

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
WORK INTEGRATED LEARNING PROGRAMMES
M. Tech Automotive Electronics
I Semester 2019-20

Course Title	Automotive Vehicles
Course No(s)	AEL ZC441
Credit Units	4
Credit Model	
Content Authors	Dr. Kiran D. Mali

Course Description:

Automotive Chassis Layout, Frame and body Construction, I.C. Engine Construction and Components. Engine Cooling and Lubrication System, Clutches, Transmission System, Drive Line System, Steering System, Suspension and Shock Absorber System, Braking System, Automotive Vehicle Performance.

Course Objectives

No	
C01	To study of main components/systems of an automobile, such as an engine, transmission, drive-axle system, suspension system, brake system, etc.
C02	Understanding the fundamental working principles of different systems.
C03	To learn the performance analysis along with working, and important aspects of various components of automotive vehicles
C04	To get acquainted with advanced concepts through projects, assignments which will be conducted during the semester

Text Book(s)

TB1	N. K. Giri, <i>Automotive Mechanics</i> , Khanna Publishers, Eighth edition
TB2	Kripal Singh, <i>Automobile Engineering</i> , - Vol. I & II, Standard Publishers & Distributors

Reference Book(s) & other resources

RBa	V. Ganeshan, <i>Internal Combustion Engines</i> , Tata McGraw-Hill Education
RBb	Joseph Heitner, <i>Automotive Mechanics – Principles and Practice</i> , - Affiliated East West Press, 2 nd edition, 1980
RBc	K.K. Jain , R. B. Asthana, <i>Automobile Engineering TTTI Bhopal</i> - Tata McGraw-Hill
RBd	S. Srinivasan, <i>Automotive Mechanics</i> , - Tata McGraw-Hill Education
RBe	Sudhir Kumar Saxena, <i>Automobile Engineering</i> , University science Press, 2009

Learning Outcomes:

No	Learning Outcomes
L01	To be able to recognize and identify different vehicle systems and components.
L02	To be able to analyze the functions and evaluate the performance of vehicle systems.
L03	Understanding importance of each system and how it may affect safety, reliability and performance of vehicle.
L04	Apply technical knowledge and skills necessary to remove, replace mechanical related small components.

Lect No.	Learning Objectives	Topics to be covered	Reference to Text
1-2	An introduction to automobiles	Overview of the course and evaluation scheme Development of automobiles, General classification, Basic structure and components of automobile	1TB1,1TB2
3	The chassis Construction and Body	Classification, Conventional construction, Sub frames, Frame less constructions, Classification of body, Numerical problems on chassis member bending.	11TB1, 1 TB2
4 to 5	Reciprocating Engine Construction and basics	Constructional details, Calculation of displacement velocity and acceleration of piston and connecting rod, Working of 2 and 4 stroke engines. Numerical problems on the above topics	3TB1
6	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.	8TB1, 12RBa
7	Cooling systems	Types of water-cooling systems. Radiators. Fans. Correlation for the power required for engine cooling. Numerical problems on the above topics	8TB1, 12RBa
8	Lubrication systems	Causes of engine friction. Function of lubrication. Mechanism of lubrication. Journal bearing lubrication.	7TB1, 11RBa
9	Lubrication systems	Types of lubrication systems. Lubrication of engine components.	7TB1, 11RBa
10	Clutch	Definition of clutch, requirements, classification, principle of working of friction clutches, Driving system and Plate clutch (uniform pressure and uniform wear).	14TB1, 3TB2
11	Clutch	Comparison of spring and diaphragm clutch, Cone clutch (uniform pressure and uniform wear).	14TB1, 3TB2
12	Clutch	Energy lost by plate clutch during engagement. Centrifugal clutch. Friction	14TB1, 3TB2

		materials and properties, Numerical problems on the above topics	
13	Brakes	Fundamentals of brakes, Braking of vehicle. Heat generated due to braking operation. Theory of Internal expansion brake.	18TB1, 10,11TB2
14-15	Brakes	Hydraulic brakes. Hand or parking brakes. Braking of vehicle moving in a curved path. Numerical problems on the above topics	18TB1, 10,11TB2
16-17	Gear box	Fundamentals of gear train, need of gear box, types of gear boxes, Torque and tooth load in epicyclic gear trains. Sliding mesh and constant mesh gears.	15TB1, 4TB2
18-19	Gear box	Epicyclic gears and hydra-matic transmission. Numerical problems on the above topics	15TB1, 4TB2
20	Differential and rear axle	Differential. Rear axle. Axle shaft. Axle housing. Numerical Problems	16TB1, 6TB2
21	Propeller shaft, Universal joint	Types of driving shafts. Mechanics of Hotchkiss and torque tube drives. Slip joint. Hook's joint.	16TB1, 6TB2
22-23	Suspension System	Object and basic requirement, Functions and types of suspension spring, Shock absorber, Independent Suspension, Stabilizer, Interconnected suspension systems, Numerical Problems on spring design	12 TB1, 7TB2
24-25	Front Axle and Steering system	Ackerman steering gear. Devis steering gear. Turning circle radii. Standard steering gears. Power steering. Numerical problems on the above topics	17TB1, 8TB2
26-27	Wheels and Tyres	Types of wheels. Design consideration of wheels. Wheel alignment.	13TB1, 9TB2
28-30	Vehicle Performance	Forces and couples on wheel, Vehicle drag, Power for propulsion, Traction and tractive efforts, Stability of vehicle on slope.	20TB1
31	Miscellaneous Topics	Accessories and vehicle safety	12,13,14 TB2
32	Revision and Review	Discussion on the topics studied	

ISM: Instructor Supplied Material

Evaluation Scheme:

Legend: EC = Evaluation Component; AN = After Noon Session; FN = Fore Noon Session

No	Name	Type	Duration	Weight	Day, Date, Session, Time
EC-1	Assignments/Quizzes	Online	-	20%	
EC-2	Mid-Semester Exam	Closed Book	2 hours	30%	
EC-4	Comprehensive Exam	Open Book	3 hours	50%	

Note:

Elearn portal: <https://elearn.bits-pilani.ac.in>.

Students are expected to visit the Elearn portal on a regular basis and stay up to date with the latest announcements and deadlines.

Evaluation Guidelines:

1. EC-1 consists of Quizzes, assignments, lab
2. For Closed Book tests: No books or reference material of any kind will be permitted.

3. For Open Book exams: Use of books and any printed / written reference material (filed or bound) is permitted. However, loose sheets of paper will not be allowed. Use of calculators is permitted in all exams. Laptops/Mobiles of any kind are not allowed. Exchange of any material is not allowed.
4. If a student is unable to appear for the Regular Test/Exam due to genuine exigencies, the student should follow the procedure to apply for the Make-Up Test/Exam which will be made available on the Elearn portal. The Make-Up Test/Exam will be conducted only at selected exam centres on the dates to be announced later.
5. Syllabus for Mid-Semester Test (Closed Book): Contact Hours 1 to 8
6. Syllabus for Comprehensive Exam (Open Book): Contact Hours 1 to 16

It shall be the responsibility of the individual student to be regular in maintaining the self-study schedule as given in the course handout, attend the lectures, and take all the prescribed evaluation components such as Quizzes, Assignments, Lab, Mid-Semester Test and Comprehensive Examination according to the evaluation scheme provided in the handout.

Instructor-in-Charge
AEL ZC441