

Academic Year	AUG - DEC 2023
Semester	THIRD
Course Code	AEPC 211
Course Name	Production Process
Course Type	PROGRAMME CORE
L-DCS-T-P	2-2-0-0
Name of Faculty	Deepak Sandhu
Semester Start & End Dates	10-08-2023 TO 04-12-2023

### STUDY AND EVALUATION SCHEME

Sr. No.	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	Production Process	2	2	0	40	0	40	60	3	0	0	60	100

HOURS	Unit & Topic of Discussion	Topic Details	Delivery Method
<b>Unit-1</b>			
12 HOURS	<b>Manufacturing Processes:</b>	General machine Tools, Description and functions of main parts, Cutting Parameters, Principles of Turning, Drilling, Boring, Shaping, Planing, Slotting and Grinding, Milling and Super finishing.	
<b>Unit-2</b>			
11 HOURS	<b>Foundry Practice:</b>	Pattern Making ,Types of Pattern, Pattern Materials, Pattern Allowances Introduction to Core ,Moulding: Introduction to Moulding, Types of Moulding Sand and their properties, Melting and pouring, Defect in castings, Simple Arc & Gas Welding	
<b>Unit-3</b>			
11 HOURS	<b>Metal forming processes &amp; Powder Metallurgy::</b>	Metal forming processes & Powder Metallurgy:	
	<b>Powder Metallurgy:</b>	Methods of metal formation, Advantages and disadvantages of Power Metallurgy, Applications.	
<b>Unit 4</b>			
11 HOURS	<b>Modern Machining Processes:</b>	Processes, Procedures, Advantages, Limitations and Applications of Electro discharge machining, Electro chemical Machining, USM, AJM and LBM.	

**Unit 5**

11 HOURS	<b>Numerical Control of Machine Tools:</b>	Introduction to Numerical control of machine tools, NC Machines, CNC machines, Direct numerical control, Advantages and disadvantages of CNC machines, Fundamentals of Part Programming, Manual part Programming, Computer aided part programming.
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	Name of Book	Author Name	Publication
Prescribed Books	Workshop Technology	Vol-I & II by Hazara & Chowdery	Asia Publishing House
	Workshop Technology	B.K. Manchanda	H. Tata Publications, Delhi.

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Academic Year	AUG - DEC 2023
Semester	THIRD
Course Code	AEPC 209
Course Name	Garage Equipment
Course Type	PROGRAMME CORE
L-DCS-T-P	2-1-0-0
Name of Faculty	Deepak Sandhu
Semester Start & End Dates	10-08-2023 TO 04-12-2023

## STUDY AND EVALUATION SCHEME

Sr. No.	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	Garage Equipment	2	1	0	40	0	40	60	3	0	0	60	100

HOURS	Unit , Topic of Discussion	Topic Details	Delivery Method
<b>Unit-1</b>			
12 HOURS	<b>General Equipment Specifications and applications of:</b>	Drilling machine (portable) along with set of drills Bench grinder Air compressor and pneumatic gun Hydraulic and electric hoists High pressure washing equipment (Car washer, Car vacuum cleaner, Buffing tool) Oil sprayers Grease Guns-manual and bucket type, pneumatic Tyre inflation gauge (Manual and Digital type automatic) Tyre Changer (Manual and Automatic) Creepers Fire extinguisher First aid box	
<b>Unit-2</b>			
12 HOURS	<b>Tuning and Testing Equipment Specifications and applications of:</b>	Vacuum Gauge, Compression Gauge (Pressure Gauge) Distributor Tester, Cam (dwell) angle tester, r.p.m. tester. Battery Tester Spark plug cleaner and tester Ignition timing light Fuel injector tester Fuel consumption tester.	
<b>Unit-3</b>			
12 HOURS	<b>Engine Repair Tools/Measuring and Testing Equipment Specifications and applications of:</b>	Torque wrench, pneumatic wrench Piston ring compressor Valve lifter and valve spring tester Piston ring files, groove cleaner Scrappers Piston ring remover Cylinder Dial gauge Smoke meter Engine Analyser/Scanner Part degreasing tank	

Unit 4		
10 HOURS	<b>Electrical Repair Equipment Specifications and uses of:</b>	Electrical Test Bench Battery Charger Head Lights Beam Aligner and Tester (Electronic and Digital type) Growler
Unit 5		
10 HOURS	<b>Reconditioning/Testing Equipment for Chassis and Body Use of:</b>	Brake Efficiency Tester (Chassis Dynamometer) or brake testing equipment Clutch Fixtures and Brake Line Riveters, pop riveting gun Crane and Chain Pulley Block Jacks mechanical, hydraulic, trolley type Paint chamber Paint Spray Gun Paint Drying Equipment Tools for tyres, automatic tyre remover Jib crane Spring tester Frame strengthening equipment Chassis alignment equipment Computerized wheel balancer -static and dynamic Computerized wheel alignment equipment Valve Refacer, Valve Seat Cutting and Grinding Radiator Tester Cylinder head leakage testing fixture Fuel injector tester Nozzle cleaning equipment.

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	Name of Book	Author Name	Publication
Prescribed Books	Automobile Engineering	Vol. I- II by Dr. Kirpal Singh,	Standard Publishers
	Garage Equipment	G.S.Aulakh,	Eagle Prakashan, Jalandhar.

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Academic Year	AUG - DEC 2023
Semester	THIRD
Course Code	AEPC 207
Course Name	Automotive Chassis,Body&Transmission-1
Course Type	PROGRAMME CORE
L-DCS-T-P	3-2-0-0
Name of Faculty	Deepak Sandhu
Semester Start & End Dates	10-08-2023 TO 04-12-2023

## STUDY AND EVALUATION SCHEME

Sr. No.	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	Automotive Chassis,Body&Transmission-1	3	1	0	40	0	40	60	3	0	0	60	100

HOURS	Unit , Topic of Discussion	Topic Details	Delivery Method
<b>Unit-1</b>			
12 HOURS	<b>Chassis and Body:</b>	Classification of vehicles, types of chassis, layout of conventional type of chassis, function and arrangement of major assemblies. Alternating arrangement used such as engine position, drive types, their merits and demerits., types of frame and body streamlining, cross members, brackets, materials of frame and body upholstery	
<b>Unit-2</b>			
11 HOURS	<b>Clutch:</b>	Necessity, function and requirements of clutch, types of clutch - single plate clutch, multi plate clutch, hydraulic power assisted and wet and dry plate clutch, clutch plate and lining material Constructional details and working of centrifugal, semi centrifugal clutch, diaphragm clutch and fluid coupling.	
<b>Unit-3</b>			
11 HOURS	<b>Transmission:</b>	Necessity, function and types of manual transmission- Sliding, constant mesh and synchromesh. Over drive, over running clutch, description and operation of transfer gear box. Common faults and remedies, trans axle construction. Types of automatic transmission and their main components. Epicyclic gearbox-construction, working and determination of speed ratio Torque converter. Construction, principle of working. Continuously variable transmission, Automated Manual Transmission, hydrostatic transmission systems, direct shift gear box (DSG).	

Unit 4		
11 HOURS	<b>Final Drive:</b>	Propeller shaft-function, construction details. Universal joints-functions and types. Types of final drive - hotchkiss drive, torque tube drive. Differential -principle, functions and it's working. Rear axles- semi floating, three quarter floating. Fully floating. Common faults and remedies
Unit 5		
11 HOURS	<b>Front Axle &amp; Steering:</b>	Types - Stub double drop, fully dropped, load distribution, effect of braking on axle shape, steering head, Elliot and reverse elliot, steering knuckle. Steering mechanism, function, Ackerman's Principle of steering. Working and constructional details of steering gear, steering linkages, sector arm, center arm, drag link and tie rod, steering ratio. Front wheel geometry-castor, camber, steering axis inclination, toe in and toe out. Cornering force, cornering power and self-righting torque. Over steering and under steering. Traction control system, Power steering- necessity, types, Construction features and working of hydraulic and electronic power steering systems ,four wheel steering, adjustable steering -rake and telescopic type, Common steering systems troubles and remedies

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	Name of Book	Author Name	Publication
Prescribed Books	Automobile Engineering	Vol. I- II by Dr. Kirpal Singh,	Standard Publishers
	Chassis, Body and Transmission-I	G.S.Aulakh,	Eagle Prakashan, Jalandhar.

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Academic Year	AUG - DEC 2023
Semester	THIRD
Course Code	AEPC 205
Course Name	Automotive Materials
Course Type	PROGRAMME CORE
L-DCS-T-P	2-1-0-0
Name of Faculty	Deepak Sandhu
Semester Start & End Dates	10-08-2023 TO 04-12-2023

## STUDY AND EVALUATION SCHEME

Sr. No.	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	Automotive Materials	2	1	0	40	0	40	60	3	0	0	60	100

HOURS	Unit , Topic of Discussion	Topic Details	Delivery Method
<b>Unit-1</b>			
12 HOURS	<b>Properties of Materials:</b>	Classification: Metals and non-metals, Ferrous and non-ferrous metals and their alloys, Names of common metals, their alloys and non-metals used in Automobile Industry, Properties of metals and alloys, Physical properties - Appearance, luster, color, density and melting point, Mechanical Properties: Strength, stiffness, elasticity, plasticity, toughness, ductility, malleability, brittleness, hardness, fatigue and creep. Thermal and electrical conductivity and corrosion resistance.	
<b>Unit-2</b>			
12 HOURS	<b>a) Ferrous Metals and Alloys:</b>	Effect of alloying elements such as Aluminium, chromium, Nickel, Cobalt, Manganese, Molybdenum, tungsten, Vanadium, Silicon, Sulphur and Phosphorus. Composition, properties, grades and uses of alloy steels such as High speed steel, Stainless steel, Silicon steel, Heat resistant steel, Spring steel.	
	<b>b) Heat Treatment:</b>	Iron-carbon diagram, objectives and practical aspects of heat treatment. Description and uses of principal heat treatment processes Annealing, Normalizing, Tempering, Hardening, Carburising, Nitriding and Cyaniding and applications. Case hardening and surface hardening, Hardenability of steels, Examples in heat treating automobile engineering components.	



**Unit-3**

10 HOURS	<b>Non-ferrous Metals and Alloys:</b>	<p>Copper: Properties and uses, Composition, properties and uses of copper alloys. Brass: Cartridge brass, Nickel silver. Bronze: Phosphor bronze, Albronze, Mn-bronze, and Gunmetal.</p> <p>Properties and uses of Aluminium and their grades</p> <p>Composition, properties and uses of Al-alloys e.g., Duralumin, Yellow metal, Magnesium and Hindalium</p> <p>Properties and uses of alloys of lead, tin and magnesium. Bearing Metal: Requisite qualities. Composition, properties and uses of white metal bearing. Copper based bearing metals. Aluminium based bearing metals. Use of nylon/PTFE for bushes/bearings, bi-metallic and tri-metallic bushes</p>
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**Unit 4**

10 HOURS	<b>Identification and Examination of Metals and Alloys:</b>	<p>Identification tests - Appearance, sound, filing, weight, magnetic, spark, bend and microstructure.</p>
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**Unit 5**

10 HOURS	<b>Other Important Materials:</b>	<p>Plastics: Definition, classification of plastics, fibre glass, reinforced plastics. Major applications of various plastics with specific mention of their uses and grades, Heat insulating materials: Properties and uses of asbestos, glass wool, thermocole, cork, mica. Sound insulating materials: Cork, fiberboards. Fabrication materials: Wood, plywood, Rubber - natural and synthetic, Glasses - plate glass, toughened glass, safety glass. Insulating materials: Asbestos, mica Electrical insulating materials, properties and uses of china clay, leather Bakelite, ebonite, glass wool, rubber felt Refractory materials: General characteristics and uses of dolomite, ceramics. Protective coating materials: Auto paints, primers, varnishes, enamels, putti, electroplating materials. Adhesive requirements types and advantages, thread locking special solution, anti-rust solution.</p>
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**CHALK-  
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	Name of Book	Author Name	Publication
Prescribed Books	Material Science	GBS Narang	Khanna Publishers, New Delhi
	Material Science	Metallurgy by RB Choudary	Khanna Publishers, New Delhi

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AT DHAULA KUAN, DISTT. SIRMOUR (HP) - 173031  
**DEPARTMENT OF MECHANICAL ENGINEERING**

**LESSON PLAN**

Academic Year	AUG - DEC 2023
Semester	THIRD
Course Code	AEPC 201
Course Name	Basics of Thermodynamics, Hydraulic and Pneumatic
Course Type	PROGRAMME CORE
L-DCS-P	3-2-0
Name of Faculty	Vishal Singh Chauhan
Semester Start & End Dates	10-08-2023 TO 04-12-2023

**STUDY AND EVALUATION SCHEME**

Sr. No.	Name of the Subject	Th	DCS	Pr	Internal Assessment			External Assessment					Total Marks
					Th	Pr	Total	Th	Hrs	Pr	Hrs	Total	
1.	Basics of Thermodynamics, Hydraulic and Pneumatic	3	2	0	40	0	40	60	3	0	0	60	100
2.	Basics of Thermodynamics, Hydraulics and Pneumatics Laboratory	0	0	2	0	40	40	0	0	60	3	60	100

HOURS	Unit , Topic of Discussion	Topic Details	Delivery Method
<b>Unit-1</b>			
11 HOURS	a) Principles of Thermal Engineering	Introduction, Thermodynamics properties – intensive and extensive, Property, path, process, system, surroundings, Heat and work Enthalpy and internal energy	
	b) Gas Laws	Boyle's law, Charle's law, Joule's law, Characteristic gas equation, gas constant, universal gas constant. Simple numerical problems. Modes of heat transfer, conduction, convection, radiation, Fourier's Law.	

<b>Unit-2</b>		
12 HOURS	<b>a) Law of Thermodynamics and Air Cycles</b>	Zeroth law of thermodynamics Irreversible process, First law of thermodynamics (concept only), Second law of thermodynamics (concept only), Thermal efficiency and heat pump, heat engine and heat sink Concept of entropy, Constant volume, constant pressure, isothermal, adiabatic, polytropic throttling and free expansion processes (concept only).
	<b>b) Air Cycles</b>	Carnot cycle, Otto cycle, Diesel cycle, and Dual combustion cycle
<b>Unit-3</b>		
11 HOURS	<b>Air Compressors</b>	Reciprocating air compressor, Centrifugal compressor working of single stage and double stage compressor and applications, Rotary air compressor and supercharger.
<b>Unit 4</b>		
11 HOURS	<b>Hydraulics</b>	Types of fluid, Properties of fluid, Pascal Law, Components of hydraulic systems, Function of each component in hydraulic circuit, Oil reservoir, filters, Hydraulic Jack, Hydraulic Press
<b>Unit 5</b>		
11 HOURS	<b>Pneumatics</b>	Basic components and their function, air cylinders – function, single acting and double acting, air filter, regulator, different types of control valves, concept of automation.

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MATERIALS  
TECHNOLOGY**

	Name of Book	Author Name	Publication
Prescribed Books	Thermal Engineering	P.L. Ballaney	Khanna Publishers, 2002
	Thermodynamics -I	Er. B.S. Ubhi	S.K. Kataria & Sons, Delhi

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### Lesson Plan

Name of the Teacher: Vishal Singh Chauhan  
Session: Aug-Dec 2023

Subject: ELEMENTS OF DESIGN, MECHANICS OF VEHICLES  
Class: 5th Sem. Auto. Engg.

Hrs.	Name of Chapter	Contents to be Taught	Remarks
4	Introduction	Design considerations, design procedure, Basic requirements	
		classifications of design and principles of good economic design	
		Standardization, interchangeability of Automobile parts with reference to IS specifications	
		Limits, fits and tolerances	
		Material selection and economics, Designing for strength	
11	Design of keys and couplings	Concept of Sunk Keys, Rectangular Keys, Square, Parallel, Crosshead, Woodruff Key	
		Design of rectangular key	
		Flange coupling, Muff coupling, Clamp coupling	
18	Design of Engine Parts	Cylinder liner and cylinder head - Brakes- Internal Expanding shoe brake	
		Piston - Connecting Rod	
		Clutch- Single Plate and Multi plate Clutch	
		Brakes- Internal Expanding shoe brake	
4	Simple Mechanism	Definition of link, kinematic pair, kinematic chain, Mechanism, inversions and machines. Simple examples of mechanism with: Lower pairs, Four bar chain, Slider crank chain, Double slider crank chain, Higher pairs	
7	Motion and Turning Moment	Displacement, velocity and acceleration of piston	
		Angular velocity and angular acceleration of connecting rod	
		Calculations of piston effort and crank effort at different angles	
		Fly wheel: types, weight and MOI - Fluctuation of energy for fly wheel	
		Turning moment diagrams with reference to internal combustion engines	
		Analysis of Hooke's Joint	
7	Power Transmission	Flat belt, V-belt and chain drives	
		Ratio of tension of two sides of the belt with and without centrifugal tension	
		Horse power transmitted and condition for maximum horse power transmitted	
		Velocity ratios transmitted by Belts, Simple, compound and epicyclic gear box	
5	Vehicle Control	Braking friction and limits of braking, Retardation and Braking force	
		calculations in case of front wheel, rear wheel and all wheel braking	
		Weight transfer during braking, Stopping distance and stopping time	
		Ackermann Steering Mechanism, Correct Steering angle	


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### Lesson Plan

Name of the Teacher: Vishal Singh Chauhan  
Session: Aug-Dec 2023

Subject: MECHATRONICS  
Class: 5th Sem. Auto. Engg.

Hrs.	Name of Chapter	Contents to be Taught	Remarks
4	Introduction	Introduction to Mechatronics, Mechatronic system, Measurement systems Control system-open Loop, Close loop and sequential, Microprocessor based controllers, The Mechatronics approach	
9	Sensors and Transducers	Sensors and transducers, Performance terminology, Displacement, position and motion sensors, Electromechanical sensors and transducers Force sensors, Liquid flow sensors, Temperature sensors, Light sensors, Selection of sensors, Simple problems	
7	Data Presentation Systems	Displays, Data presentation elements, Magnetic recording, Data acquisition systems Measurement systems, Testing and calibration Simple problems	
7	Pneumatic and Hydraulic Systems	Actuation systems, Pneumatic and hydraulic systems, Directional control valves Pressure control valves, Cylinders, Process control valves, Rotary actuators	
5	Mechanical Actuation Systems	Mechanical systems, Cams, Gear trains Ratchet and pawl, Belt and chain drives	
8	Electrical Actuation System	Electrical systems, Mechanical switches, Solid-state switches Solenoids, D.C. motors A.C. Motors, Stepper motors	
7	Microprocessors & PLC	Microcomputer structure, Microcontrollers, Applications Programmable logic controller – applications, Basic structure, input/output processing	
9	Microcomputer controlled devices and applications	SRS components, Crash avoidance features (ESC, TCS and ABS) Electronic control transmission, Collision avoidance radar warning system Keyless entry and automatic head lamps	

  
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### Lesson Plan

Name of the Teacher: Deepak Sandhu  
Session: Aug-Dec 2023

Subject: AUTO ELECTRICAL AND ELECTRONICS EQUIPMENTS  
Class: 5th Sem. Auto. Engg.

Hrs.	Name of Chapter	Contents to be Taught	Remarks
3	Introduction	Various Electrical components/systems in Automobile. Their functions and demands, earth return system, types of earthing, 6V, 12V & 24V system.	
11	Lead Acid Batteries	Construction, working, elements, types, materials used, electrolyte and its strength, effect of added plate area and temperature, rating, capacity, efficiency, temperature characteristics, terminal voltages, charging and discharging. - Battery Testing: Electrolyte testing by hydrometer, voltage test, high discharge and cadmium test (voltage). - Battery Charging: Constant potential and constant current, initial charging, normal charging, trickle charging, intermittent charging, boost charging. - Battery Defects: Sulphation, plates decay, working, erosion, cracking sedimentation, separator defects, short circuits, overcharging. - Alkaline Batteries: Construction, working, merits and demerits of Ni-Fe, Ni-Cd, Ag Zn cells.	
5	Charging System	Circuits, function and various components of alternator, types, construction, working, advantages and disadvantages of alternators, drives, cut out relay. Regulation: Functions of various components of two unit, three unit and heavy duty Regulators, Regulators for alternators.	
6	Starting System	Function of various components, torque terms, principle and constructional details of starter motor, switches, types, starter to engine drive and their types, Starter alternators.	
6	Ignition System	Constructional details of coil, distributor, condenser, meaning of cam angle, ignition timing, ignition advancing mechanisms, centrifugal and vacuum type, transistorized ignition system, construction and working of magneto ignition system. Spark Plugs: Constructional details of spark plugs, classification as per reach, heat range, diameter, and effect of leaded fuels, care and maintenance of spark plug.	
7	Lighting System	Various lighting circuits, head lamp, type and constructional details, sealed beam, double filaments, fog light, side light, brake light, instrument light, indicator lights, reversing light. - Wiring: HT and LT, their specifications, cable colour codes, wiring Harness, Wiring diagrams of cars, two wheeler, Fuses, faults and rectification	
4	Electrical Accessories	Fuel gauges: bimetallic and balancing coil type, Air pressure gauges, temperature gauges, warning light, wind screen wipers, horns, horn relay, electric fuel pump, Faults and rectification.	
4	Miscellaneous Electrical Equipment	Impulse Speedometer, tachometer, window actuation heaters, defrosters and Electric door locks,	
5	Computer Controlled Sensors	Principle and application of sensor in engine management: Air flow sensor, manifold pressure sensor, speed sensor, throttle position sensor, oxygen sensor, temperature sensor.	
5	Electronics and Computer Applications in Automobiles	Brief introduction of circuit-symbols, Integrated circuits, Logic gates, Analog and digital devices, communication chips, multiplexed wiring, working of ECU.	

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### Lesson Plan

Name of the Teacher: Deepak Sandhu  
 Period: Aug-Dec 2023

Subject: **AUTO ENGINE- II**  
 Class: 5th Sem. Auto. Engg.

Hrs.	Name of Chapter	Contents to be Taught	Remarks
12	Combustion in I.C. Engines	Phenomenon of combustion in S.I. engine- phases of combustion, Turbulence Abnormal combustion, Pre ignition and Detonation, Octane rating, Phenomenon of combustion in C.I. engines-phases of combustion. Methods of producing air movements namely squish and swirl Various types of combustion chambers for diesel engine, diesel knock, cetane rating	
14	Fuel Supply System in Diesel Engine	Layout of fuel supply system in diesel engine and their types, Modern CRDI system Individual pump system, Fuel filters – primary and secondary, priming and fuel feed pumps. Fuel injection pumps –plunger and barrel type, distributor type. Fuel injectors, governing and types of governors. Supercharging of engines – function, advantages and disadvantages, types and location of superchargers, turbochargers	
9	Specialized Types of Engine	Wankel engine, Electrical / hybrid system/plug-in hybrid system Fuel cell engine, Homogeneous Charge Compression Ignition (HCCI) engine Wheel motors	
7	Performance of Engines	Effect on engine performance due to atmospheric temperature & pressure, compression ratio, engine speed, dirt, desert, altitude and their remedial measures Performance curves	
7	Emission Control	Effects of pollutants from petrol and diesel engines on humans and other materials, Exhaust pollutants, sources of automotive emission, methods of emission control Positive crankcase ventilation, exhaust gas recirculation, catalytic converters for petrol and diesel engines, particulate filter Selective catalytic reduction technique, NOX absorbers). Emission norms	
7	Hybrid vehicle and Fuel cells	Introduction, functional classification, start/stop system, mild hybrid, full hybrid, batteries for hybrid vehicles, series hybrid drives, parallel hybrid drive trains, control of hybrid vehicles Hybrid system configuration of BMW, FIAT, VOLVO and TOYOTA Hydrogen and fuel cells, description of fuel cell system, fuel cell components, properties of fuel cell, merits and demerits	

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