Course Handout (Part II)

In addition to part-I (general handout for all courses in the time-table), this handout provides the specific details regarding the course.

Course No.: ME F441 **(3 0 3)**

Course Title: Automotive Vehicles

Instructor-in-charge: Dr. Ravi Inder Singh

Scope and Objective:
This course has been designed to make the students familiar with the automotive vehicles. It deals with the principle of operation and performance of internal combustion engines, along with working, analysis and design of various components of automotive vehicles.

Study Material:

Text Books:

i. Joseph Heitner, Automotive Mechanics – Principles and Practice, - Affiliated East West Press, 2nd edition, 1980.
ii. N. K. Giri, Automotive Mechanics, Khanna Publishers, 1996.

Reference books:

i. V. Ganeshan, Internal Combustion Engines, Tata McGraw-Hill
ii. M. L. Mathur and R. P. Sharma, A course in Internal Combustion Engines, Dhanpath Rai and Sons.
iii. A. R. Rogowski, Elements of I. C. Engines, Tata McGraw-Hill.
iv. Kirpal Singh, Automobile Engineering, - Vol. I & II, Standard Publishers & Distributors.

Course Plan:

Lecture No.	Learning Objectives	Contents	Reference @Chapters
1	Air standard cycles and their analysis	Otto, Diesel and Dual cycle	3RBi
2	Fuel-air cycles and actual cycle	Variable specific heats. Dissociation. Valve-timing diagram. Time loss factor. Heat loss factor. Exhaust blow down.	3TBi, 4&5RBi
3	Construction of I.C. engines	Piston. Piston rings. Cylinder. Crank. Connecting rod. Gaskets. Cylinder head.	3TBi, 2TBii
4	Combustion in S.I. engines	Stages of combustion. Flame front propagation. Factors influencing the flame speed. Rate of pressure rise. Knocking in SI engines. Effect of variables on knocking.	10RBi
5	Combustion in C.I. engines	Stages of combustion. Delay period. Factors influencing the delay period, Knocking in CI	10RBi

		engines. Effect of variables on knocking.	
6	Carburetors	Carburetion. Engine mixture requirements. Simple carburetor. Calculation of air fuel ratio.	8TBi, 3TBii
7	Parts of a carburetor	Strainers. Float chamber. Choke. Throttle. Metering system. Idling system. Acceleration system. Altitude compensation.	3TBii, 7RBi
8	Fuel injection system	Air injection system. Solid injection system. Unit injection system. Injection pumps. Types of nozzles, Injection pumps and fuel injectors	8RBi
9	Cooling systems	Need. Variation of gas temperature. Piston temperature distribution. Theory of engine heat transfer and correlation. Parameters affecting engine heat transfer. Air-cooled systems.	10TBi, 2TBii, 12RBi
10	Lubrication systems	Causes of engine friction. Function of lubrication. Mechanism of lubrication. Journal bearing lubrication.	6TBi, 11RBi
11	Engine performance	Measurement of frictional power. Air consumption. Fuel consumption, Engine power and Engine efficiencies. Engine performance characteristics	2TBii, 3RBi, 18RBii
12-13	Wheel and Tyres	Automobile Wheels, Tyre Fundmenatls and Chracteristics, Tyre Operation, Wheel Balancing	13 TBii
14	Clutch	Driving system and Plate clutch (uniform pressure and uniform wear).	14TBi, 5TBii
15	Clutch	Cone clutch (uniform pressure and uniform wear).	14TBi, 5TBii
16	Clutch	Energy lost by plate clutch during engagement. Centrifugal clutch.	14TBi, 5TBii
17	Gear box	Epicyclic or planetary gear (algebraic method and tabular method).	15TBi, 5TBii
18	Gear box	Torque and tooth load in Epicyclic gear trains. Sliding mesh and constant mesh gears.	15TBi, 5TBii
19,20	Gear box	Epicyclic gears and hydra-matic transmission.	15TBi, 5TBii
21	Propeller shaft	Types of driving shafts. Mechanics of Hotchkiss and torque tube drives.	20TBi, 6TBii
22	Universal joint	Slip joint. Hook's joint.	20TBi, 6TBii
23	Differential and rear axle	Differential. Rear axle. Axle shaft. Axle housing.	20TBi, 6TBii
24	Brakes	Theory of band brake, blocks brake, and band and block brake. Internal expansion brake.	21TBi, 8TBii
25 to	Brakes	Hydraulic brakes. Hand or parking brakes.	21TBi, 8TBii

27		Braking of vehicle moving in a curved path.	
28 to 31	Steering systems	Ackerman steering gear. Devis steering gear. Turning circle radii. Standard steering gears. Power steering.	22TBi, 7TBii
32	Brake wheel	Braking of vehicle. Heat generated due to braking operation. Types of wheels. Design consideration of wheels. Wheel alignment.	21TBi, 4TBii
33 to 36	Ignition and starting	Theory of automobile batteries. Testing of battery. Operation of ignition system. Primary condenser. Distributor. Spark plug. Starting motor.	12TBi, 4TBii
37-39	Chassis Electrical Systems, Safety Equipment and Vehicle Collision	Head Lights, Windscreen Wipers and Washers, Signalling Equipment, Window Winding and Central Door locking, Vehicle Security System, Tyre Pressure Warning, Vehicle Collision	19 TBii
40-42	Automobile Air Conditioning	Air conditioning requirements, Air Distribution System, Refrigeration System, Vapour compression cycle, Refrigerant and Refrigerant oil, Heater Systems	22TBii

Evaluation Scheme:

Components	Duration	Weightage (%)	Maximum Marks	Date & Time	Remarks
Class Test	50 min.	30	60	Anyday one Before Mid Sem and One After Mid Sem	Open Book
Mid Semester Test	90 min.	30	60	5/10 2:00 - 3:30 PM	Closed book
Comprehensive	3 hrs.	40	80	2/12 FN	Closed Book

Chamber Consultation Hours: Room No.: 2230: **TBA To be announced in class**

Notices: All notices related to this course will be put on the **Mech. Engineering notice board** only.

Make-up Policy: Make-up will be given only to the genuine students. The request application for make-up test must reach the Instructor-in-charge before commencement of the scheduled test (documentary proof is essential). **No make-up will be allowed for the Class Test.**

Instructor-in-charge
Dr. Ravi Inder Singh
ME F441