BITS PILANI, DUBAI CAMPUS
INSTRUCTION DIVISION
SECOND SEMESTER 2012 - 2013

Course Handout (Part II)

Date: 03.02.2013

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : ME C441 **(3 0 3)**
Course Title : Automotive Vehicles
Course Instructors : Dr. R. Udayakumar
Instructor-in-charge : Dr. R. Udayakumar

Scope and objective of the course:
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.

Course Pre/Co- requisite (if any) **& Catalogue / Bulletin Description:** *Given in the Catalogue 2012 – 2013 CD*

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. Kripal Singh, Automobile Engineering, - Vol. I & II, Standard Publishers & Distributors.

Course plan:

Lec. No.	Learning objectives	Contents	References@ (Chapters)
01	Air standard cycles and their analysis	Auto, Diesel and Dual cycle.	3RBi
02	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
03	Construction of I.C. engines	Piston. Piston rings. Cylinder. Crank. Connecting rod. Gaskets. Cylinder head.	3TBi, 2TBii
04	Combustion in S.I. engines	Stages of combustion. Flame front propagation. Factors influencing the flame speed. Rate of pressure rise.	10RBi
05	Combustion in S.I. engines	Knocking in SI engines. Effect of variables on knocking. Combustion chambers of SI engines.	10RBi
06	Combustion in C.I. engines	Stages of combustion. Delay period. Factors influencing the delay period.	10RBi
07	Combustion in C.I. engines	Knocking in CI engines. Effect of variables on knocking. Combustion chambers of CI engines.	10RBi
08	Carburetors	Carburetion. Engine mixture requirements. Simple carburetor. Calculation of air fuel ratio.	8TBi, 3TBii
09	Parts of a carburetor	Strainers. Float chamber. Choke. Throttle. Metering system. Idling system. Acceleration system. Altitude compensation.	3TBii, 7RBi
10	Fuel injection system	Air injection system. Solid injection system. Unit injection system. Injection pumps. Types of nozzles.	8RBi
11	Fuel injection system	Injection pumps and Fuel injectors.	8RBi
12	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
13	Cooling systems	Types of water-cooling systems. Radiators. Fans. Correlation for the power required for engine cooling.	12RBi
14	Lubrication systems	Causes of engine friction. Function of lubrication. Mechanism of lubrication. Journal bearing lubrication.	6TBi, 11RBi

15	Lubrication systems	Types of lubrication systems. Lubrication of engine components.	6TBi, 11RBi
16	Engine performance	Measurement of frictional power. Air consumption. Fuel consumption.	2TBii, 3RBi, 18RBii
17	Engine performance	Engine power and Engine efficiencies.	2TBii, 3RBii, 18RBii
18	Engine performance	Engine performance characteristics.	2TBii, 3RBi, 18RBii
19	Clutch	Driving system and Plate clutch (uniform pressure and uniform wear).	14TBi, 5TBii
20	Clutch	Cone clutch (uniform pressure and uniform wear).	14TBi, 5TBii
21	Clutch	Energy lost by plate clutch during engagement. Centrifugal clutch.	14TBi, 5TBii
22	Gear box	Epicyclic or planetary gear (algebraic method and tabular method).	15TBi, 5TBii
23	Gear box	Torque and tooth load in epicyclic gear trains. Sliding mesh and constant mesh gears.	15TBi, 5TBii
24,25	Gear box	Epicyclic gears and hydra-matic transmission.	15TBi, 5TBii
26	Propeller shaft	Types of driving shafts. Mechanics of Hotchkiss and torque tube drives.	20TBi, 6TBii
27	Universal joint	Slip joint. Hook's joint.	20TBi, 6TBii
28	Differential and rear axle	Differential. Rear axle. Axle shaft. Axle housing.	20TBi, 6TBii
29	Brakes	Theory of band brake, block brake, and band and block brake. Internal expansion brake.	21TBi, 8TBii
30 to 32	Brakes	Hydraulic brakes. Hand or parking brakes. Braking of vehicle moving in a curved path.	21TBi, 8TBii
33 to 35	Steering systems	Ackerman steering gear. Devis steering gear. Turning circle radii. Standard steering gears. Power steering.	22TBi, 7TBii
36 to 38	Brake wheel	Braking of vehicle. Heat generated due to braking operation. Types of wheels. Design consideration of wheels. Wheel alignment.	21TBi, 4TBii
39 to 41	Ignition and starting	Theory of automobile batteries. Testing of battery. Operation of ignition system. Primary condenser. Distributor. Spark plug. Starting motor.	12TBi, 4TBii
42 to 43	I.C. Engine Lab Visit	All Transmission systems	
44 to 45	Seminars	On survey assignments	

* The lectures may be slightly diverge from aforesaid plan based on students 'background & interest in the topic, which may perhaps include special lectures and discussions that would be planned and schedule notified accordingly.

Evaluation Scheme:

EC No	Components	Duration	Weightage%	Date & Time	Venue
1	Test-1	50 minutes	25	18.03.13 M 4	To be announced later
2	Quiz-1	20 minutes	08	To be announced	
3	Test - 2	50 minutes	20	05.05.13 Su 6	
4	Seminar	20 minutes	07	To be announced	
5	Compre Exam	3 hours	40	05.06.13 W (AN)	

* *Only prescribed text book(s) and hand written notes are permitted.*

Mid-sem Grading:
Mid-sem grading will be displayed after two evaluation components or earlier when- ever about 40 % of evaluation components are completed.

Note: A student will be likely to get "NC", if he / she

- Doesn't appear / appear for the sake of appearing for the evaluation components / scoring zero in pre-compre total.
- Scoring zero in the lab component / Abstaining from lab classes throughout.

Makeup and Attendance policies:
Make-ups are not given as a routine. It is solely dependent upon the genuineness of the circumstances under which a student fails to appear in a scheduled evaluation component. In such circumstances, prior

permission should be obtained from the Instructor-in-Charge (I/C).The decision of the I/C in the above matter will be final.

Attendance: Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course. A student should have a minimum of 50% of attendance in a course to be eligible to appear for the Comprehensive Examination in that course. For the students under the purview of Academic Counseling Board (ACB), the Board shall prescribe the minimum attendance requirement on a case-to-case basis. Attendance in the course will be a deciding factor in judging the seriousness of a student which may be directly / indirectly related to grading.

General timings for consultation:
Each instructor will specify his / her chamber consultation hours during
which the student can contact him / her in his / her chamber for consultation. (For details see part II)

General instructions:
Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

Notices:
All notices concerning the course will be displayed on the respective Notice Boards.

Instructor-in-Charge
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Instructor's Contact details: Dr.R.Udayakumar (Course Coordinator) – Academic Block, **Chamber No: 274** Contact Tel. No: 04 4200700 Extn. 287, Email: udaya@bits-dubai.ac.ae