



**Format CO
COURSE OUTLINE (*)**

ELECTRONICALLY CONTROLLED TRANSMISSION

Course Title

AM 226

Dept. & Course No.

I COURSE DESCRIPTION

This course is designed to enhance the knowledge, skill and attitude of an individual in servicing electronic controlled transmission. And it also includes servicing and repair of electrical and electronic components of automatic transmission.

II SEMESTER CREDITS: 3

III CONTACT HOURS PER WEEK:

2

3

5

Lecture

Laboratory

Total

IV PREREQUISITE: AM113, AM125 and AM215

V STUDENTS LEARNING OUTCOME

VI. COURSE CONTENT

Upon completion of this course the student will be able, with 65% level of accuracy, to:

1.) Name automatic transmission planetary gear box parts and components and explain their functions.

A. Planetary gear type automatic transmission parts and components

- 1.) Forward clutch
- 2.) Reverse clutch
- 3.) Overdrive clutch
- 4.) Planetary ring gear
- 5.) Planetary carrier
- 6.) Planetary sun gear
- 7.) Brakes
- 8.) One-way clutch
- 9.) Torque converter
- 10.) Valve body
- 11.) Oil pump assembly
- 12.) Automatic transmission fluid
- 13.) Input shaft
- 14.) Intermediate shaft
- 15.) Output shaft

2.) Explain the operating principle of electronic controlled automatic transmission.

B. Explain the operating principle of electronic controlled transmission

- 1.) Power flow of forward gears (low speed and high speed)
- 2.) Power flow of reverse gears
- 3.) Power flow overdrive gears

3.) Overhaul automatic transmission planetary gear box

4.) Name automatic transmission electronic control system parts and components and explain their functions.

5.) Explain automatic transmission electronic control system operating principle.

6.) Check automatic transmission electronic control system as per vehicle specification.

C. Electronic controlled automatic transmission Overhauling procedure

- 1.) Dismantle transmission gear box parts and components
- 2.) Clean transmission gear box parts and components
- 3.) Assemble transmission gear box assembly
- 4.) Overhaul electronic controlled transmission valve body.

D. Automatic transmission electronic control system parts and components and their functions.

- 1.) Solenoid valves
- 2.) Neutral safety switch
- 3.) Automatic transmission control module.
- 4.) Hydraulic circuitry
- 5.) Speed sensor

E. Operating principle of automatic transmission electronic control system

- 1.) During P-range
- 2.) During R-range
- 3.) During N-range
- 4.) During D-range (from 1st to overdrive speed)
- 5.) During S-range
- 6.) When making +and – shifting
- 7.) During R-range

F. Automatic Transmission Electronic Control System inspection maintenance

- 1.) Check valve body Solenoid valves functionality, rationality, and circuitry.
- 2.) Check Neutral safety switch rationality, functionality, and rationality.
- 3.) Check Automatic transmission control module functionality, rationality, and circuitry.
- 4.) Check converter lock-up solenoid
- 5.) Check Speed sensor functionality, rationality, and circuitry
- 6.) Check overdrive cancel solenoid for functionality, rationality, and circuitry
- 7.) Check solenoid downshift

functionality, and rationality.

7.) Name continuously variable transmission gear box parts and components and explain their functions.

G. Continuously Variable Transmission gear box parts and components and their Functions

1. Drive pulley
2. Driven pulley
3. Forward clutch
4. Reverse clutch
5. Input shaft
6. Output shaft
7. Steel belt
8. Valve body
9. Oil pump
10. CVT fluid
11. Parking lock pawl
12. One-way clutch
13. Clutch piston
14. Clutch plate and disc
15. Planetary gear unit
16. Seal rings
17. Oil seals

8.) Explain continuously variable transmission gear box operating principle.

H. Continuously Variable Transmission gear box operating principle.

1. Under-drive
2. Over-drive
3. Direct drive
4. Reverse drive
5. Power flow

9.) Overhaul continuously variable transmission gear box

I. Continuously Variable Transmission gear box overhauling procedure.

1. Remove CVT transmission assembly
2. Overhaul CVT transmission gear box
3. Overhaul CVT valve body
4. Change CVT fluid
- 5.) Clean transmission gear box parts and components
- 6.) Install CVT transmission assembly

10.) Name continuously variable transmission electronic control system parts and components and explain their functions.

J. Continuously Variable Transmission Electronic Control system parts and components and their functions.

- 1.) Speed sensor
- 2.) Control module (for CVT)
- 3.) Select pattern switch
- 4.) Down shift solenoid

11.) Explain continuously variable transmission electronic control system operating principle.

12.) Check continuously variable transmission electronic control system

13.) Name electronic controlled four wheel drive automatic transmission gear box parts and components and explain their functions.

14.) Explain the operating principle of electronic controlled four wheel drive automatic transmission gear box.

K. Continuously Variable Transmission electronic control system operating principle.

- 1.) When shifting to drive
 - Low speed
 - Medium speed
 - High speed
- 2.) When shifting to reverse
- 3.) When shifting to low gear
 - Engine braking
 - Torque increase

L. Continuously Variable Transmission Inspection Maintenance.

- 1.) Check speed sensor for functionality, rationality, and circuitry
- 2.) Check control module for functionality, rationality, and circuitry
- 3.) Check Select pattern switch for functionality, rationality, and circuitry
- 4.) Check down shift solenoid functionality, rationality, and circuitry

M. Electronic Controlled Four Wheel Drive Automatic Transmission gear box parts and components.

- 1.) Transfer gear
- 2.) Output shaft
- 3.) Input shaft
- 4.) Brakes
- 5.) Clutches
- 6.) Planetary gear set
- 7.) Differential assembly
- 8.) Drive axle

N. Electronic Controlled Four Wheel Drive Automatic Transmission operating principle.

1. Real time 4WD
2. Super handling AWD
3. Active all-wheel drive (AWD)
4. Full time 4WD
5. Four Motion full-time 4WD
6. Variable Torque distribution AWD with vehicle dynamic control.

15.) Overhaul electronic controlled four wheel drive automatic transmission gear box as per vehicle specification.

- O. Electronic Controlled Four Wheel Drive Automatic Transmission overhauling procedure
- 1.) Dismantle four wheel drive automatic transmission gear box parts and components.
 - 2.) Clean four wheel drive automatic transmission gear box parts and components.
 - 3.) Assemble four wheel drive automatic transmission gear box assembly.
 - 4.) Overhaul four wheel drive electronic controlled transmission valve body.
 - 5.) Install four wheel drive automatic transmission.

VII MATERIALS AND EQUIPMENT

Materials	Equipment
Automatic transmission fluid	OBD II (On-Board Diagnostic Generation II)
Automatic transmission sealer	Stethoscope
Washing solvent	Oil pressure gauge
Cork gasket	Oscilloscope tester
Vellumoid gasket	Automatic transmission puller
Hand soap	Multi meter digital
Shop rugs	Multi meter analog
Gasket silicon	
O-ring gasket	

VIII TEXT AND REFERENCES

- A. Required Text:
 James E. Duffy. **Modern Automotive Technology.** Tinley Park Illinois.
 GOODHEART-WILLCOX COMPANY, INC. 2004.

IX METHOD OF INSTRUCTION

- A. Lecture
- B. Visual Aid
- C. Demonstration
- D. Discussion

X METHOD OF EVALUATION:

1.) The components with corresponding weight in percent included in the computation of the final grade are:

Course work (quizzes / class works / homework / projects)	30%
Skill Tests	40%
Exam (Midterm and final exam)	30%

	100%

2.) The transmutation of the total percent to a letter grade is as of follows:

90 – 100	A
80 – 89	B
70 – 79	C
65 – 69	D
0 – 64	F



**Form NC-2
TASK LISTING SHEET**

AM 226 Electronically Controlled Transmission
Course No. & Title

Credits: **2** **1** **48**
Lec. Lab Total lab hours

Laboratory objectives	Time allotment
1.) Overhaul Automatic Transmission Planetary gear box a. Overhaul electronic controlled longitudinal type Automatic Transmission gear box. b. Overhaul electronic controlled transversal type Automatic Transmission gear box.	8 hours
2.) Check Automatic Transmission Electronic Control System as per vehicle specification. a. Check valve body Solenoid valves for functionality, rationality, and circuitry. b. Check Neutral safety switch for rationality, functionality, and rationality. c. Check Automatic transmission control module for functionality, rationality, and circuitry. d. Check converter lock-up solenoid for functionality e. Check Speed sensor for functionality, rationality, and circuitry	8 hours
3.) Overhaul Continuously Variable Transmission gear box 5. Remove CVT transmission assembly 6. Overhaul CVT transmission gear box 7. Overhaul CVT valve body 8. Change CVT fluid 9. Clean transmission gear box parts and components 10. Install CVT transmission assembly	8 hours
4.) Check Continuously Variable Transmission Electronic Control System a. Check valve body Solenoid valves for functionality, rationality, and circuitry. b. Check Neutral safety switch for rationality, functionality, and rationality. c. Check Automatic transmission control module for functionality, rationality, and circuitry. d. Check converter lock-up solenoid for functionality e. Check Speed sensor for functionality, rationality, and circuitry	8 hours
5.) Overhaul Electronic Controlled Four Wheel Drive Automatic Transmission gear box as per vehicle specification. a. Overhaul Real time 4WD assembly. b. Overhaul super handling AWD assembly. c. Overhaul Active all-wheel drive (AWD) assembly. d. Overhaul Full time 4WD assembly. e. Overhaul Four Motion full-time 4WD assembly. f. Overhaul Variable Torque distribution AWD with vehicle dynamic control assembly.	16 hours



PALAU COMMUNITY COLLEGE
AM226 Electronically Controlled Transmission
COURSE LEARNING OUTCOMES
Course Learning Outcome

During the course experience, the course learning outcomes (CLO's) will be assessed through the use of signature assignments. A rating scale will be used to determine the students' proficiency level of each CLO using specifically aligned assignments. The numerical ratings of 3, 2, and 1 are not intended to represent the traditional school grading system of A, B, C, D, and F. The descriptions associated with each of the numbers focus on the level of student performance of each of the course learning outcomes listed below:

Rating Scale:

- 3 Highly Competent 85% to 100%
- 2 Competent 70% to 84%
- 1 Beginner Below 70%

Course learning Outcome #1: Service Automatic Transmission gear box (planetary type)

Paper based assessment: Name electronic controlled transmission gear box (planetary gear type) parts and components, and explain their functions, Explain the operating principle of electronic controlled transmission gear box, and analyze cause and effect involving electronic controlled transmission gear box problems.

Authentic Assessment: Overhaul automatic transmission gear box assembly and/or check band and disc brakes, disc clutches, and one-way clutches for functionality.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Automatic Transmission gear box (planetary type) with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Automatic Transmission gear box (planetary type) with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Automatic Transmission gear box (planetary type) with below 70% performance accuracy.

Course learning Outcome #2: Service Automatic Transmission Electronic Control System (planetary gear type)

Paper based assessment: Name Automatic Transmission Electronic Controlled System parts and components and explain their functions and explain the operating principle of Automatic Transmission Electronic Controlled System and analyze cause and effect involving electronic control system problems.

Authentic Assessment: Check valve body Solenoid valves, Neutral safety switch, Automatic transmission control module, converter lock-up solenoid, Speed sensor, overdrive cancel solenoid and solenoid downshift solenoid for functionality, circuitry and rationality, and/or read and analyze electronic control system DTC's, parameters I.D, and DSO pattern.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Automatic Transmission Electronic Control System (planetary gear type) with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Automatic Transmission Electronic Control System (planetary gear type) with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Automatic Transmission Electronic Control System (planetary gear type) with below 70% performance accuracy.

Course learning Outcome #3: Service Continuously Variable Transmission gear box (CVT).

Paper based assessment: Name Continuously Variable Transmission gear box parts and components and explain their functions, explain Continuously Variable Transmission gear box operating principle and analyze cause and effect involving Continuously Variable Transmission gear box problems.

Authentic Assessment: Remove CVT transmission assembly, Overhaul CVT transmission gear box, Overhaul CVT valve body, Change CVT fluid, Clean transmission gear box parts and components, and/or Install CVT transmission assembly.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Continuously Variable Transmission gear box (CVT) with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Continuously Variable Transmission gear box (CVT) with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Continuously Variable Transmission gear box (CVT) with below 70% performance accuracy.

Course learning Outcome #4: Service Electronic Control System of Continuously Variable Transmission (CVT).

Paper based assessment: Name Continuously Variable Transmission Electronic Control System parts and components, and explain their functions, Explain Continuously Variable Transmission Electronic Control System operating principle and analyze cause and effect involving CVT electronic control problems.

Authentic Assessment: Check speed sensor, control module, neutral safety switch, down shift solenoid for functionality, rationality, and circuitry and/or read and analyze transmission electronic control system with DSO pattern, parameters I.D, and DTC's

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Electronic Control System of Continuously Variable Transmission (CVT) with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Electronic Control System of Continuously Variable Transmission (CVT) with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Electronic Control System of Continuously Variable Transmission (CVT) with below 70% performance accuracy.

Course learning Outcome #5: Service Electronic Controlled components of Four Wheel Drive Automatic Transmission gear box.

Paper based assessment: Name Electronic Controlled Four Wheel Drive Automatic Transmission gear box parts and components and explain their functions and Explain the operating principle of Electronic Controlled Four Wheel Drive Automatic Transmission gear box and analyze cause and effect involving Electronic Controlled Four Wheel Drive Automatic Transmission gear box problems.

Authentic Assessment: Overhaul four wheel drive automatic transmission gear box, and/or Install four wheel drive automatic transmission.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Electronic Controlled components of Four Wheel Drive Automatic Transmission gear box with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Electronic Controlled components of Four Wheel Drive Automatic Transmission gear box with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Electronic Controlled components of Four Wheel Drive Automatic Transmission gear box with below 70% performance accuracy.