



Format CO
COURSE OUTLINE

TRACTION CONTROL
Course Title

AM227
Dept & Course No.

I COURSE DESCRIPTION

This course is designed to enhance the knowledge, skills and attitude of an individual in servicing automotive traction control, such as; Anti-lock Brake System (ABS), Stability Control system, electronic traction control system, and electronic controlled suspension system. And it also includes reading circuit diagram, troubleshooting, and servicing traction control system.

II SEMESTER CREDITS: 3

III CONTACT HOURS PER WEEK:	<u>2</u>	<u>3</u>	<u>5</u>
	Lecture	Laboratory	Total

IV PREREQUISITE: AM111, AM113, and AM125

V STUDENTS LEARNING OUTCOME

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

- 1.) Name Anti-lock Brake System parts and components and explain their functions as per repair manual specifications.
- 2.) Explain Anti-lock Brake System operating principle as per manual specification.

VI. COURSE CONTENT

- A. Anti-lock brake system components
 - 1.) Abs warning light
 - 2.) Speed sensor
 - 3.) Sensor rotor
 - 4.) Stop light switch
 - 5.) ABS control module
 - 6.) Modulator unit
 - 7.) ABS control relay
- B. Anti-lock brake system principles of operation
 - 1.) ABS modes
 - 2.) ABS channel
 - 3.) ABS operation
 - Normal condition
 - Panic braking
 - Pumping brakes
 - Brake pedal pulsation
 - Motor pump
 - ABS warning light
 - ABS sensor signal

3.) Troubleshoot Anti-lock Brake System problems.

4.) Service Anti-lock Brake System as per repair manual specifications.

5.) Name Stability Control System parts and components and explain their functions as per repair manual specifications.

6.) Explain Stability Control System operating principle as per repair manual specifications.

7.) Troubleshoot Stability Control System problems.

C. Troubleshooting Anti-lock brake system problems

1.) Seven steps to diagnose ABS problem

- Verifying customer complaint
- Confirm customers complaint
- System checks
- Code check
- Bulletin checks
- Diagnostic plan
- Repair and verify repair

2.) Reading and analyzing ABS diagnostic codes

3.) Analyzing ABS parts and components functionality, rationality, and circuitry.

D. Procedures in servicing Anti-lock brake system

1.) Check modulator unit for functionality and rationality

2.) Clear ABS diagnostic codes

3.) Clean speed sensor and rotor

4.) Check speed sensor for functionality and rationality

5.) Check ABS control module for functionality, rationality, and circuitry.

E. Stability control system parts and components

1.) Steering angle sensor

2.) Lateral angle sensor

3.) Yaw sensor

4.) Throttle position sensor

5.) Brake pressure sensor

6.) Stability Control module

F. Stability control system principles of operation

1.) Under steer

2.) Over steer

3.) Counter steer

G. Troubleshooting stability control system problem

1.) Seven steps to diagnose Stability control system problem

- Verifying customer complaint
- Confirm customers complaint

- System checks
 - Code check
 - Bulletin checks
 - Diagnostic plan
 - Repair and verify repair
- 2.) Reading and analyzing Stability control system diagnostic codes
 - 3.) Analyzing stability control parts and components functionality, rationality, and circuitry.
- 8.) Service Stability Control System as per repair manual specifications.
 - 9.) Name Electronic Traction Control system parts and components and explain their functions as per repair manual specifications.
 - 10.) Explain Electronic Traction Control system operating principle as per repair manual specification.
- H. Procedures in servicing stability control system
 - 1.) Check steering sensor functionality and rationality.
 - 2.) Check lateral acceleration sensor functionality and rationality.
 - 3.) Check modulator unit for functionality and rationality.
 - 4.) Clean speed sensor
 - 5.) Check speed sensor functionality
 - 6.) Clear diagnostic codes
 - I. Electronic traction control system parts and components
 - 1.) Traction warning light
 - 2.) Traction modulator unit
 - 3.) Traction control module
 - 4.) Neutral start shift sensor
 - 5.) Stop light switch
 - 6.) Traction main relay
 - 7.) Traction motor relay
 - 8.) Speed sensor
 - J. Operating principles of electronic traction control system.
 - 1.) During normal driving
 - 2.) During acceleration
 - 3.) Real time four-wheel drive (Honda cars)
 - 4.) Super handling All wheel-drive (Honda cars)
 - 5.) Active all-wheel drive (Forester)
 - 6.) Full-time four-wheel drive (Toyota High Lander)
 - 7.) Four motion full-time four-wheel drive (Volkswagen Passat)
 - 8.) Asymmetrical All wheel-drive (Subaru Legacy)

11.) Troubleshoot Electronic Traction Control system problems.

12.) Service Electronic Traction Control system as per repair manual specification.

13.) Name Suspension Height Control System parts and components and explain their functions as per repair manual specifications.

K. Troubleshooting electronic traction control system

- 1.) Seven steps to diagnose electronic Traction control problem.
 - Verifying customer complaint
 - Confirm customers complaint
 - System checks
 - Code check
 - Bulletin checks
 - Diagnostic plan
 - Repair and verify repair
- 2.) Reading and analyzing electronic traction control diagnostic codes.
- 3.) Analyzing electronic traction control parts and components functionality, rationality, and circuitry.

L. Procedures in servicing electronic traction control system

- 1.) Check Traction modulator unit for functionality and rationality
- 2.) Check Traction control module for functionality, rationality, and circuitry
- 3.) Check Neutral start shift sensor for functionality
- 4.) Check Stop light switch functionality
- 5.) Check Traction main relay functionality
- 6.) Check Traction motor relay functionality and rationality.
- 7.) Clean speed sensor
- 8.) Check speed sensor for functionality and rationality

M. Suspension height control system parts and components

- 1.) Height control sensor
- 2.) Compressor assembly
- 3.) Air pressure lines
- 4.) Air shocks
- 5.) Sensor link
- 6.) Suspension height control module
- 7.) Solenoid valve

14.) Explain Suspension Height Control System operating principle as per repair manual specification.

15.) Troubleshoot Suspension Height Control System problem.

16.) Service Suspension Height Control System as per repair manual specification.

N. Operating principles of suspension height control system
1.) Electronic height control system
2.) Electronic suspension system
3.) Active suspension system

O. Troubleshooting suspension height control system problems.
1.) Seven steps to diagnose suspension height control problem.
• Verifying customer complaint
• Confirm customers complaint
• System checks
• Code check
• Bulletin checks
• Diagnostic plan
• Repair and verify repair
2.) Reading and analyzing suspension height control diagnostic codes.
3.) Analyzing suspension height control parts and components for functionality, rationality, and circuitry.

P. Procedures in servicing suspension height control system.
1.) Check Electronic height control system parts and components for functionality and rationality.
2.) Check Electronic suspension system parts and components for functionality and rationality.
3.) Check Active suspension system parts and components for functionality and rationality

VII MATERIALS AND EQUIPMENT

Materials	Equipment
Sand paper 1000 cc	OBD II (On-Board Diagnostic Generation II)
Brake fluid	Stethoscope
Shop rugs	Oscilloscope tester
Sand paper 120 cc	Multi meter digital
Brake cleaner fluid	Multi meter analog
Penetrating oil	Mock-up for ABS with active suspension system

Brake cleaner fluid	Jack stand
Electrical tape	
Hand soap	

VIII TEXT AND REFERENCES

- A Required Text:
 James E. Duffy, Modern Automotive Technology, Tinley Park Illinois,
 GOODHEART-WILLCOX COMPANY, INC. 2004
 ISBN-10: 1-59070-186-0
 ISBN-13: 978-1-59070-186-7

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 227 TRACTION CONTROL

Course No. & Title

Credits: 2 1 48
Lec. Lab Total lab hours

Laboratory objectives	Time allotment
1.) Troubleshoot Anti-lock Brake System problems. a. Analyze cause and effect involving ABS problems. b. Read and analyze ABS diagnostic codes. c. Read the circuit diagram of ABS system for two, three, and four channels.	<u>4 hours</u>
2.) Service Anti-lock Brake System as per repair manual specifications. a. Check modulator unit for functionality and rationality. b. Clear ABS diagnostic codes. c. Clean speed sensor and rotor. d. Check speed sensor for functionality and rationality. e. Check ABS control module for functionality, rationality, and circuitry.	<u>8 hours</u>
3.) Troubleshoot Stability Control System problems a. Analyze cause and effect involving stability control system problem. b. Read and analyze stability control system diagnostic codes. c. Analyze stability control live data for functionality, rationality, and circuitry.	<u>4 hours</u>
4.) Service Stability Control System as per repair manual specifications a. Check steering sensor functionality and rationality. b. Check lateral acceleration sensor functionality and rationality. c. Check modulator unit for functionality and rationality. d. Clean speed sensor. e. Check speed sensor functionality. f. Clear diagnostic codes.	<u>8 hours</u>
5.) Troubleshoot Electronic Traction Control system problems. a. Read and analyze electronic traction control diagnostic codes. b. Analyze electronic traction control parts and components functionality, rationality, and circuitry. c. Analyze cause and effect involving Electronic Traction Control system problem.	<u>4 hours</u>
6.) Service Electronic Traction Control system as per repair manual specification. a. Check Traction modulator unit for functionality and rationality.	<u>8 hours</u>

<ul style="list-style-type: none"> b. Check Traction control module for functionality, rationality, and circuitry c. Check Neutral start shift sensor for functionality. d. Check Stop light switch functionality. e. Check Traction main relay functionality. f. Check Traction motor relay functionality and rationality. g. Clean speed sensor. h. Check speed sensor for functionality and rationality. 	
<p>7.) Troubleshoot Suspension Height Control System problem.</p> <ul style="list-style-type: none"> a. Analyze cause and effect involving suspension height control system problems. b. Read and analyze suspension height control diagnostic codes. c. Analyze suspension height control parts and components for functionality, rationality, and circuitry. 	<u>4 hours</u>
<p>8.) Service Suspension Height Control System as per repair manual specification.</p> <ul style="list-style-type: none"> a. Check Electronic height control system parts and components for functionality and rationality. b. Check Electronic suspension system parts and components for functionality and rationality. c. Check Active suspension system parts and components for functionality and rationality 	<u>8 hours</u>



**PALAU COMMUNITY COLLEGE
AM227 TRACTION CONTROL
COURSE LEARNING OUTCOMES**

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 Anti-lock Brake System

Paper based assessment: Name Anti-lock Brake System parts and components and explain their functions, and Explain the operating principle of Anti-lock Brake System.

Authentic Assessment: Check modulator unit, speed sensor, ABS control module for functionality, circuitry, and rationality, and/or Clear ABS diagnostic codes, and clean speed sensor and rotor.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing Anti-lock Brake System with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing Anti-lock Brake System with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing Anti-lock Brake System with below 70% performance accuracy.

Course learning Outcome #2: Service Stability Control System

Paper based assessment: Name Stability Control System parts and components and explain their functions, and Explain the operating principle of Stability Control System.

Authentic Assessment: Check steering sensor, lateral acceleration sensor, yaw sensor, modulator unit, and speed sensor for functionality, rationality, and circuitry, and/or clear diagnostic codes.

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

Course learning Outcome #3: Service Electronic Traction Control

Paper based assessment: Name Electronic Traction Control system parts and components and explain their functions, and Explain Electronic Traction Control system operating principle.

Authentic Assessment: Check Traction modulator unit, Traction control module, Neutral start shift sensor, Stop light switch, Traction main relay, speed sensors, and Traction motor relay for functionality, rationality, and circuitry, and/or Clean speed sensor and rotor for clear signal frequency.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in servicing electronic traction control system with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in servicing electronic traction control with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in servicing electronic traction control with below 70% performance accuracy.

Course learning Outcome #4: Service Electronic Controlled Suspension System

Paper based assessment: Name Suspension Electronic Controlled Suspension System parts and components and explain their functions, and Explain Electronic Controlled Suspension System operating principle.

Authentic Assessment: Check Electronic suspension height control system parts and components for functionality and rationality, Check Electronic suspension system parts and components for functionality and rationality, and/or Check Active suspension system parts and components for functionality and rationality.

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

Course learning Outcome #5: Troubleshoot Traction Control System problems

Paper based assessment: Analyze cause and effect relationship involving Anti-lock Brake System problems, Stability Control System problems, Electronic Traction Control system problems, and Suspension Height Control System problem.

Authentic Assessment: Read and analyze C code DTC's for ABS, Stability Control, Traction control, and of electronic controlled suspension system. And/or Read and analyze live data and DSO results for ABS, Stability Control, Traction control, and electronic controlled suspension system, and of Stability control system.

Numerical Value	
Highly Competent 3 (10 points)	Student demonstrates the knowledge and skills in Troubleshooting Traction Control System problems with 85% to 100% performance accuracy.
Competent 2 (7 points)	Student demonstrates the knowledge and skills in Troubleshooting Traction Control System problems with 70% to 84% performance accuracy.
Beginner 1 (3 points)	Student demonstrates the knowledge and skills in Troubleshooting Traction Control System problems with below 70% performance accuracy.