

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

Course Curriculum

AUTOMOBILE TRANSMISSION & MECHANISMS (Code: 3330202)

Diploma Programme in which this course is offered	Semester in which offered
Automobile Engineering	3 rd Semester

1. RATIONALE

Any automobile apart from engine is made of transmission system and other systems like brakes, steering, suspension systems, wheel and tyres. This course provides knowledge about these systems. This course will also help the students during inspection, installation, operation and maintenance of transmission, steering and suspension systems of automobiles. This course is therefore a core course for automobile engineers and they should develop mastery over it.

COMPETENCIES (Programme Outcomes (POs) According to NBA terminology)

The course content should be taught and with the aim to develop different types of skills so that students are able to acquire following competencies:

- **Install and test automobile power transmission, brakes, steering and suspension system during manufacturing**
- **Maintain automobile power transmission, brakes, steering and suspension system during service**

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	PA	ESE	PA	150
4	0	2	6	70	30	20	30	

Legends: L-Lecture; T – Tutorial/Teacher Guided Student Activity; P -Practical; C – Credit;; ESE -End Semester Examination; PA - Progressive Assessment.

4. DETAILED COURSE CONTENTS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit – I Introduction to Automobile Transmission System	1a. Describe power transmission systems. 1b. Draw different layout of chassis. 1c. Explain construction of frames.	1.1 Flow of power transmitted in front wheel drive, rear wheel drive and four wheel drive. 1.2 Different layout of chassis. 1.3 Lubrication of chassis. 1.4 Different types of frame. 1.5 Frame less chassis
Unit – II Clutch	2a. List different types of clutches. 2b. Explain operation of Clutch, Clutch actuating Mechanism. 2c. Describe Construction and working of fluid coupling.	2.1 Necessity Types of clutches. 2.2 Construction and functions of different types of clutches, clutch actuating mechanism. 2.3 Construction and functions of fluid coupling.
Unit – III Gear box	3a. Describe different types of gears and gear boxes. 3b. Describe operation of Gear shifting mechanisms with line diagram of motion flow. 3c. Explain construction & working of overdrive & torque convertor.	3.1 Necessity Types of gearboxes. 3.2 Construction and functions of Sliding mesh, Constant mesh, Synchromesh, Epicyclical train & automatic transmission. 3.3 Gear shifting mechanism, 3.4 Torque converter and overdrive- construction & working.
Unit– IV Propeller shaft & universal joint	4a. Explain need & construction of various types of propeller shafts. 4b. Explain construction & functions of various types of universal joints.	4.1 Need of propeller shaft, universal joint and slip joint. 4.2 Construction & functions of various types of propeller shafts. 4.3 Construction & functions of various types of universal joints.
Unit– V Rear axle assembly	5a. Identify components of final drive assembly. 5b. Describe construction and operation of differential and different types of rear axles. 5c. Describe construction and operation of different types of axle housings.	5.1 Necessity of final drive, Types of final drive. 5.2 Construction & functions of final drive. 5.3 Necessity of differential, Construction & functions of differential, differential locks. 5.4 Types of axle housing, Function of axle housing and different types of axle mounting.
Unit– VI Front axle and steering mechanism	6a. Explain steering geometry. 6b. Describe various steering mechanisms with is need and importance. 6c. Identify various linkages of steering mechanisms, steering gears. 6d. Explain power steering	6.1 Necessity of steering geometry. 6.2 Kingpin inclination, camber, caster, Toe-in Toe-out and other terminology. 6.3 Types of front axle. 6.4 Types of steering linkages and Types of steering gears. 6.5 Effect of under steer and over steering. 6.6 Steering lock and turning circle radius. 6.7 Power steering systems- hydraulic,

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
	systems .	electronics controlled electrical.
Unit– VII Brakes	7a. List types of brakes. 7b. Explain construction and operation of various braking mechanisms. 7c. Explain need, construction & working of Anti lock brakes.	7.1 Necessity & Types of brake. 7.2 Construction and functions of braking system, Braking Mechanism, Brake setting. 7.3 Anti lock brake systems- purpose, arrangement and function of different parts.
Unit– VIII Suspension system	8a. Explain importance of suspension system. 8b. Describe construction and working of front & rear suspension systems and shock absorbers. 8c. Differentiate functions of springs and shock absorbers.	8.1 Necessity of suspension system. 8.2 Types of front & rear suspension systems. 8.3 Types of springs. 8.4 Construction and functions of various types of suspension system. 8.5 Necessity of shock absorber. 8.6 Construction and functions of shock absorber.
Unit– IX Wheels and tyres	9a. Describe construction of various types of wheels and tyres. 9b. Factors affecting life of tyre, & Tyre rotation. 9c. Describe tyre rating & specifications. 9d. Explain Hot & cold tyre retreading procedures.	9.1 Various types of wheels. 9.2 Salient features of wheels. 9.3 Salient features of different types of rims. 9.4 Types of tyres. 9.5 Constructional details of tube and tubeless tyres. 9.6 Hot & cold tyre retreading procedure. 9.7 Rating of tyre. 9.8 Factors affecting life of tyre. 9.9 Tyre rotation and Tyre specification.

5. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total
1.	Introduction to automobile transmission system	04	04	03	00	07
2.	Clutch	07	02	03	02	07
3.	Gear box	09	03	04	03	10
4.	Propeller shaft & universal joint	05	02	03	02	07
5.	Rear axle assembly	04	02	03	02	07
6.	Front axle and steering mechanism	07	02	03	02	07
7.	Brakes	10	03	04	04	11
8.	Suspension system	05	02	03	02	07
9.	Wheels and tyres	05	02	03	02	07
	Total	56	22	29	19	70

Legends: R = Remember; U= Understand; A= Apply and above levels (Revised Bloom's taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

6. SUGGESTED LIST OF PRACTICAL/EXERCISES

The practical/exercises should be properly designed and implemented with an attempt to develop different types of practical skills (**Course Outcomes in psychomotor and affective domain**) so that students are able to acquire the competencies (Programme Outcomes). Following is the list of practical exercises for guidance.

Note: Here only Course Outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme. Faculty should refer to that common list and should ensure that students also acquire those Programme Outcomes/Course Outcomes related to affective domain.

Sr. No.	Unit No.	Practical Exercise (Any Seven) (Course Outcomes in Psychomotor Domain according to NBA terminology)	Apprx. Hrs. Required
1	II	Demonstrate construction and working of different types of clutch.	4
2	III	Demonstrate construction and working of different types of gear boxes.	4
3	III	Study working principal of overdrive mechanism.	4
4	IV	Demonstrate functions of propeller shaft and universal joint.	4
5	V	Demonstrate working of differential.	4
6	VII	Demonstrate operation of brake mechanisms and brakes (Hydraulic, Mechanical, Air brake).	4
7	VI	Demonstrate construction and operation of steering mechanism.	4
8	V	Demonstrate construction and operation of power steering.	4
9	VIII	Demonstrate of different types of suspension systems and shock absorbers.	4
10	IX	Study of different types of wheels and tyres.	4
Total			28

7. SUGGESTED LIST OF PROPOSED STUDENT ACTIVITIES

Following is the list of proposed student activities like:

- a. Seminar by students on various automobile transmission mechanisms like clutch, gear, brakes actuating mechanisms etc.
- b. Preparation of display boards or charts for steering mechanism, suspension system, different types of brakes, wheels and tyres etc.
- c. Assembly and disassembly of clutch actuating mechanism, gear box, differential, steering mechanisms, brake actuating mechanism, steering, suspension systems, etc.
- d. Individual or group-based projects to prepare working model of various mechanisms such as brake operating mechanism, different clutch operating mechanism, steering mechanism, model of differential etc.
- e. Teacher guided self learning activities to prepare report as an assignment from industrial survey/internet/library/or group discussion on any of the automobile transmission mechanisms.

8. SUGGESTED INSTRUCTIONAL STRATEGIES (If Any)

- a. Lecture cum discussion using demonstration of charts, cut section models, animation and videos.
- b. Visit of authorized workshop of two wheeler and four wheeler or transmission component manufacturers.
- c. Group discussion on any of the automobile transmission and mechanisms.

9. SUGGESTED LEARNING RESOURCES

A. List of Books

S.No.	Author	Title of Books	Publication
1	R. B. Gupta	Automobile Engineering	SatyaPrakashan, New Delhi
2	Anil Chhikara	Automobile Engineering vol-II	SatyaPrakashan, New Delhi
3	K. M. Gupta	Automobile Engineering	Umesh Publication
4	Jain K.K., Asthana R.B.	Automobile Engineering	Tata Mc-Graw Hill Publishing Co. Ltd.
5	G. B. S. Narang	Automobile Engineering	Khanna Publishers
6	A. W. Judge	Motor Manual	London, 1925
7	W.H.Crouse & D.L. Anglin	Transmission and power Train	Tata Mc-Graw Hill Publishing Co. Ltd.
8	Singh Kirpal	Automobile Engineering: (Vol-II)	Standard Publishers Distributors
9	S. Srinivasan	Automotive Mechanics	Tata McGraw-Hill Education

S.No.	Author	Title of Books	Publication
10	N. K. Giri	Automobile Technology	Khanna Publishers
11	C.P. Nakra	Basic Automobile Engineering	DhanpatRai Publication Co. (P) Ltd.

B. List of Major Equipment/ Instrument

- Cut Sectioned working model of various types of clutches, gear boxes, fluid coupling/ torque convertor.
- Cut sectioned working model of various brake systems, differential.
- Display board of various steering gear mechanisms, power steering.
- Display board of various types of suspension system and shock absorbers.
- Charts for various types of chassis and frames, wheels and tyres.

C. List of Software/Learning Websites

- http://www.youtube.com/watch?v=H7Iay0Ke_t4
- <http://www.youtube.com/watch?v=OQ9eI7mEmxw>
- <http://www.youtube.com/watch?v=FfjGohWy-OU>
- <http://www.youtube.com/watch?v=IKywZ730JFs>
- <http://www.youtube.com/watch?v=eKKfJAaVBJE>
- <http://www.youtube.com/watch?v=aUIS25r3XY0>
- <http://www.youtube.com/watch?v=VcFQZ8NiF4o>
- <http://www.youtube.com/watch?v=17FG-GzVJyI>
- <http://www.youtube.com/watch?v=1-ksUrWmBo4>
- http://www.ehow.com/video_2327738_overview-shocks-suspension-system.html
- Howstuffworks.com
- Wikipedia.com

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

- **Prof. D.A. Dave**, H.O.D., Automobile Engineering Department, Sir Bhavsinhji Polytechnic Institute, Bhavnagar.
- **Prof. M.N. Vibhakar**, Lecturer, Automobile Engineering Department, Dr. S&S Gandhi Polytechnic, Surat.
- **Prof. S.V. Trivedi**, Lecturer, Automobile Engineering Department, Parul Institute of Engineering and Technology, Vadodara.
- **Prof. Sanjay Kumar Ghaiye**, Head Automobile Engineering Department, Kalaniketan Govt. Polytechnic, Jabalpur (MP).

Coordinator and Faculty Members from NITTTR Bhopal

- **Dr. K.K. Jain**, Professor, Department of Mechanical Engineering
- **Dr. C.K. Chugh**, Professor, Department of Electronic Media