

DEPARTMENT OF MECHANICAL ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech – Minor Course		
Course Title	Fundamentals of Automotive Technology		
Course Code	MEMI15	No. of Credits	03
Course Code of Pre-requisite subject(s)	-NIL-		
Session	January 2022	Section (if, applicable)	NA
Name of Faculty	Dr. Bishweshwar Babu	Department	Mechanical Engg.
Email	bishweshwar@nitt.edu	Telephone No.	+91 8285236031
Course Type	<input type="checkbox"/> Core course <input checked="" type="checkbox"/> Elective course		
SYLLABUS (APPROVED IN BoS)			
<p>Types of automobiles, vehicle construction and different layouts, chassis, frame and body.</p> <p>Electronically controlled gasoline injection system for SI engines, electronically controlled diesel injection system, Electronic ignition system, Turbo chargers, Catalytic converter.</p> <p>Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, over drive, transfer box, fluid flywheel –torque converter, propeller shaft, slip joints, universal joints.</p> <p>Steering geometry and types, types of Front Axle, Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System and Traction Control.</p> <p>Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternative fuels. EV and Hybrid vehicles.</p>			
COURSE OBJECTIVES			
<ol style="list-style-type: none"> 1. To understand the construction and working principle of various parts of an automobile. 2. To have the practice for assembling and dismantling of engine parts and transmission system. 			

COURSE OUTCOMES (CO)	
Course Outcomes	Aligned Programme Outcomes (PO)
At the end of the course, student will be able to	
1. Develop electronically modified injection systems.	1, 2, 3, 4, 5, 11, 12
2. Identify the use of fuels and its emission characteristics.	1, 2, 3, 4, 5, 6, 7, 11, 12
3. Perform both hydraulic and pneumatic braking systems.	1, 2, 3, 4, 5, 11, 12
4. Identify the type of transmission of motion in vehicles.	1, 2, 3, 4, 5, 11, 12

COURSE PLAN – PART II			
COURSE OVERVIEW			
Automotive Technology is the branch of engineering which deals with the design, manufacturing, operation, repair, as well as maintenance of automobiles and the various mechanisms involved. This course provides fundamental knowledge on various systems and components of automotive power plant, transmission, control, comfort and safety. The course also extends insight on the recent trends and developments of automobiles for the future.			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	Week	Topic	Mode of Delivery
1	1 st Week	Introduction – History of Automobiles – Automobiles - layouts, chassis, frame, body – material and construction	Online Lectures through MS Teams / PPT / Videos/ Writing pad
2	2 nd Week	Aerodynamics - Flow phenomenon - drag, side and lift force, rolling resistance. Ergonomics and anthropometry - comfort systems - air conditioning	
3	3 rd Week	Noise, Vibrations and Harshness. Vehicle safety systems - Regulations and test standards. Vehicle maintenance	
4	4 th Week	IC Engine and auxiliary systems - SI and CI Engines – Principle of operation, components and materials. Air and fuel systems - MPFI, GDI & CRDI, Turbochargers. Cooling and lubrication systems	

5	5 th Week	Typical performance, combustion and emission characteristics of automobile engines. Emission standards and control strategies - recent developments.
6	6 th Week	Manual and automatic transmission system – clutch, gear box, over drives, transfer box, fluid flywheel, torque convertors, Continuously Variable Transmission (CVT)
7	7 th Week	Propeller shaft - Hotchkiss drives, torque tube drive, universal joints. Final drive - differential - rear axle
8	8 th Week	Front axle - Wheel geometry - Wheel alignment and balancing - Steering geometry - Steering linkages & gear box - Power steering
9	9 th Week	Hydraulic and pneumatic braking systems - power and power assisted brakes - disc & drum brakes - braking torque - factors affecting braking - Antilock Braking System (ABS)
10	10 th Week	Suspension - types, factors influencing ride comfort, shock absorbers. Tires - types, construction and materials - static and rolling properties tire wear and maintenance
11	11 th Week	Electricity generation, storage and distribution - wiring harness. Starting & Ignition system. Automotive lighting
12	12 th Week	Automotive sensors & actuators, Engine Management Control System (EMS). Vehicle Management System- vehicle tracking system, Collision avoidance, Radar warning system, Global Positioning Systems (GPS)
13	13 th Week	Layout and operation - Power electronics - Electric machines and drives - Power train - Regenerative braking - Electric charging and batteries
14	14 th Week	Performance of electric and hybrid vehicles - Thermal management - NVH - Artificial Noise Generator - recent developments

COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test – 1	7 th week	30 mins	20
2	Cycle Test – 2	13 th week	30 mins	20
3	Assignments/ Group presentation/ Viva	–		30
CPA	Compensation Assessment (CPA)	14 th week	30 mins (syllabus – upto last week class teaching)	20
4	Final Assessment	As per institute policy		30
Essential Readings (Text Books, Reference Books, Journals, etc.)				
<ol style="list-style-type: none"> 1. Singh, K., <i>Automotive Engineering, Vol. I & II</i>, Standard Publishers, New Delhi, 1997. 2. Jain, K.K., and Asthana, R.B., <i>Automobile Engineering</i>, Tata McGraw-Hill Publishers, New Delhi, 2002 3. Newton, K., Steeds, W., and Garrett, T.K., <i>The Motor Vehicle</i>, Butterworth, 1989. 4. Heitner, J., <i>Automotive Mechanics</i>, 2nd edition, East-West Press, 1999. 5. Stockel, M.W., and Stockle, M.T., <i>Automotive Mechanics Fundamentals</i>, The Good heart –Will Cox Company Inc., USA, 1978. 6. Heisler, H., <i>Advanced Engine Technology</i>, SAE International Publications, USA, 1998. 7. Ganesan, V., <i>Internal Combustion Engines</i>, 3rd edition, Tata McGraw–hill, 2007. 				
COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)				
<ol style="list-style-type: none"> 1. Feedback from the students during class committee meeting. 2. At the end of every cycle test, feedback will be obtained for the lecture improvement. 3. End semester feedback on Course Outcomes. 				
COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)				
MODE OF CORRESPONDENCE (email/ phone etc)				
<ol style="list-style-type: none"> 1. Email (bishweshwar@nitt.edu) only, NO MOBILE PHONE communications. 2. Student meeting hours: Monday to Friday 15:00 – 18:00 (during this time period, students can come and discuss their doubts, projects, and assignment works) 				

COMPENSATION ASSESSMENT POLICY

If any student is not able to attend either CT – 1 or CT – 2 due to genuine reason, they are permitted to attend the compensation assessment (CPA) with %age weightage equal to maximum of CT-1/CT-2 (This is not valid for students who have attendance lag). Syllabus for the test should be the topics covered up to last week before the test.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- **At least 75% attendance in each course is mandatory.**
- **A maximum of 10% shall be allowed under On Duty (OD) category.**
- Students with **less than 65% of attendance** shall be prevented from writing the final assessment and **shall be awarded 'V' grade.**

ACADEMIC DISHONESTY & PLAGIARISM



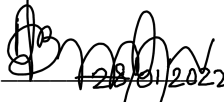
- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

- Course materials can be obtained from MS Teams.
- The faculty is available for consultation at times as per the intimation given by the faculty.

FOR APPROVAL

		
Course Faculty _____	CC-Chairperson <u>Dr. S. Vedharaj</u> 27-01-2022	HOD _____ 28/01/2022

Guidelines:

- a) The number of assessments for a course shall range from 4 to 6.
- b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**
- c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.**
- d) **The passing minimum shall be as per the regulations.**

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or class average/2 whichever is greater.		Peak/3 or class average/2 whichever is lower		40%

- e) **Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.**
- f) **Absolute grading policy shall be incorporated if the number of students per course is less than 10.**
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.