

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
UTTAR PRADESH, LUCKNOW**



STUDY, EVALUATION SCHEME & SYLLABUS

For

**B. VOC.
AUTOMOBILE ENGINEERING (AE)**

**Based on
AICTE MODEL CURRICULUM
(EFFECTIVE FROM THE SESSION: 2020-21)**

EVALUATION SCHEME
B. Voc Automobile Engineering

NSFQ Level 5 SEMESTER- I											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAEV511	Elements of Automobile	30	10	5	5	20	30		50	2
2	BAEV512	Electrical & Electronic Systems	30	10	5	5	20	30		50	2
3	BAEV513	Non Commercial vehicles	30	10	5	5	20	30		50	2
4	BAEV514	Materials for Automobile	30	10	5	5	20	30		50	2
5	BAEP511	Automobile Lab	30				20		30	50	1
6	BAEP512	Electrical and Electronics I lab	30				20		30	50	1
7	BAEP513	Language Lab	30				20		30	50	2
8	BAET511	Sales consultant (Retail)(ASC/Q1005)							Any one Training 400hrs/ 8weeks	150	12
	BAET512	Territory Service Manager (ASC/Q0602)									
	BAET513	Spare Parts Operations Executive Level 5 (ASC/Q 1502)									
	BAET514	Area Parts Manager (ASC/Q0605)									
	BAET515	Automotive Service Technician Level 5 (ASC/Q 1403)									
Total			610							500	24

NSFQ Level 5 SEMESTER- II											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAEV521	I.C. Engines	30	10	5	5	20	30		50	2
2	BAEV522	Transmission systems	30	10	5	5	20	30		50	2
3	BAEV523	Instruments and Equipment	30	10	5	5	20	30		50	2
4	BAEV524	Suspension and Damping Systems	30	10	5	5	20	30		50	2
5	BAEP521	Project	30				20		30	50	1
6	BAEP522	Measurement Metrology lab	30				20		30	50	1
7	BAEP523	I.C. Engine lab	30				20		30	50	2
8	BAET521	Sales consultant (Retail)(ASC/Q1005)							Any one Training (other than 1 st sem) 400 hrs/ 8 weeks	150	12
	BAET522	Territory Service Manager (ASC/Q0602)									
	BAET523	Spare Parts Operations Executive Level 5									
	BAET524	Area Parts Manager (ASC/Q0605)									
	BAET525	Automotive Service Technician Level 5									
Total			610							500	24

GV: General Vocational; VP: Vocational Practical; OJT: On Job Training; SSC: Sector Skill Council

NSFQ Level 6 SEMESTER- III

S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAEV631	Commercial vehicles	30	10	5	5	20	30		50	2
2	BAEV632	Automotive component design	30	10	5	5	20	30		50	2
3	BAEV633	Electric Vehicles	30	10	5	5	20	30		50	2
4	BAEV634	Engine Management principles	30	10	5	5	20	30		50	2
5	BAEE631	Uni. Human Values & ethics/Environment& Ecology	30	10	5	5	20	30		50	2
6	BAEP631	Electric Vehicles Lab	30				20		30	50	1
7	BAEP632	Engine Management lab	30				20		30	50	1
8	BAET631	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training 400 hrs/ 8 weeks			150	12
	BAET632	Area Service Manager (ASC/Q0603)									
	BAET633	Home Installer/Home delivery Manager (ASC/Q1006)									
	BAET634	Product Design Engineer(ASC/Q8102)									
	BAET635	Quality Controller (ASC/Q1605)									
Total			610							500	24

NSFQ Level 6 SEMESTER- IV

S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAEV641	Autotronics	30	10	5	5	20	30		50	2
2	BAEV642	Air Conditioning and Heating systems	30	10	5	5	20	30		50	2
3	BAEV643	Quality Management in automobile Industry	30	10	5	5	20	30		50	2
4	BAEV644	Tyre Technology	30	10	5	5	20	30		50	2
5	BAEH641	Environment & Ecology /Universal Human Values & Ethics	30	10	5	5	20	30		50	2
6	BAEP641	Autotronics lab	30				20		30	50	1
7	BAEP642	Air conditioning lab	30				20		30	50	1
8	BAET641	Automotive Service Technician Level 6 (ASC/Q1404)					Any one Training (other than 3rd sem)400 hrs/ 8 weeks			150	12
	BAET642	Area Service Manager (ASC/Q0603)									
	BAET643	Home Installer/Home delivery Manager (ASC/Q1006)									
	BAET644	Product Design Engineer(ASC/Q8102)									
	BAET645	Quality Controller (ASC/Q1605)									
Total			610							500	24

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NSFQ Level 7 SEMESTER- V											
S. No.	Subject Code	Subject	Total Teaching / Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAEV751	Modern Vehicle Technology	30	10	5	5	20	30		50	2
2	BAEV752	Automobile Assembly Principles	30	10	5	5	20	30		50	2
3	BAEV753	Vehicle safety principles	30	10	5	5	20	30		50	2
4	BAEV754	Elements of Noise vibration and Harshness control	30	10	5	5	20	30		50	2
5	BAEH751	Indian Constitution / Essence of Indian Traditional Knowledge	30	10	5	5	20	30		50	2
6	BAEP751	Elements of Noise vibration and Harshness control lab	30				20		30	50	1
7	BAEP752	Modern vehicle Technology lab	30				20		30	50	1
8	BAET751	Prototyping Manager (ASC/Q8302)							Any one Training 400 hrs/ 8 weeks	150	12
	BAET752	Body Shop In-Charge(ASC/Q1413)									
	BAET753	Service Supervisor (ASC/Q1412)									
	BAET754	Testing Manager (ASC/Q8405)									
	BAET755	Spare Parts Operations In charge (ASC/Q1503)									
Total			610							500	24

NSFQ Level 7 SEMESTER- VI											
S. No.	Subject Code	Subject	Total Teaching/ Training Hours	Evaluation Scheme				End Semester		Total	Credit
				CT	TA	AT	Total	TE	PE		
1	BAEV761	Automobile servicing	30	10	5	5	20	30		50	2
2	BAEV762	Traction and Driving Systems	30	10	5	5	20	30		50	2
3	BAEH761	Essence of Indian Traditional Knowledge / Indian Constitution	30	10	5	5	20	30		50	2
4	BAEP761	Major Project	180						150	150	6
5	BAET761	Prototyping Manager (ASC/Q8302)							Any one Training (other than 5 th sem) 400 hrs/ 8 weeks	200	12
	BAET762	Body Shop In-Charge(ASC/Q1413)									
	BAET763	Service Supervisor (ASC/Q1412)									
	BAET764	Testing Manager (ASC/Q8405)									
	BAET765	Spare Parts Operations In charge (ASC/Q1503)									
Total			670							500	24

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Level 5 (Semester I)

5.GV.01 Elements of Automobile

UNIT-I:

Introduction: Classification of automobiles- according to number of wheels, propulsion systems, transmission drives, type of fuels, application & capacity, study of main specifications. Components of automobile- functions & layout of frame, frameless construction, axles, steering system, suspension system, braking system, power train & drives, clutch, gear box, final drive, propeller shaft, u-joints, vehicle body, wheels, tyres & tubes.

UNIT-II:

Power Unit: Selection of engine for two wheelers, three wheeler & four wheeler vehicles; constructional & working details of two strokes & four stroke petrol & diesel engines, fuel system, ignition system, starting system, charging system, lighting system, cooling system, lubrication system, combustion & combustion chambers.

UNIT-III:

Steering System and Suspension System: Steering system- requirements, front axle details & steering geometry, castor, camber, toe-in, toe-out steering axis inclination, steering linkages, and different types of steering gear boxes, their constructional & working details. Concept and working of power steering. Need, types of suspension systems, constructional details, characteristics of laminated, coil springs. Introduction to independent suspension, front & rear suspension systems of the vehicle, shock absorbers.

UNIT-IV:

Wheels, Tyres & Braking System: Wheel requirements, types of wheels, their constructional & working details, rims & tyres, types of tyres, tyre selection, ordinary, radial tyres tubeless tyres, their constructional details, comparison & application, wheel balancing. Need and classification of brakes, drum brakes and disc brakes, constructional & working details, introduction to hydraulic brake, parking brake, vacuum assisted hydraulic brakes, air assisted hydraulic brakes, air brakes, leading & trailing brake shoes, self energizing brakes & ABS, working of master cylinder, wheel cylinders, tandem master cylinder, characteristics of brakefluid.

Text Book(s):

[T1] K.K. Ramalingam, "Automobile Engineering", Scitech Publication, Chennai

[T2] Tom Denton, "Automobile Mechanical and Electrical Systems" Indian Ed., Routledge (T&F Group) Pub

[T3] P.L. Kohli, "Automotive Chassis & Body", Tata McGraw Hill, New Delhi

Reference Book(s):

[R1] Newton Steeds and Garrot "Motor Vehicles", Butterworths, London.

[R2] Judge A.W, "Mechanism of the Car", Chapman and Halls Ltd., London.

[R3] Crouse W.H, "Automotive Chassis and Body", Mcgraw –Hill, New York.

[R4] K.K. Jain, R.B. Asthana, "Automobile Engineering", Tata McGraw Hill, New Delhi

[R5] Dr. Kirpal Singh, "Automobile Engineering (Vol-1)", Standard Publisher Distributors.

5.GV.02 Electrical & Electronic System

UNIT-I:

Fundamentals of DC & AC Circuits: Introduction to DC and AC circuits, Active and passive two terminal elements, Ohms law, Voltage-Current relations for resistor, inductor, capacitor, Kirchoff's laws, Mesh analysis, Nodal analysis, Ideal sources –equivalent resistor, current division, voltage division. Sinusoids, Generation of AC, Average and RMS values, Form and peak factors, concept of phase or representation, Introduction to three phase systems - types of connections, relationship between line and phase values. Introduction to magnetic circuits- Simple Magnetic Circuits-Faraday's laws, induced emf and inductances.

UNIT-II:

Electrical Machines & Measuring Instruments: Working principle, construction and applications of DC machines and AC machines, transformers, single phase induction motors: split phase, capacitor start and capacitor start & run motors. Basic principles and classification of instruments - Moving coil and moving iron instruments.

UNIT-III:

Electronic Components & Semiconductor Devices: Resistors, capacitors & inductors (properties, common types, I-V relationship and uses), Overview of Semiconductors - basic principle, operation and characteristics of PN diode, Zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell)

UNIT-IV:

Transducers & Digital Electronics: Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.

Number systems: binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.

Text Book(s):

[T1] Dash S.S, Subramani C, Vijayakumar K, “Basic Electrical Engineering”, First Edition,

Vijay Nicole Imprints Pvt. Ltd

[T2] Thyagarajan T, SendurChelvi K.P, Rangaswamy T.R, “Basic Electronics Engineering”, Third Edition New Age International,

[T3] Somanathan Nair B, Deepa S.R, “Basic Electronics”, I.K. International Pvt. Ltd.

Reference Book(s):

[R1] Smarajit Ghosh, “Fundamentals of Electrical & Electronics Engineering”, Second Edition, PHI Learning

[R2] Metha V.K, RohitMetha, “Basic Electrical Engineering”, Fifth Edition, S. Chand & Co

[R3] Kothari D. P. and Nagrath I. J., “Basic Electrical Engineering”, Second Edition, Tata McGraw-Hill

[R4] Bhattacharya S. K, “Basic Electrical and Electronics Engineering”, First Edition, Pearson Education.

[R5] Thomas L. Floyd, “Electronic Devices”, Ninth Edition, Pearson Education.

[R6] Rajput R.K, “Basic Electrical and Electronics Engineering”, First Edition, Laxmi Publications.

5.GV.03 Non-Commercial Vehicle

UNIT-I:

The Power Unit

Two stroke and four stroke SI & CI engine Construction and Working, merit sand demerit, Symmetrical and unsymmetrical valve & port timing diagrams, scavenging process

UNIT-II:

Fuel and Ignition Systems

Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self-starter system, recent technologies

UNIT-III:

Chassis and Sub-Systems

Main frame for non-commercial vehicles, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear control sin two wheelers,Frontandrearsuspensionsystems,Shockabsorbers,Panelmetersandcontrolsonhandlebar, Free wheeling devices

UNIT-IV:

Brakes and Wheels

Drum brakes & Disc brakes Construction and Working and itsTypes, Front and Rear brake links layouts. Brake actuation mechanism, Spoked wheel, cast wheel, Disc wheel & its merits and demerits, Tyres and tubes Construction & its Types, Steering geometry

Test Books:

1 .Two and three wheeler Technology, Dhruv u. Panchal

5.GV.04 Materials for Automobile

UNIT-I:

Advanced Materials: Composites – non metallic and metallic. Other specialty materials used in Automotive design and manufacturing. Role of Nano technology in automotive systems.

UNIT-II:

Composite Materials: Mechanics, Manufacturing and Design. Composite materials, including naturally occurring substances such as wood and bone, and engineered materials from concrete to carbon-fiber reinforced epoxies. Development of micromechanical models for a variety of constitutive laws. Link between processing and as-manufactured properties through coupled fluid and structural analyses.

UNIT-III:

Smart Materials and Structures: Theoretical aspects of smart materials, sensors and actuator technologies. It will also cover design, modeling and manufacturing issues Page 49 of 73 involved in integrating smart materials and components with control capabilities to engineering smart structures.

UNIT-IV:

Laser Materials Processing: Application of lasers in materials processing and manufacturing. Laser principles and optics. Fundamental concepts of laser/material interaction. Laser welding, cutting, surface modification, forming, and rapid prototyping. Modeling of processes, microstructure and mechanical properties of processed materials. Transport phenomena. Process monitoring.

Text Book(s):

1. Kenneth G. Budinski, Budinshi; “Engineering Materials: Properties and Selection”, 7th Edition, Pearson Singapore (Prentice Hall)

Reference Book(s):

2. Donald R. Askeland, Pradeep P. Phule; “Essentials of Material Science and Engineering”, Thomson.
3. A. P. Gupta, “Polymer Composites”, M.C.Gupta; New Age Publication.

5.VP.01 Automobile Lab

List of Experiments:

1. Identification of different chassis components of a vehicle.
2. Identification of different components of S.I. engine.
3. Identification of different components of C.I. engine.
4. Identification of different components of lubrication system of an engine.
5. Identification of different components of cooling system of an engine.
6. Identification of different components of fuel supply system of S.I. engine.
7. Identification of different components of fuel supply system of C.I. engine.
8. Identification of different components of ignition system of S.I. engine.
9. Identification of different components of starting system of an engine.
10. Identification of different components of transmission system of a car.

5.VP.02 Electrical and Electronics I Lab

List of Experiments:

1. Measurement of energy (using single phase and three phase energy meter)
2. Measurement of electrical quantities (like voltage, current, power, power factor in RLC circuits)
3. Study of earthing and measurement of earth resistance.
4. Study of trouble shooting of electrical equipment (fan, iron box, mixer grinder etc)
5. Study of various electrical gadgets (Induction motor, transformer, CFL, LED, PV cell, etc)
6. Testing of the following popular components with:-

a) Resistor	b) Potential meter	c) Inductor (Only continents)
d) Capacitor	e) Diode	f) BJT
g) LED	h) SCR	i) Few digital ICs and analog ICS.

7. Techniques of Soldering.
8. Familiarization of the following equipment.
 - a) Multi-meter: - voltage, current, resistance measurement.
 - b) Regulated Power Supply: - Set up for certain output voltage and measure it with multimeter.
 - c) Signal generator and CRO: - check the signal generator frequencies and amplifier with CRO.
9. V.I. Characteristics of the following components:- a) Rectifier diode b). Zener Diode
10. V.I. Characteristics of SCR.

5.VP.03 Language lab

Module – 1: Listening and speaking skills

In this module the learners will be exposed to a variety of listening activities recorded on audiotapes. These will be samples of good spoken English, which the learner can use as models. Work sheets will accompany the listening material. This module will include the following:

1. Introducing yourself/friends in formal and informal situations.
2. Inviting people (over the phone and face to face) giving details of occasion, time place and date. Acceptance and refusal of invitation – formal and informal.
3. Seeking and supplying information (example opening an account in a bank, applying for loan etc.)
4. Talking and conveying messages (over the phone and face to face).
5. Giving directions /instruction.
6. Discussing contemporary issues related to environment, child labor, gender bias etc.
7. Listening to excerpts from television and radio.
8. Listening to poems/plays (prescribed).
9. Listening to speeches /talks.
10. Listening to songs like “We shall overcome”.

Module – 2 to 4 (English for specific purposes) (opt any one)

These modules are being offered. A learner has to opt for any one. The first is for academic purposes and the next two are for vocational purposes. The focus is not on the teaching of the subject matter like science and literature but on the way in which language is used in the different subjects.

Module 2: English for Science

This course will introduce learners to some interesting pieces of popular science

1. Health and hygiene
2. Conservation of (nearly extinct) animals.
3. Plant life.
4. Bio gas / solar energy.

These pieces illustrate the use of English in scientific writing: giving information factually, logically and objectively.

Module 3: English for Receptionist

This module will introduce the learner to a variety of exercises, tasks and meaningful activities related to the receptionist's use of English. The printed course materials will be supported by tapes.

The following competencies be developed:

1. Receiving messages, making request etc.
2. Supplying information
3. Giving advice and making suggestions
4. Dealing with complaints
5. Making entries in an appointment book, register etc.

Module 4: English for Office Use

This course will help the learner to use English effectively and appropriately in the office environment. The competencies will be developed.

1. Using the telephone taking and passing messages.
2. Receiving messages
3. Marking noting on files and circular.
4. Writing office notes, memos, notices, agendas for meetings.
5. Telegrams and fax messages.
6. Writing business letters, application enquires, complaints.
7. Filling in forms, cheques, pay in ship sets.

LEVEL 5 (SEMESTER II)

5.GV.05 IC Engines

Unit-1

Operation fundamentals

Working principles of IC engines, classification-SI, CI engine, 2 stroke, 4 stroke, I C engine components- constructional details and working.

Unit-II

Engine systems

Cooling system, lubrication, fuel supply, valve operation and valve timing, ignition system

Unit-III

Fuel and combustion

SI Engine- fuels, fuel mixture preparation, fuel combustion process, normal and abnormal combustion, products of combustion, pollutants

CI engines- fuels, fuel injection system, fuel combustion process normal and abnormal combustion, products of combustion, pollutants

Unit-IV

Performance and testing

Engine parameters- bore, stroke, capacity, compression ratio, compression pressure

Performance parameters-Engine RPM, Torque, Power- IHP, BHP, fuel consumption, efficiency-thermal, brake

Engine testing- Measurement of IHP, BHP, Specific fuel consumption, Heat balance sheet, thermal efficiency.

Text Book(s):

[T1] A Course in I.C. Engine - Mathur&Sharma ,Dhanpat Rai & Sons, Delhi, 1994

[T2] Internal Combustion Engines-V Ganesan, Tata McGraw Hill, Delhi, 602

Reference Book(s):

[R1] Fundamentals of I.C. Engines - J.B.Heywood, McGraw Hill International Edition

[R2] I.C. Engine – Maleev & Litchy, McGraw Hill

[R3] Modern Petrol Engine - A.W.Judge, B.I. Publications. 1983

[R4] Automobile Engineering – Anil Chhikara, Satya Prakashan, Delhi

[R5] I.C Engines and Air Pollution by Obert.

5.GV.06 Transmission Systems

UNIT-I

Transmission requirements: requirements of transmission system, general arrangement of power transmission, general arrangement of rear-engine vehicle with live axles, general arrangement of dead- axle and axles transmission; four-wheel-drive transmission.

UNIT-II

Clutches Requirements of clutches, principle of friction clutches, types of clutches and materials used- cone, single plate, diaphragm-spring, multi-plate, centrifugal, over-running and electromagnetic clutch.

UNIT-III

Gear box: Need of gear boxes, types- sliding mesh, constant mesh and epicyclical, gear boxes; synchronizers: principle, early and later Warner synchronizer, Vauxhall synchronizer- gear materials lubrication and design of gear box; Hydrodynamic drive: Advantages and limitations, principle of fluid coupling, constructional details, torque capacity performance characteristics, drag torque, methods of minimizing drag torque; Torque converter: performance characteristics; single, multistage and poly phase torque converters, converter-coupling-performance characteristics, coupling-blade angle and fluid flow, converter fluid.

UNIT-IV

Transmissionsystems-Driveline:Definition,forces&torquesacting;typesofdrives-Hotchkiss,torque tube & radius rod drives; components- propeller shaft, slip joint, universal joints & constant velocity universal joints; front wheel drive; Final drive: definition; types- worm- wheel, straight-bevel gear, spiral-bevel gear & hypoid-gear drives; double-reduction & twin- speed final drives; Differential: Function, principle, construction and working; non-slip differential; differential lock; rear axle- loads acting & types; multi-axle vehicles.

Text / References Books:

- 1 Heldt P.M.; Torque converters; Chilton Book Co.
- 2 Giri NK; Automobile Engineering; Khanna Publisher.
3. Newton, Steeds & Garret; Motor Vehicles; B.H. Publication.
4. Judge, A.W., Modern Transmission Systems, Chapman & Hall Ltd.
5. Check Chart; Automatic Transmission; Harper & Row Publication.

5.GV.07 Instruments and Equipment

UNIT-I

Metrology and Instrumentation: Metrology- definition, objectives, and necessity. Precision Measurement, limits fits and tolerances, measuring instruments- classification, linear measurement- Vernier caliper, micrometer, dial gauge. Angular measurement- combination set, plain surface measurement- level surface gauge, surface plate.

Instrumentation- modes of measurement- primary or direct, secondary or indirect involving one translation, territory- indirect measurement involving two conversions

UNIT II

Servicing Equipment: Garage, service station, tune-up, specification and application of-aircompressor, hydraulic hoist, electro mechanical hoist, jack (mechanical, hydraulic), car washer and automatic car washer, grease dispenser, oil sprayer, tyre changer, wheel balance, wheel aligner, use of vacuum gauge, compression gauge, cam (dwell) angle and r.p.m. tester, battery Tester, spark plug cleaner and tester, ignition timing light, fuel injector tester, fuel consumption tester, cylinder leakage tester, radiator tester, exhaust gas analyzer, smoke meter, on-board/ smart diagnostic tool

UNIT-III

Engine repair, measuring, testing and reconditioning equipment: Specification and use of- torque wrench, pneumatic wrench, piston ring compressor and expander, piston ring filer, groove cleaner, scrapers, Valve lifter and valve spring tester, inside & outside micrometer, dial micrometer, cylinder bore gauge , cylinder boring machine and honing machine, crankshaft and camshaft grinding machine, connecting rod aligner, line boring machine, valve refacing, valve seat cutting and grinding machine, cylinder head refacing machine

UNIT-IV

Electrical repair instruments: Specification and use of- soldering iron, digital multimeter, growler, battery charger, head light beam aligner, alternator voltage regulator tester, test bench for starter motor and alternator.

TextBook (s):

[T1] Garage Equipment-- R K Chauhan, Ishan Publications.

[T2] Engineering metrology and instrumentation, R K Rajput, S K Kataria and Sons Publication

Reference Book(s):

[R1] Tune-up testing and performance – Ken Layne, Regents/Prentice Hall, 1993

[R2] Classroom Manual for Automotive Engine Performance- Douglas Vidler, Thomson/Delmar Learning, 603

[R3] Today's Technician: Automotive Computer Systems- Donald Knowles, Jack Erjavec, Cengage Learning, 1996

5.GV.08 Suspension and Damping Systems

Unit I

Automotive chassis: Definition; chassis layout; types of chassis layout with reference to power plant location, steering position and drive on wheels; chassis components; chassis classification; Automotive frames: Construction; functions; load sacting; materials; types; frame cross sections; frame diagnosis and service; dimensions of wheel base; wheel track; chassis overhang and ground clearance.

Unit II

Front axle & steering system: Functions, construction & types of front axle; front wheel geometry; front wheel drive; steering mechanisms; steering linkages & layout; types of steering gear boxes; power & power assisted steering; electronic steering; four-wheel steering; terminology-reversible steering, under- steering, over-steering, turning radius.

Unit III

Suspension system: Need; factors influencing ride comfort; types; suspension springs-leaf spring, coil spring & torsion bar; spring materials; independent suspension; rubber suspension; pneumatic suspension; hydraulic suspension, shock absorbers-liquid & gas filled.

Unit IV

Wheel: Forces acting on wheels, construction of wheel assembly, types- spoke, disc & built-up wheels; wheel balancing; wheel alignment; Tyres: Static & rolling properties of tyres, construction details, types of tyres-pneumatic & hydraulic; types of tyre-wear & their causes; tyre rotation. Bearings: Functions; classification of bearings; bearing materials; automotive bearings.

Books and References:

1. Automobile engineering", Dr. KripalSingh.
2. Automobile engineering" K.M.Gupta.
3. Heldt P.M., "Automotive chassis", Chilton Co., NewYork.
4. Giles J.G., "Steering, Suspension and tyres", Iliffe Book Co.,London.

5.VP.04 Project

On the basis of learning in the vocational diploma, a project to be taken up by the student strengthening his/ her vocational skills

5. VP 05 Measurement Metrology lab

1. Measurement of angle with the help of sine bar/Vernier Bevel protractor.
2. Study and sketch of various types of optical projectors.
3. Study and sketch of various types of comparators and use them for comparing length of given piece.
4. To measure the diameter of a hole with the help of precision balls.
5. To measure external and internal taper with the help of taper gauges, precision rollers.
6. To test the squareness of a component with auto-collimeter.
7. To measure the pitch, angle and form of thread of a screw.
8. To measure the geometry of a gear having involute profile.
9. To measure the straightness of the edge of a component with the help of auto collimeter.
10. To measure the length, breadth, thickness, depth, height with micrometer.
11. To measure the length, breadth, thickness, depth, height, with height gauge and Vernier calipers.
12. Calibration of Vernier calipers/micrometers.
13. Calibration of height gauge/depth gauge.
14. Study of a tool maker's microscope.
15. Checking of accuracy of snap gauge with slip gauge.
16. Checking of accuracy of a plug gauge with micrometer.
17. Measurement of areas by planimeter.
18. Use of feeler, wire, radius and fillet gauges measurement of standard parameters.

5. VP 06 I.C. Engine lab

1. Study of Combustion Chambers shape and design.
2. Study & Overhaul of Fuel Injection Pumps
3. Study of Cooling System & Faultfinding.
4. Study of Lubrication and faultfinding.
5. Dismantling & Study of Superchargers.
6. Dismantling & Study of Petrol engine Sump
7. Dismantling & Study of Diesel engine Sump
8. Dismantling & Study of Petrol engine cylinder head
9. Dismantling & Study of Diesel engine cylinder head
10. Study of wiring harness of engines.

Level 6 (Semester III)
6. GV 01 Commercial Vehicles

UNIT-I

Tractors: Development of tractor- prominent makes in India, types of engines used, fuels used, horse power requirement, human factor in tractor design, traction theory, salient features of :- Tractor chassis, clutch, power transmission and final drive, steering, brakes and wheels, power takeoff-drawbarworking, working of hydraulic lift system, working principle of automatic draft sensing and control system

UNIT-II

Farm Equipment: Working attachment of tractors-farm equipment – classification – auxiliary equipment – trailers and body tipping mechanism.

UNIT-III

Introduction of off Road Vehicles: Classification-their application, excavator: different types of shovel and dragline, their construction, operating principles. Production capacity and cost of production, transport equipment: various types of dumpers, main system, components and carrying capacity of dumper.

UNIT-IV

Road Making and Maintenance Machines: Different types of dozer, grader, and their construction. Operating principles, production capacity and application mechanism. Other equipment: scraper and front end loader, their construction and operation maintenance: maintenance aspect of off road vehicles.

Text Book(s):

[T1] Tractor and Automobiles, Rodichev and G.Rodicheva, Mir Publishers, 1987

[T2] Latest Development of Heavy Earth Moving Machinery, De, Annapurna Publishers, Dhanbad 1995

Reference Book(s):

[R1] Road Making Machinery- Abrosimov, K. Bran Berg, A and Katayer, K., M I R.Publishers Moscow. 1971

[R2] Moving the Earth- Nichols, Herber L (Jr.), Galgotia Publishing House, New Delhi, 1962.

[R3] Digging of Soils by Earthmover with Power Parts- Rudnev, V. K. Oxanian Press Pvt. Ltd., N Delhi, 1985

[R4] Design of Automotive Engines for Tractor- Kolchin. A., and V.Demidov, Mir Publishers, 1972

6.GV 02 Automotive Component Design

UNIT-I

Introduction to Engineering Design: Design methods, Aesthetic and Ergonomics consideration in design, Material properties and their uses in design, Manufacturing consideration in design, Design considerations of casting and forging, Basic principles of Machine Design, Modes of failures, Factor of safety, Design stresses, Principal stresses and strains, Theories of failures, Standards, I. S. codes, Preferred Series and Numbers.

UNIT-II

Piston, piston rings, piston pin, Piston Temperatures, piston slap, compensation of thermal expansion in pistons. Piston Rings, forms of gap, stresses in piston rings, ring collapse, heat treatment, piston ring selection, shape. Piston pin, locking of piston pins, length of piston.

UNIT-III

Connecting rod: Length of rod, Cross section, Buckling, drilled connecting rods, piston pin bearing, offset connecting rods, effects of whipping, bearing materials, lubrication.

UNIT-IV

Crank Case, Crank shaft: Crank Case – General form of crank case, oil sumps and cooling features, flywheel mountings Crank shaft- Balance weights, local balance, Crankshaft proportions, oil holes drilled in crank shafts, balancing, vibration dampers, firing order, bearings, lubrication.

Text Book(s):

- [T1] Automobile Design and Drawing - R.B.Gupta, Satya Prakashan
- [T2] Design of Machine Elements- V. B. Bhandari, McGraw Hill Publication
- [T3] Machine Design- Pandya & Shah, Charotar Publishing.

Reference Book(s):

- [R1] Mechanical Engineering Design- J. E. Shigley, McGraw Hill Publication
- [R2] Design of machine elements- Sharma & Purohit, Prentice Hall India Pub.
- [R3] Machine Design-An Integrated Approach- Robert L. Norton, Pearson Education.
- [R4] Fundamentals of Machine Elements- Hawrock & Jacobson, McGraw Hill Publication

6. GV 03 Electric vehicles

UNIT-I

Introduction: define fuel economy, carbon foot print, factors affecting fuel economy, possible actions, alternative energy sources- hybrid in history, hybrid cars. Basic concept of electric traction, introduction to various electric drive train topologies.

UNIT-II

Drive train structure: Conventional drive train, parallel drive train, series hybrid Drivetrain, combined (split) hybrid, all-wheel drive hybrid, merits and demerits of different drive trains.

UNIT-III

Components of a hybrid electric drive train: Electric energy storage devices- lead acid, nickel based, lithium based batteries, merits and demerits of different type of batteries, battery wear, battery management, electrical machines, power electronics, electrified auxiliary system, additional mechanical devices- power split.

UNIT-IV

Case Studies: Design of a hybrid car, Design of an electric car

Text Book(s):

[T1] Emadi Ali, "Vehicular Electric Power System", Marcel Dekker, Inc. 2004

[T2] Robert Bosch, "Bosch Automotive Handbook", 7th Edition, John Wiley & Sons.

Reference Book(s):

[R1] Emadi Ali, "Vehicular Electric Power System", Marcel Dekker, Inc. 2004

[R2] Robert Bosch, "Bosch Automotive Handbook", 7th Edition, John Wiley & Sons.

[R3] Alternative Fuels: "Fuel Cells and Natural Gas-Society of Automotive Engineers", Incorporated, 600.

[R4] Thipse S. S, "Alternative Fuels: Concepts, Technologies and Developments"- Jaico Publishing House,

6. GV 04 Engine Management Principles

Unit I-

ME-SFI voltage supply function, ME-SFI fuel ignition and injection system function, To measure the output voltage & to observe the output wave for mofa crank shaft sensor, To measure the output voltage & to observe the output wave form of a camshaft sensor, ME-SFI engine speed signal function.

Unit II-

Synchronizing fuel injection and firing order function, ME-SFI fuel supply function, ME-SFI fuel pump actuation function, ME-SFI consumption signal function, ME-SFI fuel reserve signal function, ME-SFI cam shaft adjustment function, ME-SFI electronic adjustment function, ME-SFI idle speed control function, ME-SFI throttle valve damping function, ME-SFI O2 sensor control function, ME-SFI oxygen sensor heating function.

Unit III-

Study of principle of working, application, location and effect of sensors- Cam shaft sensor, Crankshaft position sensor, coolant temperature sensor, air temperature sensor, HFM sensor, charge pressure sensor, accelerator pedal sensor, oil sensor. CDI ignition On function. CDI Turbo charging function.

Unit IV-

CDI Fuel supply function. CDI Main injection function. CDI Intel shut off part function. CDI Pre-glow function. CDI Start-up glowing and after- glowing function. CDI EGR function. CDI emission control function. CDI starting function. CDI idle speed/driving mode function. CDI start quantity control function. CDI Idle speed control function. CDI quantity control function. CDI anti jerk control function. CDI limiting full load injection quantity function.

- Reference Books:**
1. Gasoline Engine Management Bosch
 2. Diesel Engine Management Bosch

6. AV 01. Universal human Values and Ethics

UNIT I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education Understanding the need, basic guidelines, content and process for Value Education Self Exploration—what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT II:

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’ Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya

UNIT III:

Understanding Harmony in the Family and Society- Harmony in Human. Human Relationship Understanding Harmony in the family – the basic unit of human interaction Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

UNIT IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space , Holistic perception of harmony at all levels of existence

Reference Book:

1. The text book R.R Gaur, R Sangal, G P Bagaria,
2. A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978- 8-174-46781-2

6 VP 01 Electric Vehicle lab

1. Study of hybrid vehicle.
2. Study of solar vehicle.
3. Study of an electric vehicle.
4. Study of fuel cell technology.
5. Study of regenerative braking system of a hybrid car.
6. Experiment on squirrel cage induction motor.
7. Study of lithium based batteries.
8. Study of Nickel based batteries.
9. Testing and maintenance of Lead Acid batteries.
10. Study of different Drive train structures.

6 VP 02 Engine Management Lab

1. Study of Crank shaft sensor.
2. Study of throttle valve function.
3. Study Air mass flow sensors.
4. Study of Fuel injection flow sensors.
5. Study of Refunction.
6. Study of cruise control and variable speed limiter function.
7. CDI Ignition On function.
8. Study of Accelerator pedal sensor
9. Study of coolant temperature sensor.
10. Air temperature Sensor study.
11. Study of turbo charging function

Level 6 (Semester IV)

06 GV 05 Autotronics

UNIT –I

Fundamentals of Automotive Electronic System: Current Trends in Automotive Electronic Engine Management System, Electro-magnetic Interference Suppression, Electromagnetic Compatibility, Electronic Dashboard Instruments, onboard Diagnostic system, security and warning systems.

UNIT –II

Automotive Sensors & Actuators: Types of sensors, actuators, Crankshaft position, camshaft position, manifold absolute pressure, Air flow rate sensor, Throttle position sensor, Inlet air temperature sensor, oxygen sensor, vehicle speed sensor, Wheel speed sensor, sensors for feedback control, engine control actuators, Solenoid actuators, motorized actuators.

UNIT –III

Automotive Electronic Systems: Electronic Ignition systems, Electronic injection systems, Antilock brake system circuit, Traction control, Electronic control of automobile transmission, Active suspension, EPS

UNIT –IV

Applications: Data Acquisitions- Temperature Control – Stepper Motor Control-Automotive Applications Engine Control, Suspension System Control, Driver Information Systems), Development of A High Speed, High Precision Learning Control System for the Engine Control. Programmable Logic Controls, Relay Logic Control, Motion Control.

Text Book(s):

- [T1] Ramesh Goankar S., “Microprocessor Architecture Programming and Applications”, Willey Eastern Ltd.
- [T2] William B. Riddens, “Understanding Automotive Electronics”, 5th Edition, ButterWorth Heinemann Woburn, 1998.

Reference Book(s):

- [R1] Bechhold, “Understanding Automotive Electronics”, SAE- 1998.
- [R2] Crouse, W. H., “Automobile Electrical Equipment”, Tata Mc Graw Hill Book Co., Inc., New York, 3rd Edition.
- [R3] Aditya P. Mathur, “Introduction to Microprocessors”, 3rd Edition, Tata Mc Graw-Hill Publishing Co.Ltd., New Delhi, 1989.

06 GV 06 Air-conditioning and Heating Systems

UNIT-I

Refrigeration: Principles of refrigeration, Performance parameters, Types of refrigeration systems, Study of simple Vapor compression refrigeration system, and System components, Applications of refrigeration- Need of transport refrigeration, introduction to food preservation, Types of transport refrigeration systems.

UNIT-II

Refrigerants: Definition, desired properties like thermodynamic, chemical & physical and classification. Selection of refrigerants, Effect on ozone depletion and global warming, introduction to alternative refrigerants.

UNIT-III

Psychometric: Psychometric properties of air, Use of Psychometric charts & tables, Representation, of psychometric processes on the chart such as heating and Cooling with humidification and dehumidification, adiabatic dehumidification, chemical dehumidification and mixing processes.

UNIT-IV

Airconditioner-Heating Systems: Factors contributing the Cooling/Heating in automobiles (car/bus). Concept of bypass factor, Sensible heat factor, Apparatus Dew Point, Room Sensible Heat Factor (RSHF),Gross Sensible Heat Factor (GSHF),summer,winter and year round air conditioning systems

Text Book(s):

- [T1] Arora, C.P., “Refrigeration & Air Conditioning”, 2nd Edition, Tata McGraw Hill, 2013
- [T2] William, H., Course, Donald, L., Anglin, “Automotive Air Conditioning”, Tata McGraw Hill, 2012

Reference Book(s):

- [R1] McQuiston, Parker and Spitler, Heating, “Automotive Air Conditioning, Analysis and Design”, Wiley 6th Edition Wiley Student Edition.
- [R2] Stoecker, W.F., “Refrigeration & Air Conditioning”, 2nd Edition, Tata McGraw Hill, New York, 2009
- [R3] Tom, Birch, “Automotive Heating and Air Conditioning”, Prentice Hall, 2010
- [R4] Mitchel Information Services, Inc., Mitchell, “Automatic Heating and Air Conditioning Systems”,Prentice Hall, Inc., 2010

6 GV 07 Quality Management in Automobile Industry

Unit I

Introduction to Quality, Dimensions of Quality, Quality Planning, Concept and definition of quality cost, Determinants of Quality, Optimum cost of performance, Principles of TQM, Pillars of TQM, Introduction to leadership and Leadership roles, Quality council and Quality statement, Strategic Planning Process, Deming philosophy

Unit II

Input /output process Model, Juran trilogy, PDCA Cycle, 5-‘S’ Housekeeping principle, Kaizen Seven tools of Quality (Q-7 tools), Check Sheet, Histogram, Cause and effect diagram, Pereto diagram, Stratification analysis, Scatter diagram, Control charts, Control chart for variables & process capability, Control chart for attributes

Unit III

Affinity diagram, Relationship diagram, Tree diagram, Matrix diagram, Matrix data analysis, Arrow Diagram, Process decision programme chart (PDPC), Concept of bench marking, Reason to bench marking, Bench marking process, Types of bench marking, Benefits of bench marking

Unit IV

JIT philosophy, Three elements of JIT, Principles of JIT Manufacturing, JIT Manufacturing building blocks, JIT benefits, Kanban & 2 Bin Systems

Reference Books:

1. Total Quality Management, S.C. Sharma, M.P. Poonia, Khanna Publishing House

6 GV 08 Tyre Technology

UNIT – I

Introduction: Importance of tyres, history, current status, functions of pneumatic tyres, applications, types of tyres, desirable tyre properties, classification of tyres based on carcass, tyre profile, geometry, sizing & designation, tyre components, principle of pneumatic tyre, requirements of pneumatic tyres.

UNIT – II

Tyre Design: General, motion forces, heat buildup, types of bonding, set of service conditions, tyre size requirements, and safety requirements: Tread design, general, role of foot print area and factors affecting tread life, various types of tread pattern. Carcass design, role of foot print area and factors affecting tread life, various types of tread pattern. Carcass design, role of various fibers used in carcass, estimation of number of piles, Bead design, single bead, multiple beads, and various configurations of wires in bead assembly.

UNIT – III

Manufacturing Technology: General introduction, role of various mixing ingredients, various recipes. Compound mixing, mixing equipment, extrusion of components, tyre cord, wire cord manufacture, calendaring tyre manufacture, mold procurement, component preparation, green tyre building, pre curing, curing and post curing operations/treatments.

UNIT – IV

Tyre testing/ Evaluation Methods: General safety standards, carcass strength, resistance to bead unseating, machine simulation test, indoor laboratory testing, field-test on road, proving ground, latest testing techniques.

Text Book(s):

- [T1] Tyre Technology- S.N. Chakravarty, Indian Rubber Institute
- [T2] Tires, Encyclopedia of Chemical Technology- Kirk & Othmer

Reference Book(s):

- [R1] Pneumatic Tyre Design- E.C. Wood, Cambridge
- [R2] Tire Engineering- Kovac& Rodgers, Goodyear Tire Rubber Co., Ohio
- [R3] Hand book of Rubber Technology, R.Schuster, Wiley Interscience

6 AV 02 Environment and Ecology

Unit I

Definition, Scope & Importance, Need for Public Awareness• Environment definition, Eco system - Balanced ecosystem, Human activities - Food, Shelter, Economic and social Security. Effects of human activities on environment , Agriculture, Housing, Industry, Mining and Transportation activities, Basics of Environmental Impact Assessment & Sustainable Development.

UNIT II

Basic concepts and definitions: ecology, landscape, habitat, ecozones, biosphere, ecosystems, ecosystem stability, resistance and resilience; autecology; synecology; major terrestrial biomes.

UNIT III

Types of ecosystem: forest, grassland, lentic, lotic, estuarine, marine, desert, wetlands; ecosystem structure and function; abiotic and biotic components of ecosystem; ecosystem boundary; ecosystem 19 function; ecosystem metabolism; primary production and models of energy flow; secondary production and trophic efficiency; ecosystem connections: food chain, food web; detritus pathway of energy flow and decomposition processes; ecological efficiencies; ecological pyramids: pyramids of number, biomass, and energy.

UNIT IV

Significant global environmental issues such as acid rain, climate change, and resource depletion; historical developments in cultural, social and economic issues related to land, forest, and water management in a global context; interface between environment and society

Reference Books

1. Chokkan, K.B., Pandya, H. &Raghunathan, H. (eds). 2004. Understanding Environment. Sagar Publication India Pvt. Ltd., New Delhi.
2. Elliot,D.2003.Energy,Society and Environment, Technology for a Sustainable Future.Routledge Press.

6 VP 03 Autotronics Lab

1. Study of electro- magnetic compatibility
2. Identify the various Electronic Dashboard Equipment
3. Use of onboard diagnostic system
4. Study of Security and warning system on vehicle
5. Study of solenoid actuators
6. Identify wheel speed sensor
7. Identify Air flow sensor
8. Identify Inlet temperature sensor
9. Identify Oxygen sensor
10. Study various types of relays

6 VP 04 Air conditioning Lab

1. Study of various methods of transport refrigeration systems.
2. Study components and layout of car & bus air conditioning systems.
3. Study of compressors used in automotive refrigeration and air-conditioning systems.
4. Study of condensers & Evaporators used in automotive refrigeration and air-conditioning system.
5. Study of expansion valves used in automotive refrigeration and air-conditioning systems
6. Study and demonstration of various controls in refrigeration (on refrigeration bench).
7. Trail on air conditioning system
8. Study and demonstration of air-conditioning charging methods.
9. Study and trial on vapor absorption system.

**Level 7 (Semester V) Modern
7 GV 01 Vehicle Technology**

UNIT-I

Suspension Brakes and Safety: Air Suspension–Closed Loop Suspension, Antiskid Braking System, Retarders, Regenerative Braking Safety Cage – Air Bags – Crash Resistance - Passenger Comfort.

UNIT-II

Trends in Vehicles: Hybrid Vehicles – Stratified Charged/ Learn Burn Engines – Hydrogen Engines – Battery Vehicles – Electric Propulsion with Cables – Magnetic Track Vehicles.

UNIT-III

Advance Techniques in Traffic Management: Vehicle & traffic navigation system, global positioning system, advanced traffic control devices, Intelligent Transport System.

UNIT-IV

Control systems in Automobiles- Automotive application of sensors, Engine management systems, Electronic transmission control, Multiplex wiring systems, On-board navigation systems.

Text Book(s):

[T1] Crouse W and Anglin D, “Automotive Mechanics”, 10th Edition, McGraw Hill Publication, 2004.

[T2] Robert Bosch, “Bosch Hand Book”, 3rd Edition, SAE, 1993.

[T3] Julian Happian, “An Introduction to Modern Vehicle Design”, Smith Butterworth-Heinemann, Oxford

Reference Book(s):

[R1] J. B. Heywood, “Fundamentals of I.C. Engines”, McGraw Hill International Edition

[R2] Tom Denton, “Automobile Electrical & Electronic Systems”, SAE International

[R3] A. W. Judge, “Modern Petrol Engine”, B.I. Publications. 1983

[R4] Michel Westbrook, “The Electric and Hybrid Electric Car”, SAE International

7 GV 02 Automobile Assembly Principles

UNIT-I

Locating and clamping devices: Concept, meaning and definitions of location and clamping, Use of locating and clamping principles in day-to-day supervision on shop floor, Degree of freedom-concept and importance, 3-2-1 principle of location, Locators-Types, Sketches with nomenclature, Working, Applications, Fool proofing and ejecting

UNIT-II

Types of layout problems, the layout function, organization of layout. Analysis and Design of Material Flow: Systems approach to flow cycle, process charts, flow process charts, Quantitative analysis of material flow; optimal material flow configuration. Space and Area Allocation for Production and Physical Plant Services;

UNIT-III

Design of system configurations conforming to various kinds of product features and layout characteristics; Design concepts of common handling and transfer equipment; Different types of conveyors, elevators, forklifts;

UNIT-IV

Design concept of warehouse facilities commensurate with adopted kind of handling and transfer devices; Automated Handling of materials, Automated Transfer lines, AGVS, Use of Robots in Product handling, automated packaging devices.

Reference Book(s):

1. Assembly Line Planning and Control Nick T. Thomopoulos Springer
2. Plant Layout and Materials Handling, R. B. Choudhary, G. R. N. Tagore

7 GV 03 Vehicle Safety Principles

UNIT –I

Automotive vehicle testing for Safety: Introduction to active & passive vehicle safety systems, occupant safety system- seat belts and belttighteners, front air bag, side air bag, rollover protection system

UNIT –II

Braking test (asperIS11852-2001), ABS performance & Traction control test Seatbelt anchorage testing, Horn, lighting installation and mirror, test.

UNIT –III

Collapsible steering column testing: Frontal crash test, side door intrusion, interior and exterior test. Body block test (S-11939-1996), Introduction to the offset, Frontal impact test (IS-11939-1996 & (ECE94), Lateral Impact(ECER95),AIS-029:Survival spaceforoccupants,pedestrianprotectiontest and other upcoming standards.

UNIT –IV

Motor Vehicle Act (1988), Central Motor Vehicles Rules (1989) and subsequent amendments

Text Book(s):

[T1] U.W. Seiffert M. Gonter, “Integrated Automotive Safety Handbook”, SAE-International ISBN (978-07680-6437-7)

[T2] M.V. Act 1988 - Central Law Agency, Allahabad

Reference Book(s):

[R1] U. W. Seiffert M. Gonter, “Integrated Automotive Safety Handbook”, Published by SAE-International ISBN (978-07680-6437-7)

[R2] Robert Bosch, “Bosch Automotive Handbook”, 7th Edition, John Wiley & Sons.

7 GV04 Elements of Noise and Vibration and Harshness Control

UNIT-I

Introduce the concepts relating to Noise, Vibration and Harshness (NVH): Define NVH terminology, necessity for NVH diagnosis, Concepts of the transmission of vibration and sound, concepts of preventing excessive vibration and noise. Develop skills in associating NVH symptoms to the: Sensation, Frequency range, operating conditions, Causes, Vibrating system.

UNIT-II

Vibration- Characteristics of vibration, Oscillation, Cycle, Dissipation of Energy from a Single Impact, Sensors Signal, Calculating Component Frequency, Amplitude, vibration measurement, Natural frequency, Resonance resonance point, resonance graph (frequency – vehicle speed), Dampers,

UNIT-III

Vibrations due to road roughness, vehicle ride model, Human response to vibrations, sprung & unsprung mass, pitch & bounce, roll centre & roll axis. Introduction to random vibrations, Evaluation of vehicle vibration in relation to ride comfort criterion. Beating/ Phasing/ Growl, vibration order- tire frequencies, engine vibrations.

UNIT-IV

Harshness, transmission path of harshness, NVH in Automobiles- Engine, Driveline, wheels, Common NVH Symptoms, causes and remedies for- Body Shake, Steering Flutter and Shimmy, Accelerator pedal vibration, Shift lever vibration, Harshness, Road noise, Tire pattern noise, Body Booming noise, Engine noise, Body Beating noise, Transmission gear whine, differential whine, clutch judder, brake vibration, brake squeak.

Text Book(s):

- [T1] N. L. Meirovitch, "Elements of Vibration Analysis", McGraw Hill New York, 1986.
- [T2] Irwin & Garf, "Industrial Noise & Vibration Control", Prantice Hall, 1979

Reference Book(s):

- [R1] J.P. Den Hartog, "Mechanical Vibration", 4th Edition, Mc Graw Hill, New York 1985.
- [R2] Daniel J. Inman, "Engineering Vibration", Prentice Hall, NJ
- [R3] Grover G. K., "Mechanical Vibration", Nem Chand & Brothers, Roorkee
- [R4] Julian Happian Smith, "An Introduction to Modern Vehicle Design", Butterworth- Heinemann, Oxford.

7 AV 01 INDIAN CONSTITUTION

UNIT I

Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II

Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha

UNIT III

Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT IV

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

References

1. 'Indian Polity' by Laxmikanth
2. 'Indian Administration' by Subhash Kashyap
3. 'Indian Constitution' by D.D.Basu
4. 'Indian Administration' by Avasti and Avasti

7 VP 01 Elements of Noise, Vibration & Harshness Control Lab

1. Demonstration of washing & greasing of vehicle
2. Chassis Greasing of light / heavy duty vehicle
3. Engine oil change & periodic maintenance of vehicle
4. Clutch overhaul of light / heavy duty vehicle
5. Suspension steering overhaul of light / heavy duty vehicle
6. Dismantling & assembly of constant mesh gear box
7. Dismantling & assembly of synchro mesh gear box
8. Drive line overhaul (universal joint, propeller shaft, slip joint)
9. Final drive & differential overhaul
10. Rear axle hub greasing
11. Door adjustments.

1. Demonstration of washing & greasing of vehicle
2. Chassis Greasing of light / heavy duty vehicle
3. Engine oil change & periodic maintenance of vehicle
4. Clutch overhaul of light / heavy duty vehicle
5. Suspension steering overhaul of light / heavy duty vehicle
6. Dismantling & assembly of constant mesh gearbox
7. Dismantling & assembly of synchromesh gearbox
8. Drive line overhaul (universal joint, propeller shaft, slip joint)
9. Final drive & differential overhaul
10. Rear axle hub greasing
11. Door adjustments.

7 VP 02 Modern Vehicle Technology Lab

1. Study air suspension system and its application.
2. Study Antiskid Braking System.
3. Study Regenerative Braking system.
4. Study Hydrogen Engines.
5. Study Intelligent Transport System.
6. Identification and function of different sensors.
7. Study multiplex wiring system.
8. Study engine management system of a petrol car.
9. Study engine management system of a heavy duty vehicle.
10. Practice on-board testing of a modern car.

Level 7 (Semester VI)

7 GV 05 Automobile Servicing

UNIT-I

Importance of maintenance, types- preventive (scheduled) and breakdown (unscheduled) maintenance, requirements of maintenance, preparation of check lists, Inspection schedules. Safety precautions in maintenance. Knowledge of free and paid service schedules, fault diagnosis, job cards, warranty procedures, log sheets and other forms.

UNIT-II

Lubrication system – lubricating/ engine oil top up, oil changing, cleaning methods, visual and dimensional inspections, minor/major adjustments of various components, maintenance of engine accessories- air filter, battery, cooling system, electrical wiring in engine compartment. Engine tune up, top overhauling, dismantling of engine components, cleaning, visual and dimensional inspections, minor/major reconditioning of various components, reconditioning methods, engine assembly, special tools used for maintenance/ overhauling, Servicing and maintenance of cooling systems, lubrication system.

UNIT-III

Maintenance of other assemblies: lubrication system – lubricating/ gear oil top up, oil changing, cleaning methods, visual and dimensional inspections, minor/major adjustments of various components of transmission system, Servicing and maintenance of clutch, gear box, propeller shaft, differential. Servicing and maintenance of suspension system, brake system, steering system, wheel alignment and wheel balancing.

UNIT-IV

Electrical System Maintenance

Checking of electrical components for functioning, checking of battery, electrolyte top up, terminal cleaning&protectionmethods,checkingofstartermotor,checkingofchargingsystems-fanbelttension checking and adjustment, Testing methods for checking of ignitions system, lighting system, fault diagnosis and maintenance of modern electronic controls, checking and servicing of dash board instruments.

Text Book(s):

- [T1] K.K. Ramalingam, “Automobile Engineering”, Scitech Publication, Chennai
- [T2] S Srinivasan, “Automotive Mechanics”, Tata McGraw Hill, New Delhi
- [T3] Tom Denton, “Automobile Mechanical and Electrical Systems” Indian Edition, Routledge (Taylor & Francis Group) Publication.

Reference Book(s):

- [R1] Newton Steeds and Garrot, “Motor Vehicles”, Butterworths, London.
- [R2] Judge A.W, “Mechanism of the Car”, Chapman and Halls Ltd., London.
- [R3] Crouse W.H, “Automotive Chassis and Body”, McGraw –Hill, New York.
- [R4] K.K. Jain, R.B. Asthana, “Automobile Engineering”, Tata McGraw Hill, New Delhi
- [R5] Dr. Kirpal Singh, “Automobile Engineering” (Vol-1), Standard Publisher Distributors

7 GV 06 Traction and Driving Systems

UNIT I

Study of physics of driving Vehicle Kinematics terms Study in detail the function, task and location of different components of ESP.

UNIT II

Study the function location and task of the lateral acceleration sensor, Study the function of Yaw rate sensor, Input signals to ESP control unit.

UNIT III

Output signals of ESP control unit, Function of ESP if vehicle under steers and over steers during left cornering and during braking in the right side curve, Study of ASR functions: Brake torque control and drive torque control.

UNIT IV

Study of brake booster with BAS, understanding function of BAS. Understanding BAS operating conditions, to study function and task of ABS.

Reference

1. Car owner manual
2. Workshop Information Systems

7 AV 02 Essence of Indian Traditional Knowledge

UNIT I

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge through indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge through formal knowledge

UNIT II

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge.

UNIT IV

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

References:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
3. VN Jha (Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Arnakulam
4. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkata

7 VP 03 Major Project

On the basis of learning in the Bachelor of Vocational, a project to be taken up by the student strengthening his/ her vocational skills