Lok Jagruti Kendra University
University with a Difference

# Diploma
# in
# Automobile Engineering

LJ Polytechnic

## Course Code: 025010303
## Automobile Powertrain

| Programme / Branch Name | | | Diploma in Automobile Engineering | | | |
|---|---|---|---|---|---|---|
| **Course Name** | Automobile Powertrain | | | | **Course Code** | 025010303 |
| **Course Type** | HSSC | BSC | ESC | PCC | OEC | PEC |

**Legends:** HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

## 1. Teaching and Evaluation Scheme

| Teaching Hours / Week | | | | | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **L** | **T** | **P** | **Total Teaching Hours** | **Total Credit** | **CA** | **CCE** | **SEE (TH)** | **SEE (PR)** | **Total** |
| 3 | 0 | 2 | 5 | 4 | 10 | 40 | 50 | 50 | 150 |

**Legends:** L: Lectures T: Tutorial P: Practical
CA: Continuous Assessment (Attendance + Activity)
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

## 2. Prerequisite

- ✓ Physics

## 3. Rationale

The course aims to impart basic skills for understanding of different types of transmission layouts, components of transmission system along with its working principle and recent advancements in Automobile Powertrain.

## 4. Objectives

- ✓ Penetrate deep into classification of different types of powertrain layouts.
- ✓ Grasp the importance of clutch and its actuating mechanisms.
- ✓ Understand the working and types of gear box and Transaxle used in Automobile
- ✓ Understand the necessity of Propeller shaft assembly in Rear-wheel-drive vehicles.
- ✓ Understand the Rear Axle Assembly.

## 5. Contents

| Unit No. | Unit Name | Topics | Learning Outcome | % Weightage | Hours |
|---|---|---|---|---|---|
| **1.** | **Introduction to Automobile Powertrain** | 1.1 Power flow layout from engine to wheels in front wheel drive, rear wheel drive and four-wheel drive.<br>1.2 Different types of chassis layout.<br>1.3 Different types of frames.<br>1.4 Constructional details of frameless chassis.<br>1.5 Lubrication of chassis. | • Grasp the basics of Powertrain layouts and types of chassis used in Automobile. | 15 | 5 |
| **2.** | **Clutch** | 2.1 Necessity of Clutch.<br>2.2 Principle of Clutch.<br>2.3 Different types of clutches used in Automobile.<br>2.4 Different types of clutch actuating mechanisms used in Automobile.<br>2.5 Construction and functions of fluid coupling. | • Understanding necessity, types, construction and working of Clutch used in Automobile | 20 | 10 |
| **3.** | **Transmission** | 3.1 Necessity of Gearbox in Automobile.<br>3.2 Construction of different types of Gears used in Automobile Gearbox.<br>3.3 Construction and working of Sliding mesh, Constant mesh and Synchromesh Gearbox<br>3.4 Gear Shifting mechanism.<br>3.5 Introduction and basics of Automatic Transmission.<br>3.6 Construction and Working of Torque Converter used in Automatic Transmission.<br>3.7 Construction and Working of Overdrive. | • Describe the construction and working of different types of gearboxes used in Automobile | 25 | 15 |
| **4.** | **Propeller Shaft and Universal Joints** | 4.1 Necessity of Propeller Shafts, Universal Joints and Slip Joints. | • Describe construction and working of propeller shaft assembly. | 20 | 4 |

| | | | | | |
|---|---|---|---|---|---|
| | | 4.2 Construction & working of various types of propeller shafts.<br>4.3 Construction & working of various types of universal joints.<br>4.4 Construction & working of slip joints. | | | |
| **5.** | **Rear Axle Assembly** | 5.1 Necessity of final drive<br>5.2 Types of final drive.<br>5.3 Construction & working of final drive.<br>5.4 Necessity of differential<br>5.5 Construction & working of differential.<br>5.6 Differential Lock Mechanism.<br>5.7 Function of axle housing<br>5.8 Types of axle housing<br>5.9 Types of axle mounting. | • Understanding rear axle assembly and its constructional as well as functional details. | 20 | 8 |
| | | | | **Total Hours** | **42** |

## 6. Suggested Specification Table for Evaluation Scheme

| Unit No. | Unit Name | Distribution of Topics According to Bloom's Taxonomy | | | | | |
|---|---|---|---|---|---|---|---|
| | | R % | U % | App % | C % | E % | An % |
| 1. | Introduction to Automobile Powertrain | 40 | 40 | 20 | 0 | 0 | 0 |
| 2. | Clutch | 25 | 50 | 25 | 0 | 0 | 0 |
| 3. | Transmission | 30 | 70 | 0 | 0 | 0 | 0 |
| 4. | Propeller Shaft and Universal Joint | 40 | 40 | 20 | 0 | 0 | 0 |
| 5. | Rear Axle Assembly | 30 | 50 | 20 | 0 | 0 | 0 |

**Legends:** R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

## 7. List of Practicals / Exercises

| Sr. No | Practical / Exercises | Key Competency | Hours |
|---|---|---|---|
| 1 | Demonstrate construction and working of Powertrain layout of Vehicle driveline. | Draw the different layouts of powertrain for front wheel drive, rear wheel drive and four-wheel drive along with understandability of power flow from Engine to Wheels. | 2 |
| 2 | Demonstrate construction and working of Single plate clutch and multi-plate clutch. | Identify different parts of Single Plate Clutch and Multi-plate Clutch. Understanding of Engaging and Disengaging process of Single Plate Clutch and Multi-Plate Clutch. Different components responsible for engaging and disengaging clutch. | 2 |
| 3 | Demonstrate construction and working of different clutch actuating mechanisms. | Identify different parts of Clutch actuating mechanism. Understanding of Clutch actuating mechanism for two wheelers and four wheelers. Understanding Clutch pedal free play and adjustments. | 2 |
| 4 | Demonstrate construction and working of Sliding mesh and Constant mesh gear box | Identify different components of Sliding Mesh Gearbox and Constant Mesh Gearbox. Understanding Power flow in Sliding mesh and Constant mesh gearbox. Different types of gears used in different transmission. | 2 |
| 5 | Demonstrate construction and working of Synchromesh gear box | Identify different components of Synchromesh Gearbox. Understanding speed synchronization of two gears. Materials used for manufacturing synchronizing ring, synchronizing sleeve and Gears. | 2 |
| 6 | Demonstrate construction and working of Automatic Gearbox. | List out and identify different components used in Automatic Transmission. Role of Torque Converter in Automatic Transmission. Integral components of Torque Converter. Understanding Epicyclic Gear train of Automatic Gearbox. | 2 |
| 7 | Demonstrate functions of propeller shaft and universal joint. | Understanding the construction and working of propeller shaft. Role of Universal Joint and Slip Joint in Propeller shaft assembly. Understanding different types of universal joints as per its constructional details. | 2 |
| 8 | Demonstrate construction and working of Conventional Differential | Understanding the construction and working of Conventional Differential. Understanding role of differential when vehicle is moving on straight path. Role of differential to attain speed difference of inner and outer wheels while taking turn. | 2 |
| 9 | Demonstrate construction and working of Limited Slip Differential and Differential Lock. | Understanding the construction and working of Limited Slip Differential. Techniques used for Differential Lock and different types of mechanisms used for differential lock. | 2 |
| 10 | Demonstrate construction and working of types of Axle Housing and Axle Mountings. | Understanding the construction and working of different types of axle housing and axle mounting used in passenger as well as commercial vehicles. | 2 |

Total Hours **20**

## 8. Reference Books

1) Automobile Engineering Vol. I by Dr. Kirpal Singh, Standard Publishers (Text Book)
2) Automobile Engineering by R.B Gupta, Satya Prakashan
3) Automobile Engineering Vol II by Anil Chhikara, Satya Prakashan
4) Transmission and Power Train by William Crouse and Donald Anglin, Tata McGraw Hill
5) Automobile Technology by N.K Giri, Khanna Publishers
6) Automotive Mechanics by S. Srinivasan, Tata McGraw Hill
7) Automotive Power Transmission Systems by YI Zhang and Chris MI, Wiley Publications

## 9. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/c/TheAutomotives
2) https://theautomobileengineers.blogspot.com/
3) http://nptel.ac.in/
4) https://www.youtube.com/c/LearnEngineering
5) http://www.learnerstv.com/
6) http://auto.howstuffworks.com/
7) https://www.youtube.com/watch?v=rb3_suXXbxY
8) https://www.youtube.com/watch?v=WeLm7wHvdxQ
9) https://www.youtube.com/watch?v=yYAw79386WI
10) https://www.youtube.com/watch?v=6DL0j0eKD8Y
11) https://www.youtube.com/watch?v=u_y1S8C0Hmc
12) https://www.youtube.com/watch?v=u_y1S8C0Hmc
13) https://www.youtube.com/watch?v=WwMYGF2avrs
14) https://www.youtube.com/watch?v=mWtFkEwF61I
15) https://www.youtube.com/watch?v=ZN6xHc7Nz-E
16) https://www.youtube.com/watch?v=18YNpG7IAQ8
17) https://www.youtube.com/watch?v=vNSZ_HYiJoI
18) https://www.youtube.com/watch?v=bRcDvCj_JPs
19) https://www.youtube.com/watch?v=FTiJAdJjsqA
20) https://www.youtube.com/watch?v=OezhCX4WBLs