

## COURSE PLAN

### FIRST: AUTOMOTIVE ENGINEERING

#### College

College : Faculty of Engineering Technology

Department : Mechanical Engineering Department

#### Course

Course Title : Electric Vehicles Technology Workshops

Course Code : 020201266

Credit Hours : 2 (0 Theoretical, 2 Practical)

Prerequisite : 020201235

#### Instructor

Name : Dr. Suleiman Qasim Abu-ein

Office No. :

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Office Hours :

Class Times

Building	Day	Start Time	End Time	Room No.
00	00	00	00	00

#### Text Book

Title : • Electric and Hybrid Vehicles, 2nd Edition, Tom Denton  
• Electric and Hybrid Vehicles, Power Sources, Models, Sustainability, Infrastructure and the Market, Editor: Gianfranco Pistoia.

#### References

1. Workshop Manuals.
2. Electric and Hybrid Vehicles: Technologies, Modeling and Control

### SECOND: PROFESSIONAL INFORMATION

#### COURSE DESCRIPTION

This course specifies a basic principles of workshop safety and instructions in inspection, diagnosis, disassembly and assembly of electric vehicles components such as, inverter assembly, EV charging, control module, electric brake system, transmission, types of electric Traction Motors, high voltage batteries, energy storage. high voltage batteries etc.

#### COURSE OBJECTIVES

The objective of this course is to enable the student to do the following:

- Explain the high voltage safety and precautions.
- Develop working competence of the right EV Special Tools.
- Develop working competence of major components of EV: Traction Motors, high Voltage Batteries electric brake system, transmission system. etc.

#### COURSE LEARNING OUTCOMES

By the end of the course, the students will be able to:

- CLO1. Apply the basics of safe working and hazard management and use the right tools  
 CLO2. Diagnose and check EV high voltage systems  
 CLO3. Use and wear personal protection equipment  
 CLO4. Diagnose and check high voltage battery  
 CLO5. Diagnose and check traction motors  
 CLO6. Diagnose and check inverter assembly  
 CLO7. Inspect EV Charging  
 CLO8. Diagnose and check Vehicle Control Module - VCM  
 CLO9. Diagnose and check Power Delivery Module – PDM  
 CLO10. Diagnose and check EV transmission  
 CLO11. Diagnose and check Electric Control Brake System- e-ACT

Week	Unit	Content	Related LO and Reference (Chapter)	Proposed assignments
1	Save working, Tools and Hazard Management	<ul style="list-style-type: none"> <li>• Personal safety.</li> <li>• General Safety guidance:               <ol style="list-style-type: none"> <li>a) Before Maintenance.</li> <li>b) During Maintenance.</li> <li>c) Interruptions.</li> <li>d) After Maintenance.</li> </ol> </li> </ul>	CLO1	
2	Diagnostic and Check High Voltage Systems	<ul style="list-style-type: none"> <li>• High Voltage safety precautions.</li> <li>• Low and High Voltage.</li> <li>• High Tension cables replacement.</li> </ul>	CLO2	
3	Personal Protection Equipment	<ul style="list-style-type: none"> <li>• Protection Devices.</li> <li>• AC Electric Shock.</li> <li>• DC Electric Shock.</li> </ul>	CLO3	
4	Diagnose and Check High Voltage Battery - 1	<ul style="list-style-type: none"> <li>• Safety Precautions and personal safety protection devices.</li> <li>• Capacity test using Scan Tool.</li> <li>• Acceleration Mode test.</li> <li>• Fuel Economy Mode test.</li> <li>• Battery Control Unit Check Points.</li> <li>• System Voltage diagnosis.</li> </ul>	CLO4	Practice report
5	Diagnose and Check High Voltage Battery - 2	<ul style="list-style-type: none"> <li>• Check and replace Battery Packs.</li> <li>• Battery Pack Cooling Fane.</li> <li>• Battery Pack Cooling Fane circuit.</li> <li>• High Voltage Fuse.</li> <li>• High Voltage Battery Temperature sensor.</li> <li>• Battery Pack Air Temperature Sensor.</li> </ul>	CLO4	Practice report

Week	Unit	Content	Related LO and Reference (Chapter)	Proposed assignments
		<ul style="list-style-type: none"> <li>Auxiliary Battery Temperature Sensor.</li> </ul>		
6	Diagnose and Check High Voltage Battery - 3	<ul style="list-style-type: none"> <li>Check for Short.</li> <li>Battery Pack Current Sensor.</li> <li>Low Voltage System in High Voltage Battery:               <ol style="list-style-type: none"> <li>Code POA1F.</li> <li>Reading Battery Pack Voltage.</li> </ol> </li> <li>Battery Pack Voltage Drop.</li> <li>Battery Block Voltage Check.</li> <li>Check Communication Loss between control modules.</li> <li>System Main Relay Fault check.</li> </ul>	CLO4	Practice report
7	Diagnose and Check Traction Motors	<ul style="list-style-type: none"> <li>On Road Test.</li> <li>Scan Tool Test.</li> <li>Current Sensor.</li> <li>Temperature Sensor.</li> <li>Speed Sensor (Resolver).</li> <li>Bearings.</li> <li>Winding Wires.</li> </ul>	CLO5	
8	<b>Mid Exam</b>			
9	Diagnose and Check Inverter Assembly -1	<ul style="list-style-type: none"> <li>Inverter Common Faults.</li> <li>Boost Converter Temperature Sensing Circuit.</li> <li>Boost Converter Voltage Signal.</li> <li>Boost Converter Monitoring signal.</li> </ul>	CLO6	
10	Diagnose and Check Inverter Assembly -2	<ul style="list-style-type: none"> <li>Inverter Sensors:               <ol style="list-style-type: none"> <li>Inverter Temperature Sensor for Traction Motor.</li> <li>Current Sensor for Traction Motor.</li> <li>Inverter Voltage Sensor.</li> </ol> </li> <li>Inverter Signals:               <ol style="list-style-type: none"> <li>Pulse Width Modulation Signal.</li> <li>Inverter Fail Signal for Generator.</li> </ol> </li> </ul>	CLO6	
11	Inspection of EV Charging	<ul style="list-style-type: none"> <li>Electric Vehicle Supply Equipment – EVSE.</li> <li>Charging Time.</li> <li>Charging Level:               <ol style="list-style-type: none"> <li>Normal Charging.</li> <li>Quick Charging.</li> </ol> </li> </ul>	CLO7	

Week	Unit	Content	Related LO and Reference (Chapter)	Proposed assignments
		<ul style="list-style-type: none"> <li>On-board Charger.</li> </ul>		
12	Diagnose and Check Vehicle Control Module - VCM	<ul style="list-style-type: none"> <li>VCM- System Power Relay.</li> <li>Motor Control Relay – M/C.</li> <li>Failsafe Charge Relay – F/S.</li> <li>A/C Relay.</li> </ul>	CLO8	
13	Diagnose and Check Power Delivery Module - PDM	<ul style="list-style-type: none"> <li>DC/DC Converter.</li> <li>Junction/B+</li> </ul>	CLO9	
14	Diagnose and Check EV Transmission	<ul style="list-style-type: none"> <li>Reduction Gear.</li> <li>Drive Shafts.</li> <li>Parking Lock by Wire (PBW) actuator.</li> <li>Parking Lock Mechanism.</li> </ul>	CLO10	
15	Diagnose and Check Electric Control Brake System- e-ACT	<ul style="list-style-type: none"> <li>Hydraulic Pipes.</li> <li>Power Supply Harness.</li> <li>Brake Pedal Stroke Sensor.</li> <li>Master Cylinder.</li> <li>Backup Power Source.</li> </ul>	CLO11	
16	<b>Final Exam</b>			

### COURSE LEARNING RESOURCES

The effectiveness of teaching in this course depends on making students familiar with the basic manual skills, such as: Inspection, diagnosis, disassembly and assembly of Electric Vehicles (EV) components such as: Electric Propulsion System, types of electric Traction Motors (DC, inductive, etc.). Energy storage. High Voltage Batteries, replace, and inspect related parts. Use of the Scan Tools.

#### Teaching methods:

- Exercising and practicing: by training students to follow the basics of safe working and hazard management, and use the right tools do all the practical works and to identify the type of exercise.
- Online research skills, watching related videos such as you tube, on topics related to course objectives and recent developments in the field of specific work.
- Learning skills and adaptability: Developed by transferring students and reconfiguring work teams to enable them to adapt to other individuals from time to time.

### ONLINE RESOURCES

[www.youtube.com](http://www.youtube.com)

**ASSESSMANT TOOLS**

(Write assessment tools that will be used to test students ability to understand the course material and gain the skills and competencies stated in learning outcomes)

ASSESSMENT TOOLS	%
Quizzes	
Researches and Reports	20
Participation	
Oral Exams	
Activities/attendance	
Presentation	
Mid Exam	30
Final Exam	50
<b>TOTAL MARKS</b>	<b>100</b>

**THIRD: COURSE RULES****ATTENDANCE RULES**

Attendance and participation are extremely important, and the usual University rules will apply. Attendance will be recorded for each class. Absence of 10% will result in a first written warning. Absence of 15% of the course will result in a second warning. Absence of 20% or more will result in forfeiting the course and the student will not be permitted to attend the final examination. Should a student encounter any special circumstances (i.e. medical or personal), he/she is encouraged to discuss this with the instructor and written proof will be required to delete any absences from his/her attendance records.

**GRADING SYSTEM****Example:**

0 – 49 Fail  
50 – 100 Pass

**REMARKS**

{The instructor can add any comments and directives such as the attendance policy and topics related to ethics}

**COURSE COORDINATOR**

**Course Coordinator:** Dr. Suleiman Qasim Abu-Ein

**Signature:**

**Date:**

**Department Head:**

**Signature:**

**Date:**