Course Title: **Automobile transmission & Control systems Lab**	Course Code: **15AT33**P
Credits (L:T:P) : **0:2:4** **Credit:3**	Core/ Elective: **Core**
Type of course: **Tutorials and Practical**	Total Contact Hours: **78**
CIE- 25 Marks	SEE- 50 marks

Prerequisites:

Knowledge of Automobile transmission and control systems being studied in III semester.

Course Objectives:

Understand the complete procedure of dismantling, cleaning, and inspection, fault finding/rectifying and reassembling of components of Automobile transmission and control systems.

On successful completion of the course, the students will be able to attain CO:

Course Outcome		CL	Experiments linked	Linked PO	Teaching Hrs
CO1	Service and fault diagnosis of Clutch & gearbox.	***U/A***	1,2,3,4,5,6	1,2,3,4,8,9,10	**24**
CO2	Service and fault diagnosis of Propeller shaft & differential.	***U/A***	7,8	1,2,3,4,8,9,10	**12**
CO3	Service and fault diagnosis of Steering & suspension system.	***U/A***	9,10,11,12	1,2,3,4,8,9,10	**18**
CO4	Service and fault diagnosis of braking system.	***U/A***	13,14,15,16	1,2,3,4,8,9,10	**18**
C05	Measure and check dimensions and alignment of chassis frame.	***U/A***	17,18	1,2,3,4,8,9,10	**06**
		Total sessions			**78**

COURSE PO ATTAINMENT MATRIX

Course	Programme Outcomes									
	1	2	3	4	5	6	7	8	9	10
Automobile transmission and control systems lab	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**3**

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed.

Method is to relate the level of PO with the number of hours devoted to the COs which address the given PO.
If ≥40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 3
If 25 to 40% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 2
If 5 to 25% of classroom sessions addressing a particular PO, it is considered that PO is addressed at Level 1
If < 5% of classroom sessions addressing a particular PO, it is considered that PO is considered not-addressed

Course Content:

UNIT-I

Tutorials:

Tutorial class for every graded exercise should include the followings.

1. Precautions to be taken during conduction of each exercise.
2. Proper tools to be used and sequence to conduct each exercise.
3. Any measurements/adjustments to be made in each exercise.
4. Discussion on trouble shooting of each system.

UNIT-II

Lab exercises

Sl.No	List of Graded Exercises:	Hrs. Allotted.
1	Overhauling of a Single plate clutch. (coil spring type)	03
2	Overhauling of a Single plate clutch. (Diaphragm spring type)	03
3	Overhauling of a multi-plate clutch.	03
4	Overhauling of a constant-mesh Gear-box & calculation of gear-ratio's w.r.t number of teeth.	06
5	Overhauling of a synchro-mesh Gear-box & calculation of gear-ratio's w.r.t number of teeth.	06
6	Overhauling of a Transfer case.	03
7	Overhauling of a Propeller shaft & universal joint	03
8	Overhauling of a Final drive & Differential with backlash adjustment, & calculation of Final drive gear ratio	09
9	Overhauling of a front axle & hub greasing	03
10	Overhauling of a Steering gear box with Backlash, End-play adjustment & calculation of steering gear ratio. (minimum any three different types of steering gear box)	09
11	Overhauling of an Independent suspension system	03
12	Overhauling of a Leaf spring & re-chambering.	03
13	Overhauling of a mechanical brake with free-play & brake shoe adjustments.	03
14	Overhauling of a drum brake	03
	Overhauling of a disc brake	03

15	Overhauling of a Master cylinder & wheel cylinder.	06
16	Bleeding of hydraulic brake system, free-play & brake shoe adjustments.	03
17	Measurement of Wheel base, wheel track, Toe-in, Toe-out, over length, over all height, front over-hang, rear over-hang, ground clearance.	03
18	Checking the alignment of chassis frame.	03
	Total Hrs.	**78**

Course Delivery:

The course will be delivered through tutorials, demonstration and hands on practices.

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	CIE (Continuous Internal Evaluation)	IA Tests	Students	Two IA Tests (Average of two Tests)	10	Blue books	1,2,3,4,5
				Mini Projects	10	Models	1,2,3,4,5
				Lab Records	05	Lab Records	1,2,3,4,5
				TOTAL	25		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,4,5
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1 & 2 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4,5 Effectiveness of Delivery of instructions & Assessment Methods

***CIE** – Continuous Internal Evaluation ***SEE** – Semester End Examination

Note:

1. I.A. test shall be conducted as per SEE scheme of valuation. However obtained marks shall be reduced to 10 marks. Average marks of two tests shall be rounded off to the next higher digit.
2. Rubrics to be devised appropriately by the concerned faculty to assess Mini project/Student activities.

MODEL OF RUBRICS FOR ASSESSING STUDENT ACTIVITY/MINI PROJECT

Note: The Dimensions given in below table are only representative. The lecturer has to design/decide suitable dimensions based on the activity given.

Dimension	Scale					Students Score				
	Unsatisfactory 1 marks	Developing 2marks	Satisfactory 3marks	Good 4marks	Exemplary 5marks	1	2	3	4	5
1. Research and gather information	Does not collect information relate to topic	Collects very limited information, some relate to topic	Collects basic information, most refer to the topic	Collects more information, most refer to the topic	Collects a great deals of information, all refer to the topic	3				
2.Full fills teams roles and duties	Does not perform any duties assigned to the team role	Performs very little duties	Performs nearly all duties	Performs almost all duties	Performs all duties of assigned team roles	4				
3.Shares work equally	Always relies on others to do the work	Rarely does the assigned work, often needs reminding	Usually does the assigned work, rarely needs reminding	Always does the assigned work, rarely needs reminding.	Always does the assigned work, without needing reminding	5				
4. listen to other team mates	Is always talking, never allows anyone to else to speak	Usually does most of the talking, rarely allows others to speak	Listens, but sometimes talk too much,	Listens and talks a little more than needed.	Listens and talks a fare amount	1				
Grand Average/Total=3+4+5+1/4=13/4=3.25=4						4				

Reference Books:

Sl No	Title of the book	Author Name	Publisher
01	Mechanic Motor Vehicle Trade theory and Practical	----------	National Instructional Media Institute, Chennai
02	Automobile Engineering Practices.	N.Malhotra	Asian publishers
03	Vehicle Maintenance &Garage Practice	Jigar A Doshi	PHI Learning,Delhi
04	Automotive Mechanics	W. H. Crouse & Anglin	Tata MCgraw-Hill
05	Diesel Engineering	Sean Bennett	CENGAGE Learning
06	Automotive Technology	Jack Erjavec	CENGAGE Learning
07	Automobile Engineering.	Harban Singh Rayath	S Chand
08	Charts and cut section models		

Important Note:

1. Overhauling includes Dismantling, Cleaning, Inspection, Repair / Replacement of worn parts, reassembling with necessary adjustments.
2. For every Exercises mention the detailed Trouble shooting chart in the Lab records.
3. The lab-record must have the following contents for each exercise :
    a. Aim
    b. Tools & Equipments required
    c. Procedure
    d. Precautions if any
    e. Results / Reports
    f. Troubling shooting chart.

SCHEME OF EVALUATION

***Note: Lab Record is compulsory for Practical Examination*.**

Serial no	Description	Marks
1	**Writing procedure** a) One exercise from list of exercises 1-8 b) One exercise from list of exercises 09-18	(05+05) = **10**
2	**Conducting & Performance** a) One exercise from list of exercises 1-8 b) One exercise from list of exercises 09-18	(15+15) =**30**
3	**Viva-voice**	**10**
	Total	**50**

TOOLS & EQUIPMENT LIST REQUIRED FOR THE LAB

1. Mechanic tool kit
2. Torque wrench (0-200 Nm)
3. Arbor press
4. Hydraulic press (20 Tons)
5. Hydraulic trolley jack
6. Hydraulic/ Mechanical jacks
7. Dial gauges with magnetic stand, feeler gauges,
8. Air compressor
9. Electronic Tyre inflators
10. Two post hoist
11. Tripod stands
12. Three jaw bearing pullers

LIST OF COMPONENTS REQUIRED

1. Single plate clutches (Coil & Diaphragm spring type)
2. Multi plate clutch
3. Gear boxes (constant & synchromesh mesh)
4. Transfer case
5. Propeller shaft assembly
6. Rear axle assembly with wheels
7. Front axle assembly with wheels
8. Steering gearbox assemblies (different types)
9. Chassis frame with Independent & leaf spring suspension system
10. Mechanical brake assemblies
11. Hydraulic brake system.
12. Master Cylinder-Single piston and Tandem master cylinder.
13. Wheel cylinders-single piston and double piston.
14. Drum brake assemblies.
15. Disc brake assemblies.

MODEL QUESTION BANK

1. Conduct the experiment to overhaul the given coil type single plate clutch. And list the missing/worn parts.
2. Conduct the experiment to overhaul the given diaphragm type single plate clutch. And list the missing/worn parts.
3. Conduct the experiment to overhaul the given multi plate clutch. And list the missing/worn parts.
4. Conduct the experiment to overhaul the given constant mesh gear box. And list the missing/worn parts. Also calculate different gear ratios.
5. Conduct the experiment to overhaul the Synchro mesh constant mesh gear box. And list the missing/worn parts. Also calculate different gear ratios.
6. Conduct the experiment to overhaul the given transfer gear box. And list the missing/worn parts.
7. Conduct the experiment to overhaul the given propeller shaft assembly. And list the missing/worn parts.
8. Conduct the experiment to overhaul the given differential assembly. Check and adjust back lash. List the missing/worn parts. And calculate final gear ratios.
9. Conduct the experiment to overhaul the given front axle assembly. And list the missing/worn parts.
10. Conduct the experiment to overhaul the given steering gear box. List the missing/worn parts. Also check and adjust end play and back lash.
11. Conduct the experiment to overhaul the given independent suspension system. And list the missing/worn parts.
12. Conduct the experiment to overhaul the given leaf spring. List the missing/worn parts. Also calculate its camber.
13. Conduct the experiment to overhaul the given mechanical brake system. List the missing/worn parts. Also adjust free play.
14. Conduct the experiment to overhaul the given disc brake. And list the missing/worn parts.
15. Conduct the experiment to overhaul the given master cylinder single piston type. And list the missing/worn parts.
16. Conduct the experiment to overhaul the given tandem master cylinder single piston type. And list the missing/worn parts.
17. Conduct the experiment to overhaul the given wheel cylinder single piston type. And list the missing/worn parts.
18. Conduct the experiment to bleed the given hydraulic braking system.
19. Conduct the experiment to measure Wheel base, wheel track, Toe-in, Toe-out, over length, over all height, front over-hang, rear over-hang, ground clearance of a given vehicle.
20. Conduct the experiment to check the alignment of the given chassis frame.