



**DR. A P J ABDUL KALAM UNIVERSITY,
INDORE**

SYLLABUS

For

DIPLOMA in AUTOMOBILE ENGINEERING

(PART TIME)

(THIRD YEAR, 6th SEM)

College of Polytechnic Engineering

Dr. A P J Abdul Kalam University, Indore

DR. A P J ABDUL KALAM UNIVERSITY, INDORE

Syllabus for Diploma in Automobile Engineering (Part Time)

List of Subject (Third Year, 6th Sem)

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Unit 1: INTRODUCTION

Auto Design: Definition, Various aspects, Classification, Requirements, general Procedure of design. Engineering materials and their physical properties applied to design, factor of safety, endurance limit, notch sensitivity, principles of design optimization.

Unit 2: DESIGN OF ENGINE COMPONENTS.

Design of engine cylinder, design and drafting of piston, gudgeon pin, connecting rod and crank shaft, crank pin.

Unit 3: DESIGN OF FLYWHEEL AND FRONT AXLE

Determination of mass of a flywheel for a given co-efficient of speed fluctuation. Design of hubs and arms of flywheel. Design of front axle beam.

Unit 4: DESIGN OF GEAR AND SUSPENSION SPRING

Design considerations- Strength of gear teeth. Lewis equation- Dynamic tooth load. Design of spur gear and helical gears. Types of suspension system, suspension springs, and design of laminated leaf spring and Coil spring. Design and drafting of leaf spring and shackle.

Unit 5: DESIGN OF CLUTCHES AND BRAKES:

Design of single plate & Multi plate clutch. Design of centrifugal clutch. State the different types of brakes. Design of internal expanding shoe brakes, Explain braking efficiency, The equation for brakes applied to front wheels, rear wheels, and all the four wheels.

Unit 6: LAYOUTS AND FREE HAND SKETCHES:

Lay outs of service station (Including fuel pump), Layouts of Garages (Including major repairs & body construction sections), Free hand sketches of spark plug, fuel injector, SU carburetor, connecting rod, piston, valves, air cleaner, fuel pump, wiring diagram

REFERENCE:

1. Heldt, P.M. Torque Converters, Chilton Book Co.
2. Dean Aaverns, Automobile Chassis Design, Illiffe Book Co.
3. Giri, N.K. Automobile Mechanics, Khanna Publishers, New Delhi.
4. Automobile Engineering Drawing : R.B. Gupta
5. Machine Design : Sharma Agrawal
6. Automotive Machine drawing : Laxmi Narayan & Mathur

Unit 1: INTRODUCTION

Need of Auto electrical system & its components, Conductor, Insulator, Semiconductor, current, voltage, resistance, ohm's law, series & parallel connections, electromagnetism. Introduction to Electrical measuring instruments

Unit 2: BATTERIES AND AUXILIARY SYSTEMS

Principle and construction of lead acid battery, characteristics of battery, rating, capacity and efficiency of batteries, various tests on batteries, maintenance and charging methods. Lighting system: details of head light, tail light and side light, LED lighting system, head light dazzling and preventive methods. Speedometer, Horn, wiper system. Different types of fuel gauges, oil pressure gauges & engine temperature gauges.

Unit 3: STARTING SYSTEM

Requirements of starting system, Principle, construction & working of starting motor, Characteristics of starter motor, Need of starting drive units, bendix, folothru & over running Clutch Drives. Different types of starter switches.

Unit 4: CHARGING SYSTEM

Requirements of charging system, construction & working principle of D.C generator & A.C generator (alternator), Armature reaction, cut-out relay, voltage & current regulator systems. Generation of direct current, shunt generator characteristics, third brush regulation, Difference between DC generator & alternator, Advantages of alternator over DC generator.

Unit 5: IGNITION SYSTEM

Need of ignition system, construction & working of ignition coil, distributor, spark plug, condenser, Types of ignition Systems - battery & magneto ignition system, need of spark advance, construction & working of vacuum & centrifugal spark advance. Basic concept of Electronic ignition system, distributor primary signal, sensor coil (magnetic pickup). Hall effect, spark advance, electronic spark control, electronic spark advanced controls, Distributor less ignition system. Ignition wiring diagram.

LIST OF EXPERIMENTS

- 1 Study the construction and operation of lead acid battery.
- 2 Fitting and removing battery in vehicle
- 3 Study of construction and operation of starting system .
- 4 Study of working of starting motor drive mechanism.
- 5 Study of alternator operation and functioning of diodes in the alternator.
- 6 Study of working of alternator regulator.
- 7 Checking an alternator if the battery is run down.
- 8 Study of operation of contact point ignition system.
- 9 Location and identity the components of the contact point ignition system on various vehicles.
- 10 Study the construction and operation of centrifugal and vacuum advanced mechanism.
- 11 Study the construction and operation of electronic ignition system of any

- vehicles.
- 12 Replace a head lamp.
 - 13 Aim headlight
 - 14 Study the purpose and operation of dimmer switch.
 - 15 Study the operation of horn relay.
 - 16 To test the vehicle battery for serviceability by means of high rate discharge tester and hydrometer.
 - 17 To test a vehicle battery for serviceability by measuring its capacity and comparing the results with its rated output

REFERENCES

1. Young A.P. & Griffiths. L. "Automotive Electrical Equipment", ELBS & New Press-
2. William Broadens "Understanding Automotive Electronics", 5th edition - Butter worth Heinemann Woburn,
3. Bechhold "Understanding Automotive Electronics", SAE,.
4. Crouse, W.H "Automobile Electrical Equipment", McGraw-Hill Book Co., Inc., New York, 3rd edition,.
5. Judge A.W "Modern Electrical Equipment of Automobiles", Chapman & Hall, London,.
6. Kholi.P.L "Automotive Electrical Equipment", Tata McGraw-Hill Co., Ltd., New Delhi,.
7. Robert Bosch "Automotive Hand Book", SAE (5th Edition),.
8. Ganesan.V. "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi,

Unit 1: INTRODUCTION:

Maintenance its need, three types participative maintenance, maintenance planning, Maintenance schedules, periodic Checkup, Servicing, daily/ running in maintenance

Unit 2: SERVICE OF COOLING AND LUBRICATION SYSTEM-

consumption erratic oil pressure gauge action, Servicing Lub system oil changes, checking oil level oil filter service. cooling system Trouble diagnosis causes of loss of coolant, causes of engine overheating, cleaning cooling system, repairing radiator leaks, Testing belt.

Unit 3: ENGINE TESTING PROCEDURES:

Introduction, Engine Testing Instruments, Taco meter, cylinder compressor tester, Results of compression Test, Cylinder leakage Tester, Engine vacuum gauge, Exhaust gas analyzer, Ignition timing light, oscilloscope,

Unit 4: ENGINE TUNEUP & TROUBLE DIAGNOSIS:

Introduction, trouble procedure, Engine Analyzer, and Computer testers, Engine Trouble Diagnosis chart. Turns over at normal speed but doesn't start, Engine runs but misses. Engine lacks power, Engine overheats, rough idle. Engine stalls, Engine back fires, Too much HC, CO, in Exhaust gas, Excessive oil consumption, Low oil pressure, excessive fuel consumption. Engine noises.

Unit 5: VALVE & VALVE MECHANISM SERVICE:

Valve clearing, valve troubles, diagnosis chart, valve sticking, valve over heating and burning valve breakage, valve face wear, valve seat Recession valve deposits, valve service, Adjusting valve lifter clearance The complete valve Job.

Unit 6: CONNECTING ROD, BEARINGS, PISTONS AND RINGS SERVICE:

Removing connecting rods, removing ring ridge, removing oil pan, removing piston rod assembly, servicing rods and pistons , attaching rods and piston, installing piston rod assemblies, checking rod side clearance , checking connecting rods, Bearing failure Analysis. Checking rods bearing clearance installing rod bearings. Piston service, cleaning piston inspection, piston resizing, selecting new pistons, filling pins in pistons, rod and piston alignment, fitting piston rings.

Unit 7: CRANK SHAFTS AND CYLINDER BLOCKS SERVICE:

Removing an engine, replacing engine mounts, crankshafts and bearing service, removing main bearing caps, checking crankshaft journals, inspecting main bearing, measuring main bearing cleaners measuring crankshaft end play installing main bearings, removing crankshaft, Servicing and grinding of crankshaft. Cylinder wear , cleaning and inspecting cylinder block, checking bearing bores, inspecting cylinder walls, refinishing cylinders, installing cylinder sleeves.

Unit 8: CLUTCH SERVICING:

Clutch trouble diagnosis chart, clutch slips while engaged, clutch chatters while engaged, clutch spins or drags when disengaged, clutch noise, clutch pedal pulsates. Disc facing wears rapidly, clutch pedal stiff, clutch linkage adjustments.

Unit 9: GEARBOX TROUBLE DIAGNOSIS AND SERVICE:

The trouble diagnosis chart, G.B. removal and installation G.B. transmission overhauls, shift linkage adjustment, noises. Bearing noise.

Unit 10: DIFFERENTIAL AND REAR AXLE SERVICE:

Differential trouble diagnosis, differential servicing

Unit 11: STEERING AND SUSPENSION SERVICE:

The trouble diagnosis charts, excessive play in steering system, hard steering, car wonder, can pulls to one side when braking, low speed front wheel shimmy , front wheel tramp, steering kick back tyres squeal on turns, improper tyre wear, hard or rough ride, sway on turns, sagging springs, noises, wheel alignment, wheel balance,

Unit 12: BRAKE SERVICING:

The trouble diagnosis charts, brake pedal goes to floor, one brake drags. All brakes drag, car pulls to one side, soft or spongy pedal, excessive pedal force required, sensitive brakes noisier brakes, Air in system, loss of brake fluid, excessive pedal travel, brake pedal play, brake service, adjusting drum brakes, replacing drum brakes shoes, brake drum and wheel cylinder service, master cylinder service, disc brake service, flushing hydraulic system, filling and bleeding hydraulic system.

Unit 13: ELECTRICAL AND ELECTRONIC EQUIPMENT SERVICE: BATTERY :

BATTERY – Variation in battery terminal voltages, Battery maintenance, cautions for battery service, overcharging, under charging, sulfation, corroded terminals, cable clamps, & battery holders, removing and replacing battery, slow charging. **STARTING SYSTEM-** Motor doesn't crank engine, engine crank slow by but doesn't start jump starting, removing and installing starter motor. **CHARGING SYSTEM-** Charging system trouble diagnosis, discharged battery, charging system tests removing and installing alternator. **IGNITION SYSTEM:** Causes of ignition failure, quick checks of ignition system ignition timing, spark plug service, ignition wiring, contact point service, distributor service, removal and installation. **OTHER ELECTRICAL /ELECTRONICS DEVICES:** Head light aiming, electrical fault tracing and repair in wiring system.

LIST OF EXPERIMENT

- 1 Change engine oil and oil filter
- 2 Service the engine oil Pump
- 3 Clear and flush cooling system.
- 4 Locate and repairs leaks in the cooling system
- 5 Replace water pump
- 6 Test the given battery for its conditions
- 7 check and adjust ignition timing
- 8 Adjust or replace contact points.
- 9 Remove/install ignition distributors.
- 10 Identify sources of various engine noises
- 11 Adjust valve clearance
- 12 Replace rocker arm stud of engine head
- 13 Replace camshaft bearings
- 14 Replace pistons rings /con rod bearing/piston pins
- 15 Check connecting rod for bent/twist
- 16 Replace cam shaft main bearings
- 17 Time the injection pump.
- 18 Adjust idle speed of diesel engine
- 19 Replace fuel injection nozzle.

- 20 Service and adjust clutch linkages
- 21 Remove and replace a clutch.
- 22 Adjust gear box linkages.
- 23 Service the given gearbox
- 24 remove and install transfer case
- 25 Check gearbox oil and locate possible points of leakages.
- 26 Replace the given universal joint.
- 27 Disassemble, assemble, adjust differential
- 28 Inspect, replace defective parts, lubricate steering system .
- 29 Replace, service front wheel bearings.
- 30 check and adjust wheel alignments.
- 31 Adjust the given brake system.
- 32 Test the brakes..
- 33 Change break fluid and remove the air if there.
- 34 Check and add pressurized Air to tyre tubes.
- 35 Service master cylinder/wheel drum/wheel cylinder assemblies.

REFERENCES

1. Automobile engineering - R B Gupta
2. Automobile engineering - G.B.S Narang
3. Automobile engineering -C.P. Nakra
4. Diesel Engine manual – Black
5. Automobile maintenance - Venk & troubleshooting
6. Workshop manuals of Indian vehicles - TATA, LEYLAND, MAHINDRA, BAJAJ, HONDA, HEROHONDA, YAMAHA.
7. Automobile maintenance & repairs - M/R publication Moscow. 8. Automotive mechanics - William Crouse.

OBJECTIVES:

THE STUDENTS WILL BE ABLE TO:

1. Developing working in teams
2. Apply problem solving skills for a given situation
3. Use effective presentation techniques
4. Apply techniques of effective time management
5. Apply task management techniques for given projects
6. Enhance leadership traits
7. Resolve conflict by appropriate method
8. Survive self in today's competitive world
9. Face interview without fear
10. Follow moral and ethics
11. Convince people to avoid frustration

1 SOCIAL SKILLS

SOCIETY, SOCIAL STRUCTURE, DEVELOP SYMPATHY AND EMPATHY

2 Swot Analysis – Concept, How to make use of SWOT

3 Inter personal Relation- Sources of conflict, Resolution of conflict , Ways to enhance interpersonal relations.

4 Problem Solving

I) STEPS IN PROBLEM SOLVING- identify and clarify the problem, information gathering related to problem, evaluate the evidence, consider alternative solutions and their implications, choose and implement the best alternative, review

II) Problem solving technique.(any one technique may be considered)

- 1) Trial and error, 2) Brain storming, 3) Lateral thinking

5 Presentation Skills

Body language -- Dress like the audience, Posture, Gestures, Eye contact and facial expression.

Presentation Skill- Stage Fright, Voice and language – Volume, Pitch, Inflection, Speed, Pause Pronunciation, Articulation, Language, Practice of speech. Use of aids –OHP,LCD projector, white board

6 Industrial Visits Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. **TWO** industrial visits may be arranged in the following areas / industries :

- i) Manufacturing organizations for observing various manufacturing processes including heat treatment ii) Material testing laboratories in industries or reputed organizations iii) Auto workshop / Garage iv) Plastic material processing unit v) ST workshop / City transport workshop
- ii)

7 Lectures by Professional / Industrial Expert be organized from Any

Three of the following areas : i) Use of a plastics in automobiles. ii) Nonferrous Metals and alloys for engineering applications iii) Surface Treatment Processes like electroplating, powder coating etc. iv) Selection of electric motors. v) Computer aided drafting. vi) Industrial hygiene. vii) Composite Materials. viii) Heat treatment processes. ix) Ceramics

8 Individual Assignments:

Any two from the list suggested

a) Process sequence of any two machine components. b) Write material specifications for any two composite jobs. c) Collection of samples of different plastic material or cutting tools with properties, specifications and applications. d) Preparing models using development of surfaces. e) Assignments on bending moment, shear forces, deflection of beams and torsion chapters of strength of material. f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable. g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes. h) List the various properties and applications of following materials – a. Ceramics b. fiber reinforcement plastics c. thermo plastic plastics d. thermo setting plastics e. rubbers.

OR

Conduct **ANY ONE** of the following activities through active participation of students and write report

- i) Rally for energy conservation / tree plantation. ii) Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc. iii) Conduct aptitude, general knowledge test, IQ test iv) Arrange **any one** training in the following areas : a) Yoga. B) Use of fire fighting equipment and First aid Maintenance of Domestic appliances.

9 Group discussion and Interview technique – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are - i) Sports ii) Current news items iii) Discipline and House Keeping iv) Current topics related to Electrical engineering field.

Interview Technique Necessity, Tips for Handling Common Questions

10 Working in Teams

Understand And Work Within The Dynamics of A Groups. Tips to Work Effectively In Teams, Establish Good Rapport, Interest with others and work, Effectively with Them to Meet Common objectives, Tips to Provide and Accept Feedback in A Constructive and Considerate Way, Leadership In Teams, Handling Frustrations in Group.

11 Task Management -Introduction, Task identification, Task planning, organizing and execution, Closing the task

Assignment: (Any Eight Assignments)

1) SWOT analysis: - Analyse yourself with respect to your strength and weaknesses, opportunities and threats. Following points will be useful for doing SWOT. a) Your past experiences, b) Achievements, c) Failures, d) Feedback from others etc. 2) undergo a test on reading skill/memory skill administered by your teacher. 3) Solve the puzzles. 4) Form a group of 5-10 students and do a work for social cause e.g. tree plantation, blood donation, environment protection, camps on awareness like importance of cleanliness in slum area, social activities like giving cloths to poor etc. (One activity per group) 5) Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher. 6) Watch/listen an informative session on social activities. Make a report on topic of your interest using audio/visual aids. Make a report on the programme.##### 7) Conduct an

interview of a personality and write a report on it. 8) Discuss a topic in a group and prepare minutes of discussion. Write thorough description of the topic discussed 9) Arrange an exhibition, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

Note: - Please note that these are the suggested assignments on given contents/topic. These assignments are the guide lines to the subject teachers. However the subject teachers are free to design any assignment relevant to the topic. The **term work** will consist of any eight assignments.

MINI PROJECT ON - task management. Decide any task to be complete Stipulated time with the help of teacher. Write a report considering various steps in Task management.

Reference Books

- 1 Marshall Cooks Adams Time management Viva Books
- 2 E.H. Mc Grath , S.J. Basic Managerial Skills for All Pretice Hall of India, Pvt Ltd
- 3 Allen Pease Body Language Sudha Publications Pvt. Ltd.
- 4 Lowe and Phil Creativity and problem solving Kogan Page (I) P Ltd
- 5 by Adair, J Decision making & Problem Solving Orient Longman
- 6 Bishop , Sue Develop Your Assertiveness Kogan Page India
- 7 Marion E Haynes Make Every Minute Count Kogan page India
- 8 Steven L McShane and Mary Ann Glinow Organizational Behavior Tata McGraw Hill
- 9 Stephen P. Robbins Organizational Behavior Pretice Hall of India, Pvt Ltd
- 10 Michael Hatton Presentation Skills (Canada – India Project) ISTE New Delhi
- 11 Stress Management Through Yoga and Meditation Sterling Publisher Pvt Ltd
- 12 Richard Hale ,Peter Whilom Target setting and Goal Achievement Kogan page India
- 13 Chakravarty, Ajanta Time management Rupa and Company
- 14 Harding ham Working in Teams A Orient Longman

INTERNET ASSISTANCE

1. <http://www.mindtools.com>
2. <http://www.stress.org>
3. <http://www.ethics.com>
4. <http://www.coopcomm.org/workbook.htm>
5. <http://www.mapfornonprofits.org/>
6. <http://www.learningmeditation.com> <http://bbc.co.uk/learning/courses/>
7. <http://eqi.org/>
8. <http://www.abacon.com/commstudies/interpersonal/indisclosure.html>
9. <http://www.mapnp.org/library/ethics/ethxgde.htm>
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. <http://members.aol.com/nonverbal2/diction1.htm>
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. <http://snow.utoronto.ca/Learn2/modules.html>
14. <http://www.quickmba.com/strategy/swot/>