purpose and operation of Anti lock braking system. | CO2 | L2 |
| 5 | Explain torque converter with a neat sketch. | CO2 | L2 |
| 6 | With a neat diagram, explain synchromesh three speed gear box. | CO2 | L2 |
| 7 | The engine of a car employing a single plate friction clutch develops maximum torque of 150 Nm. External diameter of the clutch plate is 1.2 times its internal diameter. Determine the dimensions of the clutch plate and the axial force provided by the springs. The maximum allowable pressure intensity for the clutch facings is 100 KPa. Coefficient of friction = 0.3 Assume uniform wear. | CO2 | L3 |
| 8 | With a neat sketch, explain the working of torsion bar. | CO2 | L2 |
| 9 | Explain wheel cylinder of hydraulic braking system with a neat sketch. | CO2 | L2 |
| 10 | Draw and explain the layout of air braking system. | CO2 | L2 |
| 11 | Explain the construction and working principle of multi plate clutch. | CO2 | L2 |
| 12 | Explain with diagram the working of constant mesh gear box and mention its advantages over sliding mesh gear box. | CO2 | L2 |
| 13 | What is the function of differential? Explain its operating principle with neat diagram. | CO2 | L2 |
| 14 | Explain the working of hydraulic braking system with neat diagram. | CO2 | L2 |
| 15 | Draw the layout of air brake system. | CO2 | L2 |
| | | | |
| e | Experiences | - | - |
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E1. CIA EXAM – 1

a. Model Question Paper – 1

| | | | | | | | | |
|-----------------|------------------------|---|----|--------|----|--------------|------------|--------------|
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 30 | Time: | 75 minutes | |
| Course: | AUTOMOBILE ENGINEERING | | | | | | | |
| - | - | Note: Answer any 3 questions, each carry equal marks. | | | | Marks | CO | Level |
| 1 | a | Draw the valve timing diagram for a 4 stroke petrol engine indicating clearly the position of following and also briefly explain them. i) IVO ii) IVC iii) Ignition iv) EVO v) EVC. | | | | 7 | 1 | L2 |
| | b | Why cooling is necessary for I.C engines? Explain Thermo siphon cooling with neat sketch. | | | | 8 | 1 | L2 |
| OR | | | | | | | | |
| 2 | a | With neat sketches, explain the construction and purpose of dry and wet liners. | | | | 7 | 1 | L2 |
| | b | What is Swirl? Explain the different methods of Swirl generation. | | | | 8 | 1 | L2 |
| MODULE-2 | | | | | | | | |
| 3 | a | With neat sketch, explain the working principle of Single plate and Multi plate clutches. | | | | 8 | 1 | L2 |
| | b | Explain the purpose and operation of Anti-lock braking system. | | | | 7 | 1 | L2 |
| OR | | | | | | | | |
| 4 | a | Explain torque converter with a neat sketch. | | | | 7 | 1 | L2 |
| | b | With a neat diagram, explain synchromesh three speed gear box. | | | | 8 | 1 | L2 |

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

| Model Assignment Questions | | | | | | | | |
|---|------------------------|---|----|--------|--------|-------|------------------|-------|
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 5 / 10 | Time: | 90 – 120 minutes | |
| Course: | AUTOMOBILE ENGINEERING | | | | | | | |
| Note: Each student to answer 2-3 assignments. Each assignment carries equal mark. | | | | | | | | |
| SNo | USN | Assignment Description | | | | Marks | CO | Level |
| 1 | | Draw the valve time diagram for a 4 – stroke Spark Ignition (Si) engine and explain? | | | | 5 | CO1 | L2 |
| 2 | | Why cooling is necessary for I.C engines? Explain thermo siphon cooling with neat sketch. | | | | 5 | CO1 | L2 |
| 3 | | What is Swirl? Explain the different methods of Swirl generation. | | | | | CO1 | L2 |
| 4 | | Explain wet and dry liners with the help of diagrams. | | | | 5 | CO1 | L2 |
| 5 | | With a neat sketch, explain pump circulation system of water cooling. | | | | 5 | CO1 | L2 |
| 6 | | Explain single row overhead valve mechanism with a neat sketch. | | | | 5 | CO1 | L2 |
| 7 | | Explain the splash lubrication, with a neat sketch | | | | 5 | CO1 | L2 |
| 8 | | Draw the valve timing diagram for a 4 stroke petrol engine indicating clearly the position of following and also briefly explain them. i) IVO ii) IVC iii) Ignition iv) EVO v) EVC. | | | | 5 | CO1 | L2 |
| 9 | | With neat sketches, explain the construction and purpose of dry | | | | 5 | CO1 | L2 |



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| | | and wet liners. | | | |
| 10 | | List advantages of Aluminium alloy pistons. | 5 | CO1 | L2 |
| 11 | | Explain the working principle of Automatic transmission. | 5 | CO2 | L2 |
| 12 | | With the neat sketch, explain the working of constant mesh gear box. | 5 | CO2 | L2 |
| 13 | | With neat sketch, explain the working principle of Single plate and Multi plate clutches. | 5 | CO2 | L2 |
| 14 | | Explain the purpose and operation of Antilock braking system. | 5 | CO2 | L2 |
| 15 | | Explain torque converter with a neat sketch. | 5 | CO2 | L2 |
| 16 | | With a neat diagram, explain synchromesh three speed gear box. | 5 | CO2 | L2 |
| 17 | | The engine of a car employing a single plate friction clutch develops maximum torque of 150 Nm. External diameter of the clutch plate is 1.2 times its internal diameter. Determine the dimensions of the clutch plate and the axial force provided by the springs. The maximum allowable pressure intensity for the clutch facings is 100 KPa. Coefficient of friction = 0.3 Assume uniform wear. | 5 | CO2 | L3 |
| 18 | | With a neat sketch, explain the working of torsion bar. | 5 | CO2 | L2 |
| 19 | | Explain wheel cylinder of hydraulic braking system with a neat sketch. | 5 | CO2 | L2 |
| 20 | | Draw and explain the layout of air braking system. | 5 | CO2 | L2 |
| 21 | | Explain the construction and working principle of multi plate clutch. | 5 | CO2 | L2 |
| 22 | | Explain with diagram the working of constant mesh gear box and mention its advantages over sliding mesh gear box. | 5 | CO2 | L2 |
| 23 | | What is the function of differential? Explain its operating principle with neat diagram. | 5 | CO2 | L2 |
| 24 | | Explain the working of hydraulic braking system with neat diagram. | 5 | CO2 | L2 |
| 25 | | Draw the layout of air brake system. | 5 | CO2 | L2 |
| 26 | | With a neat sketch, explain pump circulation system of water cooling. | 5 | CO1 | L2 |
| 27 | | Explain single row overhead valve mechanism with a neat sketch. | 5 | CO1 | L2 |
| 28 | | Explain the splash lubrication, with a neat sketch | 5 | CO1 | L2 |



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D2. TEACHING PLAN – 2

Module – 3

| | | | |
|-----------------|---|------------|---------------------|
| Title: | Steering and Suspension Systems & Ignition System. | Appr Time: | 08 Hrs |
| a | Course Outcomes | - | Blooms Level |
| - | The student should be able to: | - | Level |
| 1 | Explain the working of steering, suspension systems and illustrate the different ignition system. | CO3 | L2 |
| b | Course Schedule | | |
| Class No | Module Content Covered | CO | Level |
| 1 | Steering geometry and types of steering. | CO3 | L2 |
| 2 | Gear box-Power Steering. Types of Front Axle. | CO3 | L2 |
| 3 | Suspension, Torsion bar suspension systems. | CO3 | L2 |
| 4 | Leaf spring, coil spring system. | CO3 | L2 |
| 5 | Independent suspension for front wheel. | CO3 | L2 |
| 6 | Independent suspension for rear wheel. | CO3 | L2 |
| 7 | Air suspension system. | CO3 | L2 |
| 8 | Battery Ignition system. | CO3 | L2 |
| 9 | Magneto Ignition system. | CO3 | L2 |
| 10 | Electronic Ignition system. | CO3 | L2 |
| c | Application Areas | CO | Level |
| 1 | Most modern cars use the rack and pinion steering mechanism. | CO3 | L2 |
| 2 | Spark ignition engines are critically dependent on repeatable, reliable ignition to produce good performance and low pollutant emissions. | CO3 | L2 |
| d | Review Questions | - | - |
| 1 | Name the different types of Ignition systems. With neat sketch, explain Battery Ignition system. | CO3 | L2 |
| 2 | With neat circuit diagram, explain the principles of Electronic Ignition system. | CO3 | L2 |
| 3 | What do you mean by Ignition advance? List and explain any two factors affecting ignition advance. | CO3 | L2 |
| 4 | Write a short note on Propeller shaft. | CO3 | L2 |
| 5 | With neat sketches, explain the Hotchkiss and Torque tube drives. | CO3 | L2 |
| 6 | Explain briefly the working of Power steering. | CO3 | L2 |
| 7 | What are the requirements of suspension system? With neat sketch, explain the working of leaf spring. | CO3 | L2 |
| 8 | Differentiate between disc brakes and drum brakes. | CO3 | L2 |
| 9 | With a neat diagram, explain the battery ignition system. | CO3 | L2 |
| 10 | Draw and explain a typical electronic ignition system. | CO3 | L2 |
| 11 | Explain vacuum advance mechanism with a neat figure. | CO3 | L2 |
| 12 | With a neat sketch, explain the working of Hotchkiss drive. | CO3 | L2 |
| 13 | Describe worm and wheel steering gear with a neat sketch. | CO3 | L2 |



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| 14 | The wheel base of a car is 2.7 m and pivot centers are at 1 meter. The wheel track is 1.2 m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is 40°. | CO3 | L3 |
| 15 | List out the spark ignition and compression ignition engines components and mention its functions. | CO3 | L2 |
| 16 | What is air swirl? What are the methods of swirl generation in compression ignition engine? | CO3 | L2 |
| 17 | List out the different types of ignition system. Explain the construction and working principle of electronic ignition system | CO3 | L2 |
| 18 | Draw neat circuit diagram of battery ignition system and explain the functions of various component in the system. | CO3 | L2 |
| 19 | Explain the working principle of the telescopic type shock absorber with a neat sketch. | CO3 | L2 |
| e | Experiences | - | - |
| 1 | | | |
| 2 | | | |

Module – 4

| | | | |
|-----------------|--|-------------------|---------------|
| Title: | Supercharges and Turbochargers & Fuels, Fuel Supply Systems For SI and CI Engines. | Appr Time: | 08 Hrs |
| a | Course Outcomes | - | Blooms |
| - | The student should be able to: | - | Level |
| 1 | Explain the working of Superchargers and Turbocharger & classify fuels and injection systems. | CO4 | L2 |
| b | Course Schedule | | |
| Class No | Module Content Covered | CO | Level |
| 1 | Naturally aspirated engines, Forced Induction. | CO4 | L2 |
| 2 | Types of superchargers and construction and operation. | CO4 | L2 |
| 3 | Turbocharger construction and operation. Inter cooler, Turbocharger lag. | CO4 | L2 |
| 4 | Conventional fuels, alternative fuels. | CO4 | L2 |
| 5 | Normal and abnormal combustion, cetane and octane numbers. | CO4 | L2 |
| 6 | Fuel mixture requirements for SI engines. | CO4 | L2 |
| 7 | Types of carburetors, C.D.& C.C. carburetors. | CO4 | L2 |
| 8 | Multi point and single point fuel injection systems. | CO4 | L2 |
| 9 | Fuel transfer pumps, Fuel filters, fuel injection pumps and injectors. | CO4 | L2 |
| 10 | Electronic Injection system, Common Rail Direct Injection System. | CO4 | L2 |
| c | Application Areas | CO | Level |
| 1 | superchargers can be used to improve low speed transient response in downsized and down speed engines. | CO4 | L2 |



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| 2 | Electronic Fuel Injection System to a Single Cylinder, Four Stroke Engine. | CO4 | L2 |
| d | Review Questions | - | - |
| 1 | With neat sketch, explain the normal and abnormal combustion in SI engines. | CO4 | L2 |
| 2 | What are the main functions of carburetor? With neat sketch, explain Zenith carburetor. | CO4 | L2 |
| 3 | What do you mean by Cetane and Octane numbers? | CO4 | L2 |
| 4 | Explain briefly the alternate fuels for IC engines. | CO4 | L2 |
| 5 | Distinguish between Supercharging and Turbocharging. | CO4 | L2 |
| 6 | With neat sketch, explain any one type of supercharger. | CO4 | L2 |
| 7 | With neat sketch, explain the construction and operation of Turbocharger. | CO4 | L2 |
| 8 | Describe fuel mixture requirements of S.I.Engine. | CO4 | L2 |
| 9 | Draw a typical diesel engine fuel injector and explain its working. | CO4 | L2 |
| 10 | Define the terms cetane number and octane number. How they are related to knocking phenomenon in IC engines? | CO4 | L2 |
| 11 | Define super charging. Also explain centrifugal type supercharger. | CO4 | L2 |
| 12 | Enumerate the advantages of turbocharging in diesel engines. | CO4 | L2 |
| 13 | Write a brief note on inter cooler. | CO4 | L2 |
| 14 | What is octane and Cetane ratings for petrol and diesel fuel? | CO4 | L2 |
| 15 | Explain the construction and working principle of zenith carburetor with neat sketch | CO4 | L2 |
| 16 | Explain the working principle of electrical fuel pump with neat sketch. | CO4 | L2 |
| 17 | What do you understand by the term supercharging and turbo-charging? | CO4 | L2 |
| 18 | Explain the centrifugal type and Root 's supercharger with neat sketch. | CO4 | L2 |
| 19 | Explain any three methods of turbo-charging. | CO4 | L2 |
| e | Experiences | - | - |
| 1 | | | |
| 2 | | | |

E2. CIA EXAM – 2

a. Model Question Paper – 2

| | | | | | | | | |
|-----------|------------------------|--|----|--------|----|--------------|------------|--------------|
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 30 | Time: | 75 minutes | |
| Course: | AUTOMOBILE ENGINEERING | | | | | | | |
| - | - | Note: Answer any 2 questions, each carry equal marks. | | | | Marks | CO | Level |
| 1 | a | Name the different types of Ignition systems. With neat sketch, explain Battery Ignition system. | | | | 7 | 3 | L2 |
| | b | With neat sketches, explain the Hotchkiss and Torque tube drives. | | | | 8 | 3 | L2 |
| OR | | | | | | | | |
| 2 | a | Explain briefly the working of Power steering. | | | | 7 | 3 | L2 |
| | b | With neat circuit diagram, explain the principles of Electronic Ignition system. | | | | 8 | 3 | L2 |



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| 3 | a | With neat sketch, explain the construction and operation of Turbocharger. | 8 | 4 | L2 |
| | b | Explain the construction and working principle of zenith carburetor with neat sketch. | 7 | 4 | L2 |
| OR | | | | | |
| 4 | a | With neat sketch, explain any one type of supercharger. | 8 | 4 | L2 |
| | b | Draw a typical diesel engine fuel injector and explain its working. | 7 | 4 | L2 |

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

| Model Assignment Questions | | | | | | | |
|---|------------------------|---|----|--------|--------|-------|------------------|
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 5 / 10 | Time: | 90 – 120 minutes |
| Course: | AUTOMOBILE ENGINEERING | | | | | | |
| Note: Each student to answer 2-3 assignments. Each assignment carries equal mark. | | | | | | | |
| SNo | USN | Assignment Description | | | Marks | CO | Level |
| 1 | | Name the different types of Ignition systems. With neat sketch, explain Battery Ignition system. | | | 5 | CO3 | L2 |
| 2 | | With neat circuit diagram, explain the principles of Electronic Ignition system. | | | 5 | CO3 | L2 |
| 3 | | What do you mean by Ignition advance? List and explain any two factors affecting ignition advance. | | | 5 | CO3 | L2 |
| 5 | | Write a short note on Propeller shaft. | | | 5 | CO3 | L2 |
| 6 | | With neat sketches, explain the Hotchkiss and Torque tube drives. | | | 5 | CO3 | L2 |
| 7 | | Explain briefly the working of Power steering. | | | 5 | CO3 | L2 |
| 8 | | What are the requirements of suspension system? With neat sketch, explain the working of leaf spring. | | | 5 | CO3 | L2 |
| 9 | | Differentiate between disc brakes and drum brakes. | | | 5 | CO3 | L2 |
| 10 | | With a neat diagram, explain the battery ignition system. | | | 5 | CO3 | L2 |
| 11 | | Draw and explain a typical electronic ignition system. | | | 5 | CO3 | L2 |
| 12 | | Explain vacuum advance mechanism with a neat figure. | | | 5 | CO3 | L2 |
| 13 | | With a neat sketch, explain the working of Hotchkiss drive. | | | 5 | CO3 | L2 |
| 14 | | Describe worm and wheel steering gear with a neat sketch. | | | 5 | CO3 | L2 |
| 15 | | The wheel base of a car is 2.7 m and pivot centers are at 1 meter. The wheel track is 1.2 m. Calculate the correct angle of outside lock and turning circle radius of the outer front and inner rear wheels when the angle of inside lock is 40°. | | | 5 | CO3 | L3 |
| 16 | | List out the spark ignition and compression ignition engines components and mention its functions. | | | 5 | CO3 | L2 |
| 17 | | What is air swirl? What are the methods of swirl generation in compression ignition engine? | | | 5 | CO3 | L2 |
| 18 | | List out the different types of ignition system. Explain the construction and working principle of electronic ignition system | | | 5 | CO3 | L2 |
| 19 | | Draw neat circuit diagram of battery ignition system and explain the functions of various component in the system. | | | 5 | CO3 | L2 |
| 20 | | Explain the working principle of the telescopic type shock | | | 5 | CO3 | L2 |



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| | | absorb-er with a neat sketch. | | | |
| 21 | | With neat sketch, explain the normal and abnormal combustion in SI engines. | 5 | CO4 | L2 |
| 22 | | What are the main functions of carburetor? With neat sketch, explain Zenith carburetor. | 5 | CO4 | L2 |
| 23 | | What do you mean by Cetane and Octane numbers? | 5 | CO4 | L2 |
| 24 | | Explain briefly the alternate fuels for IC engines. | 5 | CO4 | L2 |
| 25 | | Distinguish between Supercharging and Turbo-charging. | 5 | CO4 | L2 |
| 26 | | With neat sketch, explain any one type of supercharger. | 5 | CO4 | L2 |
| 27 | | With neat sketch, explain the construction and operation of Turbocharger. | 5 | CO4 | L2 |
| 28 | | Describe fuel mixture requirements of S.I.Engine. | 5 | CO4 | L2 |
| 29 | | Draw a typical diesel engine fuel injector and explain its working. | 5 | CO4 | L2 |
| 30 | | Define the terms cetane number and octane number. How they are related to knocking phenomenon in IC engines? | 5 | CO4 | L2 |
| 31 | | Define super charging. Also explain centrifugal type supercharger. | 5 | CO4 | L2 |
| 32 | | Enumerate the advantages of turbo-changing in diesel engines. | 5 | CO4 | L2 |
| 33 | | Write a brief note on inter-cooler. | 5 | CO4 | L2 |
| 34 | | What is octane and Cetane ratings for petrol and diesel fuel? | 5 | CO4 | L2 |
| 35 | | Explain the construction and working principle of zenith carburetor with neat sketch | 5 | CO4 | L2 |
| 36 | | Explain the working principle of electrical fuel pump with neat sketch. | 5 | CO4 | L2 |
| 37 | | What do you understand by the term supercharging and turbo-charging? | 5 | CO4 | L2 |
| 38 | | Explain the centrifugal type and Root 's supercharger with neat sketch. | 5 | CO4 | L2 |
| 39 | | Explain any three methods of turbo-charging. | 5 | CO4 | L2 |

D3. TEACHING PLAN – 3

Module – 5

| | | | |
|-----------------|---|------------|---------------|
| Title: | Automotive Emission Control Systems and Emission Standards. | Appr Time: | 08 Hrs |
| a | Course Outcomes | - | Blooms |
| - | The student should be able to: | - | Level |
| 1 | Relate the cause of automobile emissions and its effects on environment also summarize methods to reduce the emissions. | CO5 | L2 |
| b | Course Schedule | | |
| Class No | Module Content Covered | CO | Level |
| 1 | Different air pollutants, formation of photo chemical smog and causes. | CO5 | L2 |
| 2 | Automotive emission controls. | CO5 | L2 |
| 3 | Controlling crankcase emissions. | CO5 | L2 |
| 4 | Controlling evaporative emissions. | CO5 | L2 |



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| 5 | Controlling the air-fuel mixture. | CO5 | L2 |
| 6 | Controlling the combustion process. | CO5 | L2 |
| 7 | Exhaust gas re-circulation, Treating the exhaust gas, Cleaning the exhaust gas. | CO5 | L2 |
| 8 | Air-injection system, Air-aspirator system, Catalytic converter. | CO5 | L2 |
| 9 | EMISSION STANDARDS: Euro I, II Euro III and IV norms. | CO5 | L2 |
| 10 | Bharat Stage II, III, IV norms. Motor Vehicle Act. | CO5 | L2 |
| | | | |
| c | Application Areas | CO | Level |
| 1 | Vehicle emissions control Unit is the study of reducing the emissions produced by motor vehicle, especially IC Engines. | CO5 | L2 |
| | | | |
| d | Review Questions | - | - |
| 1 | Write short notes on: i) Catalytic converter ii) Controlling crank case emissions. | CO5 | L2 |
| 2 | With the relevant sketch, explain the working of Exhaust Gas Re-circulation [EGR]. | CO5 | L2 |
| 3 | Write short notes on Euro – II and Euro – III norms. | CO5 | L2 |
| 4 | Explain Exhaust Gas Re-circulation (EGR) with a neat diagram. | CO5 | L2 |
| 5 | With a neat sketch, explain the catalytic converter. | CO5 | L2 |
| 6 | How the air injection system helps in reducing overall emission effect? | CO5 | L2 |
| 7 | List out the methods of controlling the engine emission. | CO5 | L2 |
| 8 | What is catalytic converter? How they are helpful in reducing exhaust gas emission? Explain with neat sketch the 3—way catalytic converter system. | CO5 | L2 |
| | | | |
| e | Experiences | - | - |
| 1 | | | |
| 2 | | | |
| | | | |

E3. CIA EXAM – 3

a. Model Question Paper – 3

| | | | | | | | | |
|-----------|------------------------|--|----|--------|----|-------------------|------------|--------------|
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 30 | Time: | 75 minutes | |
| Course: | AUTOMOBILE ENGINEERING | | | | | | | |
| - | - | Note: Answer any 2 questions, each carry equal marks. | | | | Mark s | CO | Level |
| 1 | a | Write short notes on: i) Catalytic converter ii) Controlling crank case emissions. | | | | 7 | 5 | L2 |
| | b | How the air injection system helps in reducing overall emission effect? | | | | 8 | 5 | L2 |
| | | OR | | | | | | |
| 2 | a | Explain the controlling of crank case emissions, with sketch. | | | | 7 | 5 | L2 |
| | b | What are catalytic converters? How they are helpful in reducing HC, CO and No X emissions. | | | | 8 | 5 | L2 |



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|-----------|---|--|---|---|----|
| 3 | a | With the relevant sketch, explain the working of Exhaust Gas Re-circulation [EGR]. | 8 | 5 | L2 |
| | b | Write short notes on Euro – II and Euro – III norms. | 7 | 5 | L2 |
| OR | | | | | |
| 4 | a | What is catalytic converter? How they are helpful in reducing exhaust gas emission? Explain with neat sketch the 3—way catalytic converter system. | 8 | 5 | L2 |
| | b | List out the methods of controlling the engine emission. | 7 | 5 | L2 |

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

| Model Assignment Questions | | | | | | | |
|---|------------------------|--|----|--------|--------|-------|------------------|
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 5 / 10 | Time: | 90 – 120 minutes |
| Course: | AUTOMOBILE ENGINEERING | | | | | | |
| Note: Each student to answer 2-3 assignments. Each assignment carries equal mark. | | | | | | | |
| SNo | USN | Assignment Description | | | Marks | CO | Level |
| 1 | | With the relevant sketch, explain the working of Exhaust Gas Re-circulation [EGR]. | | | 5 | CO5 | L2 |
| 2 | | Write short notes on Euro – II and Euro – III norms. | | | 5 | CO5 | L2 |
| 3 | | Explain Exhaust Gas Re-circulation (EGR) with a neat diagram. | | | 5 | CO5 | L2 |
| 4 | | With a neat sketch, explain the catalytic converter. | | | 5 | CO5 | L2 |
| 5 | | How the air injection system helps in reducing overall emission effect? | | | 5 | CO5 | L2 |
| 6 | | List out the methods of controlling the engine emission. | | | 5 | CO5 | L2 |
| 7 | | What is catalytic converter? How they are helpful in reducing exhaust gas emission? Explain with neat sketch the 3—way catalytic converter system. | | | 5 | CO5 | L2 |
| 8 | | What are the methods used to reduce amount of pollutants in the exhaust gas? | | | 5 | CO5 | L2 |
| 9 | | What are catalytic converters? How they are helpful in reducing HC, CO and NoX emissions. | | | 5 | CO5 | L2 |
| 10 | | With neat sketch, explain exhaust gas re-circulation system. | | | 5 | CO5 | L2 |
| 11 | | Briefly explain crankcase emissions controlling. | | | 5 | CO5 | L2 |
| 12 | | Explain with diagram the Exhaust Gas Circulation System. | | | 5 | CO5 | L2 |
| 13 | | Write a note on emission standards. | | | 5 | CO5 | L2 |
| 14 | | Explain the working of a positive crank case ventilation system. | | | 5 | CO5 | L2 |

F. EXAM PREPARATION

1. University Model Question Paper

| | | | | | | | | |
|-----------------|------------------------|--|----|--------|--------------|-----------|-------------|-------|
| Course: | AUTOMOBILE ENGINEERING | | | | Month / Year | May /2018 | | |
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 80 | Time: | 180 minutes | |
| - | Note | Answer all FIVE full questions. All questions carry equal marks. | | | | Marks | CO | Level |
| Module-1 | | | | | | | | |
| 1 | a | Explain wet and dry liners with the help of diagrams. | | | | 8 | CO1 | L2 |
| | b | Explain the various methods of cylinder arrangements in multi-cylinder engine. | | | | 8 | CO1 | L2 |



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| | | | | | |
|-----------------|---|--|----|-----|----|
| OR | | | | | |
| 2 | a | Explain the working principle of hybrid vehicle with the block diagram. | 8 | CO1 | L2 |
| | b | With a neat sketch, explain pump circulation system of water cooling. | 8 | CO1 | L2 |
| Module-2 | | | | | |
| 3 | a | With a neat sketch, explain the construction and working of single plate clutch. | 8 | C02 | L2 |
| | b | Explain the construction and working principle of torque converter. | 8 | CO2 | L2 |
| OR | | | | | |
| 4 | a | Explain master cylinder of hydraulic parking system with a neat sketch. | 10 | CO2 | L2 |
| | b | Differentiate between disc brakes and drum brakes. | 6 | CO2 | L2 |
| Module-3 | | | | | |
| 5 | a | Explain the effect of following on steering (i) Camber (ii) Castor (iii) King pin inclination (iv) toe-in (v) toe-out. | 10 | CO3 | L2 |
| | b | With a neat sketch, explain the working of torsion bar. | 6 | CO3 | L2 |
| OR | | | | | |
| 6 | a | What are the requirements of a suspension system? Explain the air-suspension system with a neat sketch. | 8 | CO3 | L2 |
| | b | List out the different types of ignition system. Explain the construction and working principle of electronic ignition system. | 8 | CO3 | L2 |
| Module-4 | | | | | |
| 7 | a | Define supercharging. Also explain the centrifugal type supercharger. | 8 | CO4 | L2 |
| | b | Explain with a neat sketch normal and abnormal combustion in SI engine. | 8 | CO4 | L2 |
| OR | | | | | |
| 8 | a | Explain the construction and working principle of Zenith carburetor with neat sketch. | 8 | CO4 | L2 |
| | b | With neat sketch, explain the working of electron IC fuel injection system. | 8 | CO4 | L2 |
| Module-5 | | | | | |
| 9 | a | What is catalytic converter? How they are helpful in reducing exhaust gas emission? Explain with neat sketch the 3-way catalytic converter system. | 8 | CO5 | L2 |
| | b | Explain the controlling of crank case emission with sketch. | 8 | CO5 | L2 |
| OR | | | | | |
| 10 | a | What are the methods used to reduce amount of pollutants in the exhaust gas? Explain the Exhaust Gas Recirculation (EGR) with a neat diagram. | 10 | CO5 | L2 |
| | b | Write a note on emission standards. | 6 | CO5 | L2 |

2. SEE Important Questions

| | | | | | | | |
|-----------|--|---|----|--------|--------------|-----------|-------------|
| Course: | AUTOMOBILE ENGINEERING | | | | Month / Year | May /2018 | |
| Crs Code: | 17ME655 | Sem: | VI | Marks: | 80 | Time: | 180 minutes |
| | Note Answer all FIVE full questions. All questions carry equal marks. | | | | | - | - |
| Module | Q no. | Important Question | | | Marks | CO | Year |
| | 1 | Draw the valve time diagram for a 4 – stroke Spark Ignition (Si) engine and explain? | | | 16 / 20 | CO1 | 2017/18 |
| | 2 | Why cooling is necessary for I.C engines? Explain thermo siphon cooling with neat sketch. | | | | CO1 | 2017 |
| | 3 | What is Swirl? Explain the different methods of Swirl generation. | | | | CO1 | 2016 |



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|---|---|--|---------|-----|------|
| | 4 | Explain wet and dry liners with the help of diagrams. | | CO1 | 2016 |
| 2 | 1 | Draw and explain the layout of air braking system. | 16 / 20 | CO2 | 2016 |
| | 2 | Explain the construction and working principle of multi plate clutch. | | CO2 | 2015 |
| | 3 | Explain with diagram the working of constant mesh gear box and mention its advantages over sliding mesh gear box. | | CO2 | 2009 |
| | 4 | What is the function of differential? Explain its operating principle with neat diagram. | | CO2 | 2016 |
| 3 | 1 | Name the different types of Ignition systems. With neat sketch, explain Battery Ignition system. | 16 / 20 | CO3 | 2016 |
| | 2 | With neat circuit diagram, explain the principles of Electronic Ignition system. | | CO3 | 2016 |
| | 3 | What do you mean by Ignition advance? List and explain any two factors affecting ignition advance. | | CO3 | 2018 |
| | 4 | Write a short note on Propeller shaft. | | CO3 | 2015 |
| 4 | 1 | Explain the construction and working principle of zenith carburetor with neat sketch | 16 / 20 | CO4 | 2015 |
| | 2 | Explain the working principle of electrical fuel pump with neat sketch. | | CO4 | 2016 |
| | 3 | What do you understand by the term supercharging and turbo-charging? | | CO4 | 2017 |
| | 4 | Explain the centrifugal type and Root 's supercharger with neat sketch. | | CO4 | 2018 |
| | 5 | Explain any three methods of turbo-charging. | | | |
| 5 | 1 | List out the methods of controlling the engine emission. | 16 / 20 | CO5 | 2009 |
| | 2 | What is catalytic converter? How they are helpful in reducing exhaust gas emission? Explain with neat sketch the 3—way catalytic converter system. | | CO5 | 2017 |
| | 3 | What are the methods used to reduce amount of pollutants in the exhaust gas? | | CO5 | 2018 |
| | 4 | What are catalytic converters? How they are helpful in reducing HC, CO and NoX emissions. | | CO5 | 2018 |

G. Content to Course Outcomes

1. Concepts and Outcomes:

Table 1: Concept to Outcome – Example Course

| Sem | Course Code | Unit Title | Key Concept | Explanation (What all Learning Happened, A short word for the learning) | Level |
|-----|-------------|--|--|--|-------|
| 6 | 17ME655.1 | IC Engine Cooling and lubrication system | Engine components and It's Parts Types of cooling and lubricating | Students should able to know the Engine components and It's Parts. learn about types of cooling and lubricating system and working of different system of cooling and lubricating like thermo siphon | L2 |



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| | | | | | |
|---|-----------|---|--|---|----|
| | | | system | system, forced circulation water cooling system, thermostat valves. Significance of lubrication, splash and forced feed system. | |
| 6 | 17ME655.2 | Transmission system Braking system | Power transmission Safety | Students will learn about types of transmission systems namely clutches gears and differentials. And learn different types of braking system. | L2 |
| 6 | 17ME655.3 | Steering and suspension system Ignition system | Controlling devices Types of ignition | Students will learn about Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Suspension, leaf spring, coil spring, independent suspension for front wheel and rear wheel, Air suspension system. Learning of Battery Ignition system, Magneto Ignition system, and electronic Ignition system. | L2 |
| 6 | 17ME655.4 | Super and Turbochargers Fuel system | Power boosters Lubrication | Learning about Types of superchargers, Turbocharger construction and operation, Inter-cooler, Turbocharger lag. Learning things are Conventional fuels, alternative fuels, normal and abnormal combustion, types of carburetors, C.D.& C.C. carburetors, Electronic Injection system, Common Rail Direct Injection System. | L2 |
| 6 | 17ME655.5 | Emission control Emission standards | Controlling pollution Norms | About Different air pollutants, formation of photo-chemical smog and causes. Automotive emission controls, Euro I, II, III and IV norms, Bharat Stage II, III, IV norms. Motor Vehicle Act. | L2 |