



51. Course Specification of Automotive Engineering

I. Course Identification and General information:						
1.	Course Title:	Automotive Engineering.				
2.	Course Code & Number:	ME326.				
3.	Credit hours:	C.H				TOTAL CR. HRS
		Th.	Seminar/Tu	Pr	Tr.	
		2	-	2	-	
4.	Study level/ semester at which this course is offered:	Fourth Year- Second Semester.				
5.	Pre –requisite (if any):	Internal Combustion Engines (ME355).				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered:	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	Location of teaching the course:	Mechanical Engineering Department.				
10.	Prepared By:	Asst. Prof. Dr. Abdullah Dhaiban.				
11.	Date of Approval:					

II. Course Description:	
<p>This course teaches students the working principles of automotive systems. It covers the components and systems transfer energy from engine to the wheels. Also the main systems that control the automotive motion such as suspension, steering, braking, electrical, electronic, and emission control, systems are included. The students will practice the diagnosis and troubleshooting of automotive systems and components.</p>	

III. Alignment course intended learning outcomes (CILOs)		Referenced PILOs
a1	Describe the fundamental knowledge of mechanisms used to transfer energy from engine to the wheels, and of the main systems that control the automotive motion.	A1 Demonstrate knowledge & understanding of Mathematics, Science, and Engineering relevant to Mechanical Engineering.

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a2	Recognize the need and functional requirements of electric and hybrid vehicles and latest trends in automobile.	A.3 Explain the principles of different mechanical systems and their effects on global environment and societal contexts.
b1	Explore the advancement in the automotive technology.	B1 Apply the principles of engineering, basic science and mathematics to model, analyze, design, and realize physical systems, components or processes in innovative ways.
c1	Practice the dismantling, assembly, and diagnosis trouble shooting related to the main mechanical and electrical components of automotive systems such as, clutch, transmission, wheels and brake pads, steering system.	C1 Use the various techniques, skills, equipment and modern engineering tools and methods necessary for Mechanical Engineering practice.
d1	Review diagnosis and troubleshooting of automotive system faults.	D.4 Perform searches of literature, use databases, as well as, evaluate information and evidence from various sources.

(A) Alignment course intended learning outcomes of Knowledge and Understanding to Teaching Strategies and assessment Strategies:

Course intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Describe the fundamental knowledge of mechanisms used to transfer energy from engine to the wheels, and of the main systems that control the automotive motion.	Active Lectures, Laboratory, Seminars	Written Exam, Laboratory Reports, Homework Presentations
a2- Recognize the need and functional requirements of electric and hybrid vehicles and latest trends in automobile.		

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(B) Alignment Course intended Learning Outcomes of intellectual Skills to Teaching Strategies and assessment Strategies:		
Course intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Explore the advancement in the automotive technology.	Active Lectures, Laboratory, Seminars	Written Exam, Laboratory Reports, Homework Presentations

(C) Alignment Course intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and assessment Strategies:		
Course intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Practice the dismantling, assembly, and diagnosis trouble shooting related to the main mechanical and electrical components of automotive systems such as, clutch, transmission, wheels and brake pads, steering system.	Active Lectures, Laboratory, Seminars	Written Exam, Laboratory Reports, Homework Presentations

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(D) Alignment Course intended Learning Outcomes of Transferable Skills to Teaching Strategies and assessment Strategies:		
Course intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Review diagnosis and troubleshooting of automotive system faults.	Seminars, Assignments, Projects, Problem Based Learning.	Presentations, Reports

IV. Course Content:					
A – theoretical aspect:					
Order	Units/Topics List	Learning Outcomes	Sub topics List	Number of Weeks	Contact hours
1.	Introduction	a1, a2	<ul style="list-style-type: none"> • Conventional Motor Vehicle • Vehicle Classification • Frame and Frameless Construction • Power Requirements • Vehicle Performance, • Stability of Four Wheel Drive Vehicles. 	2	4
2.	Clutch and Transmission	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Types of Clutches • Requirements for Manual and Automatic Transmission • Type and Constructional Detail. • Wheels and Tires 	1	2
3.	Steering and Suspension	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Steering Mechanisms and Steering System • Suspension Principle. • System Elements • Hydraulic Suspension. • Pneumatic Suspension. 	2	4
4.	Drive Line	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Propeller Shaft. • Joints. 	1	2

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			<ul style="list-style-type: none"> • Differential, Axle and Hub. 		
5.	Braking System	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Introduction to Braking. • System Types. • ABS. • Brake Compensation. • Electronic Brake Force Distribution (EBD). • Traction Control 	1	2
6.	Mid-Term Exam	a1, b1, c1	<ul style="list-style-type: none"> • All previous Topics 	1	2
7.	Wheel and Tires	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Wheels Types. • Tire Description. • Tire Types. • Tire Specifications and Coding. 	1	2
8.	Vehicle Electrical and Electronic Systems	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Starting System. • Electronically Controlled Gasoline Injection System for SI Engines. • Electronically Controlled Diesel Injection System. • Electronic Ignition. • Ignition System • Charging System. • Automotive Accessories and Safety Features. 	3	6
9.	Emission Control Devices	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Exhaust System • Catalytic Convertor. • Catalytic Types. • EGR. 	1	2
10.	Computerized Controls Diagnosis and Repair	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Trouble Shooting Tools • Using of Trouble Shooting Tools 	1	2
11.	Trends in Automobile Sector	a1, a2, b1, c1, d1	<ul style="list-style-type: none"> • Hybrid Vehicle. • Solar Powered Vehicles 	1	2
12.	Final Exam	a1, a2, b1, c1	<ul style="list-style-type: none"> • All Topics 	1	2

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Number of Weeks /and Units Per Semester	16	32
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B - Practical aspect:				
Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	<ul style="list-style-type: none"> • Introduction to Garage Safety. • Tools and Equipment. 	1	2	b1, c1, d1
2.	<ul style="list-style-type: none"> • Dismantling, Inspection and Assembly of Clutch and Transmission 	1	2	b1, c1, d1
3.	<ul style="list-style-type: none"> • Inspection, Dismantling and Assembly of Steering and Suspension: 	2	4	b1, c1, d1
4.	<ul style="list-style-type: none"> • Inspection, Dismantling and Assembly of Drive Line 	1	2	b1, c1, d1
5.	<ul style="list-style-type: none"> • Inspection, Dismantling and Assembly of Braking System 	1	2	b1, c1, d1
6.	<ul style="list-style-type: none"> • Experiments on Wheel Balancing and Wheel Rotation. • Inspection of Tire Wear Pattern and Verification of Wheel Alignment. 	1	2	b1, c1, d1
7.	<ul style="list-style-type: none"> • Experiments on the Condition of Battery Quality and Maintenance. • Inspection of Electric System Circuit. • Inspection of Starting System. • Inspection of Charging System. 	4	8	b1, c1, d1
8.	<ul style="list-style-type: none"> • Measurement of Exhaust Gas Emission and Combustion Analysis. 	1	2	b1, c1, d1
9.	<ul style="list-style-type: none"> • Computerized Controls Diagnosis and Repair Tools 	2	4	b1, c1, d1
Number of Weeks /and Units Per Semester		14	28	

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V. Teaching strategies of the course:

- Active Lectures,
- Laboratory,
- Seminars
- Project
- Problem Based Learning.

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark out of 150
1	Laboratory Session Report	b1, c1,d1	Weekly	10
2	Project (Single\Group)	a2, b1, c1,d1	13 th week	10
3	Homework	a1,a2,b1,	Weekly	10
Total				30

VII. Schedule of assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final assessment	Aligned Course Learning Outcomes
1	Assignments	Weekly	30	20 %	a2, b1, c1,d1
2	Quizzes	4 th , 10 th & 13 th weeks	10	6.7%	a1, a2, b1
3	Mid-Term Exam	8 th week	20	13.3 %	a2, b1, c1
4	Final Exam (Practical)	15 th week	15	10 %	b1, c1,d1
5	Final Exam (Theoretical)	16 th week	75	50 %	a1, a2, b1, c1
Total			150	100 %	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

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1- Required Textbook(s) (maximum two).	
	1. V. A. W. Hillier, F.W. Pittuck., (2012). "Fundamentals of Motor Vehicle Technology", Nelson Thornes, 2. Kirpal Singh, "Automobile Engineering" Vol. 1 & Vol. 2 Standard Publishers.
2- Essential References.	
	1. G.B.S. Narang, "Automobile Engineering", Khanna Publisher. 2. J.A. Dolan, "Motor Vehicle Technology", Heinemann Educational Books.
3- Electronic Materials and Web Sites etc.	
	1- www; youtube.com 2- Videos
I. Course Policies:	
1	Class Attendance: - The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considered as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.
2	Tardy: - For lateness in attending the class, the student will be initially notified . If he repeats late in attending class he will be considered absent .
3	Exam Attendance/Punctuality: - The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.
4	Assignments & Projects: - In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment
5	Cheating: - For cheating in exam, the student is considered as failure . In case the cheating is repeated three times during study the student will be disengaged from the Faculty
6	Plagiarism: Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Affair Council of the university.
7	Other policies: - The mobile phone is not allowable to be used during class lecture. It must be switched off , otherwise the student will be ordered to leave the lecture room.

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| <ul style="list-style-type: none"> - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy. |
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Reviewed By	<u>Vice Dean for Academic Affairs and Post Graduate Studies: Asst. Prof. Dr. Tarek A. Barakat</u> <u>President of Quality Assurance Unit: Assoc. Prof. Dr. Mohammed Algorafi</u> <u>Name of Reviewer from the Department: Assoc. Prof. Dr. Khalil Al-Hatab</u>
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51. Course Plan of Automotive Engineering

I. Information about Faculty Member Responsible for the Course:								
Name of Faculty Member	Dr, Abdullah Dhaiban		Office Hours					
Location & Telephone No.	Mechatronics Engineering Department		SAT	SUN	MON	TUE	WED	THU
E-mail	a.dhaiban@eng-su.edu.ye a.daiban2@Gmail.com							

II. Course Identification and General information:						
1.	Course Title:	Automotive Engineering.				
2.	Course Number & Code:	ME326.				
3.	Credit hours:	C.H				Total CR. HRS
		Th.	Seminar	Pr.	Tu.	
		2		2	-	3
4.	Study level/year at which this course is offered:	Fourth Year- 2 nd Semester.				
5.	Pre –requisite (if any):	Internal Combustion Engines (ME355).				
6.	Co –requisite (if any):	None.				
7.	Program (s) in which the course is offered	Mechanical Engineering Program.				
8.	Language of teaching the course:	English Language.				
9.	System of Study:	Semesters.				
10.	Mode of delivery:	Lectures, Tutorials and Lab.				
11.	Location of teaching the course:	Mechanical Engineering Department.				

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III. Course Description:

This course teaches students the working principles of automotive systems. It covers the components and systems transfer energy from engine to the wheels. Also the main systems that control the automotive motion such as suspension, steering, braking, electrical, electronic, and emission control, systems are included. The **students** will practice the diagnosis and troubleshooting of automotive systems and components.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop:
 - 1- Describe the fundamental knowledge of mechanisms used to transfer energy from engine to the wheels, and of the main systems that control the automotive motion.
 - 2- Recognize the need and functional requirements of electric and hybrid vehicles and latest trends in automobile.
 - 3- Explore the advancement in the automotive technology.
 - 4- Practice the dismantling, assembly, and diagnosis trouble shooting related to the main mechanical and electrical components of automotive systems such as, clutch, transmission, wheels and brake pads, steering system.
 - 5- Review diagnosis and troubleshooting of automotive system faults.

V. Course Content:

- Distribution of Semester Weekly Plan of Course topics/Items and Activities.

A – theoretical aspect:

Order	Topics List	Sub topics List	Week Due	Contact Hours
1-	Introduction	<ul style="list-style-type: none"> • Conventional Motor Vehicle • Vehicle Classification • Frame and Frameless Construction • Power Requirements • Vehicle Performance, • Stability of Four Wheel Drive Vehicles. 	1 st and 2 nd weeks	4
2-	Clutch and Transmission	<ul style="list-style-type: none"> • Types of Clutches 	3 rd week	2

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		<ul style="list-style-type: none"> • Requirements for Manual and Automatic Transmission • Type and Constructional Detail. • Wheels and Tires 		
3-	Steering and Suspension	<ul style="list-style-type: none"> • Steering Mechanisms and Steering System • Suspension Principle. • System Elements • Hydraulic Suspension. • Pneumatic Suspension. 	4 th and 5 th weeks	4
4-	Drive Line	<ul style="list-style-type: none"> • Propeller Shaft. • Joints. • Differential, Axle and Hub. 	6 th week	2
5-	Braking System	<ul style="list-style-type: none"> • Introduction to Braking. • System Types. • ABS. • Brake Compensation. • Electronic Brake Force Distribution (EBD). • Traction Control 	7 th week	2
6-	Mid-Term Exam	<ul style="list-style-type: none"> • All previous Topics 	8 th week	2
7-	Wheel and Tires	<ul style="list-style-type: none"> • Wheels Types. • Tire Description. • Tire Types. • Tire Specifications and Coding. 	9 th week	2
8-	Vehicle Electrical and Electronic Systems	<ul style="list-style-type: none"> • Starting System. • Electronically Controlled Gasoline Injection System for SI Engines. • Electronically Controlled Diesel Injection System. • Electronic Ignition. • Ignition System • Charging System. • Automotive Accessories and Safety Features. 	10 th , 11 th and 12 th weeks	6

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9-	Emission Control Devices	<ul style="list-style-type: none"> • Exhaust System • Catalytic Converter. • Catalytic Types. • EGR. 	13 th week	2
10-	Computerized Controls Diagnosis and Repair	<ul style="list-style-type: none"> • Trouble Shooting Tools • Using of Trouble Shooting Tools 	14 th week	2
11-	Trends in Automobile Sector	<ul style="list-style-type: none"> • Hybrid Vehicle. • Solar Powered Vehicles 	15 th week	2
12-	Final Exam	<ul style="list-style-type: none"> • All Topics 	16 th week	2
Number of Weeks /and Units Per Semester			16	32

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B – Practical aspect:			
Order	Topics List	Week Due	Contact Hours
1-	<ul style="list-style-type: none"> • Introduction to Garage Safety. • Tools and Equipment. 	2 nd week	2
2-	<ul style="list-style-type: none"> • Dismantling, Inspection and Assembly of Clutch and Transmission 	3 rd week	2
3-	<ul style="list-style-type: none"> • Inspection, Dismantling and Assembly of Steering and Suspension: 	4 th and 5 th weeks	4
4-	<ul style="list-style-type: none"> • Inspection, Dismantling and Assembly of Drive Line 	6 th week	2
5-	<ul style="list-style-type: none"> • Inspection, Dismantling and Assembly of Braking System 	7 th week	2
6-	<ul style="list-style-type: none"> • Experiments on Wheel Balancing and Wheel Rotation. • Inspection of Tire Wear Pattern and Verification of Wheel Alignment. 	9 th week	2
7-	<ul style="list-style-type: none"> • Experiments on the Condition of Battery Quality and Maintenance. • Inspection of Electric System Circuit. • Inspection of Starting System. • Inspection of Charging System. 	10 th , 11 th and 12 th weeks	8
8-	<ul style="list-style-type: none"> • Measurement of Exhaust Gas Emission and Combustion Analysis. 	13 th week	2
9-	<ul style="list-style-type: none"> • Computerized Controls Diagnosis and Repair Tools 	14 th and 15 th weeks	4
Number of Weeks /and Units Per Semester		14	28

VI. Teaching strategies of the course:
<ul style="list-style-type: none"> • Active Lectures, • Laboratory, • Seminars • Project • Problem Based Learning.

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VII. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1	Laboratory Session Report	b1, c1,d1	Weekly	10
2	Project (Single\Group)	a2, b1, c1,d1	13 th week	10
3	Homework	a1,a2,b1	Weekly	10
Total				30

VIII. Schedule of assessment Tasks for Students During the Semester:				
Assessment	Type of assessment Tasks	Week Due	Mark	Proportion of Final assessment
1	Assignments	Weekly	30	20 %
2	Quizzes	4 th , 10 th & 13 th weeks	10	6.7%
3	Mid-Term Exam	8 th week	20	13.3 %
4	Final Exam (Practical)	15 th week	15	10 %
5	Final Exam (Theoretical)	16 th week	75	50 %
Total			150	100 %

IX. Learning Resources:
• <i>Written in the following order: (Author – Year of publication – Title – Edition – Place of publication – Publisher).</i>
1- Required Textbook(s) (maximum two).
1. V. A. W. Hillier, F.W. Pittuck., (2012). "Fundamentals of Motor Vehicle Technology", Nelson Thornes, 2. Kirpal Singh, "Automobile Engineering" ,Vol. 1 & Vol. 2 Standard Publishers.
2- Essential References.
1. G.B.S. Narang, "Automobile Engineering ", Khanna Publisher. 2. J.A. Dolan, "Motor Vehicle Technology", Heinemann Educational Books.
3- Electronic Materials and Web Sites etc.
1- www; youtube.com 2- Videos

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II. Course Policies:	
1	<p>Class Attendance:</p> <p>- The student should be attending not less than 75% of total contact hours of the subject, otherwise he will not able to take exam and be considered as an exam failure. If the student is absent due to illness, he/she should bring an approved statement from university Clinic.</p>
2	<p>Tardy:</p> <p>- For lateness in attending the class, the student will be initially notified. If he repeats late in attending class he will be considered absent.</p>
3	<p>Exam Attendance/Punctuality:</p> <p>- The student should attend the exam on time. He is permitted to attend the exam half one hour from exam beginning, after that he/she will not be permitted to take exam and he/she is considered absent in the exam.</p>
4	<p>Assignments & Projects:</p> <p>- In general one assignment is given after each chapter of a course. The student should submit the assignment on time, mostly one week after giving the assignment</p>
5	<p>Cheating:</p> <p>- For cheating in exam, the student is considered as failure. In case the cheating is repeated three times during study the student will be disengaged from the Faculty</p>
6	<p>Plagiarism:</p> <p>Plagiarism is the attending of the student the exam of a course instead of other student. If the examination committee proved a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Affair Council of the university.</p>
7	<p>Other policies:</p> <ul style="list-style-type: none"> - The mobile phone is not allowable to be used during class lecture. It must be switched off, otherwise the student will be ordered to leave the lecture room. - The mobile phone is not allowed to be taken during the examination time. - Lecture notes and assignments may be given directly to students using soft or hard copy.

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