برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	أساسيات الكهرباء والالكترونيات
رقم المادة	020300101
الساعات المعتمدة	2
ساعة نظري	2
ساعة عملي	٠

Brief Course Description:

Concepts and definitions, electrical circuit elements, voltage, current, resistance, capacitance and inductance, ohms law and dc circuit Calculations. Ac Circuits. Three phase circuits, transformers, and electrical machines. Basic electronic devices and circuits. Introduction to electrical protection.

Course Objectives:

1. Defined and study current and voltage sources.
2. Use different theorems for analyzing DC electrical circuit.
3. Study the elements of AC circuit.
4. Study the resonance in AC parallel and series circuit.
5. To familiarize student with classification of electrical machines.
6. To know the structure, principle of operation, characteristic and equations related (Transformers, DC machines, AC machines).

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Direct Current Circuits**	Circuits and circuit elements. Open loop, closed loop and short circuits. Current, voltage, power. Basic calculations. Series and parallel connections of resistors.	**5**
2.	**Alternating Current Circuits**	Sine wave voltage. Main characteristics of sine waves. Single-phase and three-phase circuits. Basic calculations. Power factor.	**4**
٣.	**Transformers**	Basic construction and principle operation of single-phase transformer. Basic relationships between primary and secondary windings.	**2**
٤.	**Electrical machines**	DC motors and generators. Principle of operation. Construction. Main characteristics. Induction motors: single-phase and three-phase. Construction and basic principle of operation. Main characteristics.	**4**
٥.	**Semiconductor devices**	Diodes and transistors. Main characteristics, symbols. Basic applications.	**4**
٦.	**Control and protection devices**	Switches, relays, circuit breakers, electromagnetic, thermal and bi-metallic contactors. Ratings, applications, symbols, basic principle of operation.	**4**

Text Books & References:
Textbook

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مختبر أساسيات الكهرباء والالكترونيات
رقم المادة	٠٢٠٣٠٠١١٢
الساعات المعتمدة	١
ساعة نظري	٠
ساعة عملي	٣

Brief Course Description:

DC and AC circuits. Current and voltage measurements. Simple electronic circuits. DC and AC machines. Single-phase transformers. Protection devices and circuits.

Course Objectives:

1. To use measuring devices
2. To distinguish different types of electrical machines
3. To distinguish different types of control elements and protection devices
4. To practice electrical wiring

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Series and parallel DC circuits**	Current and voltage measurements. Voltage and current dividers	
2.	**Power measurements in DC circuits**	To check "the of conservation of energy"	**s**
٣.	**AC circuits**	Use oscilloscope and measuring devices to determine and measure the main features of sine waves	
٤.	**Transformer**	Study the relationships between primary and secondary windings	
٥.	**DC machines**	Characteristics of DC motors and generators	
٦.	**Three-phase induction motor**	Study the characteristics of three-phase induction motors	
٧.	**Electronic devices**	Investigate the characteristics of diodes and transistors. Build simple rectification circuits	
٨.	**Control and protection devices**	Construct and test simple circuits to demonstrate the operation of control and protection devices	

Text Books & References:
Instructional Lab. Sheets

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	الرسم الميكانيكي
رقم المادة	٠٢٠٢٠٠١١٢
الساعات المعتمدة	٢
ساعة نظري	٠
ساعة عملي	٦

Brief Course Description:

The course is designed to develop the technical sense for the student and enable him to create and analyze the different mechanical parts, pipes and ducts ,mechanical and HVAC symbols . Assembly and detailed drawings for technical arrangements. Applications for CAD and Solid Works modelling.

Course Objectives:

This course aims at:

1. Create engineering drawings involving isometric projection and constructing sections.
2. Create technical drawings for the commonly used parts in technical arrangements.
3. Represent the dimensions and data on technical drawings.
4. Create assembly drawings for technical arrangements.
5. Create detail drawings for technical arrangements.
6. Analyze technical drawings and make suggestions regarding them

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	3D Design (AutoCAD)		
2.	3D models in viewports		
٣.	The modification of 3D models		
٤.	Rendering		
٥.	3D space		
٦.	Editing 3D solid models		
٧.	Other features of 3D modelling		
٨.	3D Design (Solid Works)		

Text Books & References:

1. Introduction to AutoCAD 2008 2D AND 3D.ALF YARWOOD

2. Solid Works for Designers Release 2007, CADCIM Technologies, USA.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	الميكانيكا التطبيقية
رقم المادة	٠٢٠٢٠٠١١٣
الساعات المعتمدة	٢
ساعة نظري	٢
ساعة عملي	٠

Brief Course Description:

General principles, Force vector, Equilibrium of a particle, Force system resultant Equilibrium of rigid body, Analysis of structures, Internal forces, Dry friction, Centroid and Moment of Inertia, Kinematics of a particle, Kinetics of a particle(Forces and acceleration), Kinetics of a particle (impulse and momentum).

Course Objectives:

1 General principles: Mechanics, Fundamental concept, Units, SI System.
Force vector: Scalars and Vectors, Vector operations, Vector addition of forces, Cartesian vectors, position vector, Force vector directed along a line, Dot product. .
2
Equilibrium of a particle: Equilibrium condition, Free body diagram, Coplanar force system.
3
Force system resultant: Cross product, Moment of a force, Principle of moment, Moment of a force about a specified axis, Couple, Reduction of a simple distributed load.
4
Equilibrium of rigid body: Conditions of rigid body Equilibrium, Equilibrium in two dimensions.
5
Analysis of structures: Simple trusses, The method of joints, Zero force members, The method of section, frame.
6
7 Internal forces: Internal forces in structural members.
Dry friction: Characteristics of dry friction, Rules of dry friction, Angle of friction, Problems involving dry friction.
8
Centroid and Moment of Inertia: Centroid and Moment of Inertia for particle and body, composite bodies, parallel – axis theorem for an area, Moment of Inertia for mass.
9
Kinematics of a particle : continuous motion, graphical solution, general curvilinear motion(rectangular components),motion of a projectile
10
Kinetics of a particle (Forces and acceleration): equation of motion, equation of motion for a system of particles (rectangular components).
11. Kinetics of a particle (impulse and momentum): principle of linear impulse and

momentum, principle of linear impulse and momentum for a system of particles, impact.

Unit Number	Unit Name	Unit Content	Time Needed
1.	General principles:	Mechanics, Fundamental concept, Units, SI System.	
2.	Force vector:	Scalars and Vectors, Vector operations, Vector addition of forces,Cartesian vectors, position vector, Force vector directed along aline, Dot product.	
٣.	Equilibrium of a particle:	Equilibrium condition, Free body diagram, Coplanar force system.	
٤.	Force system resultant:	Cross product, Moment of a force, Principle of moment, Moment of a force about a specified axis, Couple, Reduction of a simple distributed load.	
٥.	Equilibrium of rigid body:	Conditions of rigid body Equilibrium, Equilibrium in two dimensions.	
٦.	Analysis of structures:	Simple trusses, The method of joints, Zero force members, The method of section, frame.	
٧.	Dry friction:	Internal forces: Internal forces in structural members.	
٨.	Characteristics of dry friction	Characteristics of dry friction, Rules of dry friction, Angle of friction, Problems involving dry friction.	
9.	Centroid and Moment of Inertia:	Centroid and Moment of Inertia for particle and body, composite bodies, parallel – axis theorem for an area, Moment of Inertia for mass.	
10.	Kinematics of a particle :	continuous motion, graphical solution, general curvilinear motion(rectangular components),motion o projectile	
11.	Kinetics of a particle (Forces and acceleration):	equation of motion, equation of motion for a system of particles (rectangular components).	
12.	Kinetics of a particle (impulse and momentum):	principle of linear impulse and momentum, principle of linear impulse and momentum for a system of particles, impact.	

Detailed Course Description:

References:

Vector Mechanics for Engineering - Statics & Dynamics ,By Beer and Johnston, 6th edition, McGraw Hall.

برنامج الدرجة الجامعية المتوسطة	
التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مبادئ الهندسة الحرارية
رقم المادة	٠٢٠٢٠٠١٠١
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Concepts and definitions, Properties of a pure substance, Work and heat, the first law of thermodynamics, the second law of thermodynamics, Principles of heat transfer Steady state conduction, Radiation, Heat exchangers

Course Objectives:

1. Concepts and definitions: System, control volume, properties, state of substance, processes, cycles, specific volume, pressure, temperature scales, zeroth law of thermodynamics, units
2. Properties of a pure substance: vapor-liquid-solid phase equilibrium in a pure substance, equation of state, tables of thermodynamic properties.
3. Work and heat: definition and unites of work, work done at the moving boundary of a simple compressible system, definition and unites of heat, relation between work and heat.
4. The first law of thermodynamics: The first law for the change in state of a system ,internal energy, enthalpy, constant volume and pressure specific heats, internal energy and enthalpy and constant volume and pressure specific heats for ideal gases, the first law of thermodynamics for a control volume, the steady state, steady flow process.
5. The second law of thermodynamics: the engines and refrigerators, reversible process, cornot cycle, entropy ,entropy change of an ideal gas, ploytropic and adiabatic reversible process.

Principles of heat transfer: conduction heat transfer, plane wall, plane wall in series and parallel, electro analog for conduction, contact resistance, thermal conductivity, convection heat transfer, radiation heat transfer, combined heat transfer mechanisms.

6

Steady state conduction: steady one –dimensional conduction equation without generation in rectangular coordinates, cylindrical coordinates, steady one – dimensional conduction equation with generation, fins, types of fins, fin efficiency, transient conduction with negligible internal resistance.

7

Radiation: physics of radiation, black body, planks law, stefan-Boltzman law, radiation properties, kirchoff's law, gray body, shape factor, radiative exchange between black surfaces.

8

Heat exchangers: types, overall heat transfer coefficient, the log-mean temperature difference, heat exchanger effectiveness.

Unit Number	Unit Name	Unit Content	Time Needed
1.	Concepts and definitions:	System, control volume, properties, state of substance, processes, cycles, specific volume, pressure, temperature scales, zeroth law of thermodynamics, units	
2.	Properties of a pure substance:	vapor-liquid-solid phase equilibrium in a pure substance, equation of state, tables of thermodynamic properties.	
٣.	Work and heat:	definition and unites of work, work done at the moving boundary of a simple compressible system, definition and unites of heat, relation between work and heat.	
٤.	The first law of thermodynamics :	The first law for the change in state of a system ,internal energy, enthalpy, constant volume and pressure specific heats, internal energy and enthalpy and constant volume and pressure specific heats for ideal gases, the first law of thermodynamics for a control volume, the steady state, steady flow process.	
٥.	The second law of thermodynamics :	the engines and refrigerators, reversible process, cornot cycle, entropy ,entropy change of an ideal gas, ploytropic and adiabatic reversible process.	
٦.	Principles of heat transfer:	conduction heat transfer, plane wall, plane wall in series and parallel, electro analog for conduction, contact resistance, thermal conductivity, convection heat transfer, radiation heat transfer, combined heat transfer mechanisms.	
٧.	Steady state conduction:	steady one –dimensional conduction equation without generation in rectangular coordinates, cylindrical coordinates, steady one – dimensional conduction equation with generation, fins, types of fins, fin efficiency, transient conduction with negligible internal resistance.	
٨.	Radiation:	physics of radiation, black body, planks law, stefan-Boltzman law, radiation properties, kirchoff's law, gray body, shape factor, radiative exchange between black surfaces.	
9.	Heat exchangers:	types, overall heat transfer coefficient, the log-mean temperature difference, heat exchanger effectiveness.	

Detailed Course Description:

Text Books :

1. Fundamentals of Thermodynamics, 6th Edition Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen John Wiley and Sons Inc., New York, NY, 2003
2. Basic heat transfer, Frank kreith and william Z.Black, Harper&row.

References:

1. Y.A. Cengel, Introduction to Thermodynamics and Heat Transfer, Irwin/McGraw- Hill, 1997.
2. Fundamentals of Engineering Thermodynamics, M. J. Moran, H. N. Shapiro 5th Ed, John Wiley & Sons, Inc., 2004, ISBN: 0-471-27471-2.
3. J.B. Jones and G.A. Hawkins, Engineering Thermodynamics, Second Edition, John Wiley & Sons, 1986.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مختبر مبادئ الهندسة الحرارية
رقم المادة	020200102
الساعات المعتمدة	١
ساعة نظري	٠
ساعة عملي	٣

Brief Course Description:

Pressure – Temperature relation in the saturation region; Compressor cycles and analyses; Heat pump performance; Conduction heat transfer; Radiation heat transfer; and Heat exchanger performance.

Course Objectives:

Saturation Pressure- Saturation Temperature relation (Marcel Boiler)

1.
2. Heat losses in Heat pump condenser
3. Energy balance of Heat pump
4. Coefficient of performance of heat pump
5. Air compressor polytropic work
6. Isothermal efficiency of reciprocating air compressor
7. Volumetric efficiency of reciprocating air compressor
8. longitudinal Conduction in simple bar
9. Radial Conduction in simple bar
10. Conduction in composite bar
11. Effect of insulation on conduction heat transfer
12. Forced convection heat transfer
13. performance of parallel and counter flow heat exchangers
14. performance of cross flow heat exchangers

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Saturation Pressure- Saturation Temperature relation (Marcel Boiler)		
2.	Heat losses in Heat pump condenser		
٣.	Energy balance of Heat pump		
٤.	Coefficient of performance of heat pump		
٥.	Air compressor poly tropic work		
٦.	Isothermal efficiency of reciprocating air compressor		
٧.	Volumetric efficiency of reciprocating air compressor		
٨.	longitudinal Conduction in simple bar		
9.	Radial Conduction in simple bar.		
10.	Conduction in composite bar		
11.	Effect of insulation on conduction heat transfer		
12.	Forced convection heat transfer		
13.	performance of parallel and counter flow heat exchangers		
14.	performance of cross flow heat exchangers		

Text Books :

1. Fundamentals of Thermodynamics, 6th Edition Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen John Wiley and Sons Inc., New York, NY, 2003

2. Basic heat transfer, Frank kreith and william Z.Black, Harper&row.

References:

1. Y.A. Cengel, Introduction to Thermodynamics and Heat Transfer, Irwin/McGraw- Hill, 1997.

2. Fundamentals of Engineering Thermodynamics, M. J. Moran, H. N. Shapiro 5th Ed, John Wiley & Sons, Inc., 2004, ISBN: 0-471-27471-2.

3. J.B. Jones and G.A. Hawkins, Engineering Thermodynamics, Second Edition, John Wiley & Sons, 1986

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	الموائع والالات الهيدروليكية
رقم المادة	٠٢٠٢٠٠١١٥
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types ,Selection and application of pumps

Course Objectives:

1. Develop competence in use of conservation laws (mass, energy, momentum) for analysis, design, selection, and operation of flow measuring devices, of open and closed water and waste water conveyance systems, and of hydraulic machines (pumps, turbines).
2. Utilize methods for risk and reliability analysis along with engineering economics in selecting components and systems.
3. Strengthen understanding of phenomena (e.g., cavitation, pressure/flow relations, losses), devices, components and systems with laboratory experiments and field trips.
4. Improve communication skills through report writing.
5. Development of dimensionally consistent equations. Competence with both SI and British Gravitational system of units.
6. Development of mass, momentum, and energy balances.
7. Application of conservation equations for pipe flow, pumping, and simple open channel flow application.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Introduction**	Introduction Units of measurement Fluid physical properties, Density, specific weight, viscosity, surface tension, compressibility	
2.	**Hydrostatics**	Fluid pressure, Pascal's law, Pressure variation in static fluid, pressure head, Gage and absolute pressure Pressure measurements (barometer, Manometers, Piezometer, Bourdon tube Engineering applications of hydrostatics	
٣.	**Equilibrium of Floating Bodies**	Archimedes principle Metacenter and metacentric height Condition of Equilibrium Oscillation f floating body	
٤.	**Fluid Flow Concept**	Types of flow, Laminar and turbulent flow, uniform flow, steady and unsteady flow, incompressible and Compressible flow Fluid energy: internal energy, Kinetic energy, potential energy, pressure energy Fluid motion equations: Continuity, equation of motion for steady flow, Bernoulli equation and its applications Flow measurement: Flow through Orifice, venture, flow over notches, Pitot tube, Rota meter, discharge coefficients	
٥.	**Flow through pipes**	Types of flow in pipes, Reynolds number, boundary layer and flow in pipe, loss head in pipes Darcy-Weisbach formula of head in pipe, relation between friction coefficient and Reynolds Friction loss in sudden contraction and expansion Friction loss in fittings and valves Velocity distributions in pipe flow Positive displacement pumps Gear and screw pumps	

		Centrifugal pumps Pumps performance and characteristics curves Power and efficiency calculations	
٦.	**Pumps**	Types of Pumps, Principle of operation Pump power and efficiency Net positive section head Reciprocating pumps: Construction, reducing flow fluctuations	
٧.	**Compressors**	Types of Air compressors Reciprocating compressors Centrifugal compressors	

Text Books & References:

1. Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines by R.S. Khurmi, Publisher: S
Chand, New Delhi (May 1987), ISBN: 8121901626.
2. Franzini, Fluid Mechanics with Engineering Applications, 10th Edition, McGraw Hill, 2002.
3. Giles R V et al, "Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics", 3rd Edition, McGraw-Hill, 1994.
4. E John Finnemore and Joseph B Franzini, Fluid Mechanics With Engineering Applications,
10th Edition.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مختبر الموائع والالات الهيدروليكية
رقم المادة	٠٢٠٢٠٠١١٦
الساعات المعتمدة	١
ساعة نظري	٠
ساعة عملي	٣

Brief Course Description:

Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoulli's equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.

Course Objectives:

At the completion of this course, each student is expected to be able to:
1.Validate Bernoulli's equation.
2.Measure the fluid Density and viscosity.
3.Determine the Force of pressure on immersed plate.
4.Study the Energy loss and friction coefficient.
5.Perform Flow rate measurements (by orifice and venture).
6.Study the performance of Reciprocating, gear, and centrifugal pumps.
7.Connect pumps in series and parallel and investigate the performance of each configuration.

Detailed Description:

No.	Unit Content	Hours
1	Density and viscosity measurements	
2	Force of pressure on immersed plate	
3	Demonstrating of Bernoulli's equation	
4	Flow rate measurements (flow through 1 orifice and venture)	
5	Energy loss and friction coefficient 1 measurements	
6	Head loss in smooth and rough pipes	
7	Pipe flow, Reynolds number, laminar 1 and turbulent flow in pipes	
8	Flow over notches and Weirs	
9	Pump Testing in Series	
10	Reciprocating pump performance	
11	Gear pump efficiency	
12	Performance of Reciprocation air 1 compressor	
13	Centrifugal Pump Testing	

Teaching Methods:

Laboratory

Books and references: lab-Sheets

Text Books & References:

1. Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines by R.S. Khurmi, Publisher: S
Chand, New Delhi (May 1987), ISBN: 8121901626.
2. Franzini, Fluid Mechanics with Engineering Applications, 10th Edition, McGraw Hill, 2002.
3. Giles R V et al, "Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics", 3rd Edition, McGraw-Hill, 1994.
4. E John Finnemore and Joseph B Franzini, Fluid Mechanics With Engineering Applications,
10th Edition.

Instructional Lab. Sheets

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	هندسة السيارات
رقم المادة	٠٢٠٢٠١٢٢١
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Introduction of fundamentals of engine construction and operation, engine systems, automotive transmission (manual and automatic), suspension system, clutches systems and Types, wheel alignment, automotive brake
system, steering system,

Course Objectives:

1. A system approach of understanding all automotive systems and their various subsystems
2. Understanding the important of safety and accident prevention in an automotive workshop.
3. Outline the basic of both gasoline and diesel engines.
4. Outline the basics of al automotive systems and subsystems.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Introduction Car Construction**	Historical background, car components and their functions Automotive engines	
2.	**Transmission**	Friction clutch Manual gear box Synchronize gear box Inter lock devices Automatic gear box Planetary gearing system Hydraulic torque convertor Automatic (hydraulic) gear shifting system Relationship between gear ratio, torque and rpm Final drive and drive shaft	
3.	**Suspension system**	Purpose of suspension system Components of suspension system Types of springs used in suspension Shock absorbers types , purpose and operation Automatic level control Rear suspension Front suspension me pherson type Front suspension Electronic suspension and ride control Air suspension	
4.	**Steering system**	Purpose of steering system Steering system components Types of steering gears (recirculating-ball steering gear, rack and pinion) Steering ratio Power steering systems, components of power steering, power steering types Steering electric power Four –wheel steering	
5.	**Wheel alignment**	Toe- in, Toe- Out Camber angle Wheel axis inclination Caster angle	
6.	**Braking system**	Working principle of automotive (hydraulic)	

		brake system Types of wheel brake mechanism Brake system components Servo brake Brake master cylinder (construction) Anti lock brake system(abs),types components and working principle Traction control system, purpose components and operation	

Text Books & References:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
2. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing company,
USA, 1993.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مشغل هندسة السيارات
رقم المادة	٠٢٠٢٠١٢٢٢
الساعات المعتمدة	١
ساعة نظري	٠
ساعة عملي	٣

Brief Course Description:

Personal safety, automotive workshop safety area Universal hand tools and equipments, special tools used in automotive workshop, car's units disassembly / assembly and adjustments.

Course Objectives:

1. Obtain applied stills in disassembly / assembly of all automotive systems and subsystems.
2. Obtain practical skills for using the tools and devices automotive diagnosis, maintenance and repair.
3. Obtain practical skills for implementing the maintenance and repair procedures.

Detailed Course Description:

Unit Number	Unit Name	Lab Contact	Time Needed
1.	**Safety in automotive workshop tools and equipments**	Personal safety Tool and equipment safety Universal hand tools Special tools for automotive mechanics	
2.	**Engine disassembly assembly and inspection**	Disassembly /assembly of cooling system Disassembly/assembly of lubricating system Disassembly/assembly of adjustment of gasoline engine fuel system Disassembly / assembly and adjustment of diesel engine fuel system	
٣.	**Engine reconditioning**	Disassembly \ assembly of crankshaft Piston group disassembly \ assembly Camshaft and related parts disassembly /assembly Crankshaft and camshaft timing Value clearance adjustments Cylinder head assembly cylinder head gaskets	
٤.	**Transmission**	Clutch disassembly \assembly and adjustments Gear box disassembly \assembly Drive shaft disassembly \assembly Final drive disassembly \assembly	
٥.	**Suspension system and steering system**	Suspension system components assembly / disassembly Steering system components assembly /disassembly	
٦.	**Brake system**	Brake system components disassembly \ assembly Tires disassembly \ assembly	

Text Books & References:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.

2. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing company,
USA, 1993.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	محركات الاحتراق الداخلي
رقم المادة	٠٢٠٢٠١٢٢٣
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Definition and introduction to the (ICE) fundamentals of engine, operation engine types and classification, engine construction, engine measurements and performance, engine system (lubrication, cooling, fuel) Including both carburetor and electronic fuel injection system.

Course Objectives:

After studying this course student of Autotronics should be able to Know :

1. Studying types of engines.
2. Studying and operating of internal combustion engine.
3. Studying fuel used and system of engine.
4. Studying fuel in Gasoline and diesel engine.
5. The student should know about turbo charging and super charge and intercooler.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Introduction to internal combustion engines**	Types of (ICE) System of (ICE) Important of (ICE) in different fields Differences between (ICE) and other engine types like steam engine, electrical vehicles	
2.	**Classification of (ICE) according to**	Number and arrangement of cylinders Valve arrangement in cylinder head Type of cooling systems Type of fuel	
٣.	**Engine operation**	Four stroke operation for Gasoline and diesel engine Engine diagram between pressure and crankshaft angles for four stroke engine (Gasoline and diesel) Engine pressure volume diagram with the relation of rpm and piston displacement for Gasoline engine Engine pressure – volume diagram for all Gasoline engine Atkinson cycle operation	
٤.	**Piston , cylinder construction**	Engine cylinder block types and operation Piston types and operation Piston rings types and operation Cylinder head types and operation Combustion chamber types Connecting rods, types and operation Crankshaft types and operation Vibration dampers Intake and exhaust manifolds	
٥.	**Valves and valves Trains**	Cam and cam shaft and operation Mechanical and Hydraulic valves, construction parts and cooling Springs and oil seals for valves Valve seats and types Valve lifters and types Rocker Arms Valve timing and types Engine timing gears and types	

		Valve operation and engine timing operation	
٦.	**Engine – performance measurements system**	Bore and stroke Piston displacement Top and bottom Dead centers Compression ratio (CR) and effects and increasing CR on engine operation Mean effective pressure Engine friction and indicated power out put Volumetric friction and indicated efficiency Power out put calculation Engine torque and relation with power out put and engines speed and diagrams Delivery of air-fuel mixture	
٧.	**Automotive engine fuels**	Gasoline , sources ,types and volatility Antiknock value in gasoline engine and facts effect knocking Octane No. rating, measuring, antiknock value during combustion and chemical control effectuating Types of abnormal combustion and normal combustion Diesel fuel, types, classification, volatility, and viscosity Cetane NO. and conditions effects its value Diesel fuel additives Diesel fuel combustion and conditions effect on it Detonation of diesel fuel and factors effect on it	
٨.	**Gasoline engine fuel and Exhaust system**	Purpose of fuel system Components of gasoline fuel system and operation (Tank, fuel pump, lines, carburetors , indicators and others) Components of Gasoline carburetor operation and types Carburetor cycles and systems Mechanical and electrical fuel pumps Conditions effect cerebration Fuel filters Crank case ventilation, and exhaust gas Recalculation Exhaust system, muffler and exhaust pipes Exhaust gases treatment and its effect on environment	

9.	**Diesel fuel – injection systems**	Diesel fuel – injection systems requirements Types of fuel – injection systems Cam operated 1-line plunger pump, components and operation Rotary distributor pump, components and operation Governors, types (centrifugal weights, vacuum) Automatic advance system of injection Diesel fuel injection and different factors effected by Fuel injectors- types and classifications, components and operation Diesel engine combustion chambers, types and its effect on combustion	
10.	**Engine cooling system**	Purpose of the cooling system Types of the cooling systems (water, air) Components of water cooling system, function of each part, and explain cooling circulation in the system Operation of air cooling system Radiators types and materials Antifreeze solution Temperature indicators	
11.	**Engine lubricating systems**	Purpose of the lubricating system Types of lubricating systems Components of lubricating system, operation of each part Oil filters, types and purpose Oil indicators	
12.	**Wangle (rotary) engines , and turbo charge engines , and increase power engine systems**	Wangle (rotary) engines, components and operation Turbo – charges components and operation Super charge components and operation Inter cooler components and operation	

Text Books & References:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
2. John Remling, Automotive Electricity , John Wikly & sons,Inc., U.S.A. 1987.
3. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing company,
USA, 1993.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مختبر محركات الاحتراق الداخلي
رقم المادة	020201224
الساعات المعتمدة	1
ساعة نظري	0
ساعة عملي	3

Brief Course Description:

Performance tests for spark and compression engines, air and fuel consumption, air fuel ratio bake and indicated horse power. specific fuel consumption, volumetric efficiency energy balance, variable compression ratio rest engine emission, diagnostic, adjustment of engine.

Course Objectives:

After practical this course you should be able to :

1. Studying and calculate engine measurement and performance.
2. Studying and calculate engine efficiency torque and horse power.
3. Studying and training compression, firing order, timing advance. Timing valves, wheel balance.

Detailed Course Description:

Unit Number	lab Name	Content	Time Needed
1.	Introduction to internal combustion engine		
2.	Specific fuel consumption		
٣.	Specific air consumption		
٤.	Richness of mixture and excesses air		
٥.	Volumetric efficiency Heat balance		
٦.	Heat loss in cooling water		
٧.	Heat loss at engine exhaust		
٨.	Heat loss by radiation		
9.	Engine torque, brake power, and Mechanical efficiency		

Text Books & References:

1. Introduction to Internal Combustion Engines, by Richard Stone, 3rd Edition, 1999, SAE International

2. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.

3. John Remling , Automotive Electricity , John Willy & sons,Inc., U.S.A. 1987 .

4. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing company,
USA, 1993.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	النظم الكهربائية والالكترونية في المركبات
رقم المادة	٠٢٠٢٠١٢٣٣
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Introduction, battery, starting system, charging system, ignition system, electronic fuel injection system, lights, safety and signaling, driver information and control devises, wiring harnesses, instrument panel,
(CANbus) technology for automotive application.

Course Objectives:

1. Explain electricity in terms of electrons.
2. Define voltage, current and resistance and explain how they are related.
3. Explain the basic operation of diodes and transistors.
4. Studying the battery and stating, charging, fuel injection, and electronics system.
5. Describe Ram. Rom and Prom and explain how the ECM controls engine operation.
6. Studying the sensors reporting to the ECM and can bus for automotive.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Electricity and electronic control**	Electricity and the engine Electricity and electric current Electrical charges Measuring electricity Ohm's law Introduction to electronics Semiconductors, diodes, transistor Electronic control module (ECM) Microprocessor, memory Electronic engine control	
2.	**Battery construction**	Battery operation Chemicals in battery Connecting cells Battery rating Battery efficiency Variations in thermal voltage	
٣.	**Starting system**	Need for starting system Basic motor principles Starting motor construction and operation Starting motor drive Overrunning the overrunning clutch	
٤.	**Charging system**	Purpose of charging system Alternator operation Alternator principles Alternator regulator Alternator terminal Alternator cooling	
5.	**Electronic ignition systems**	Type of electronic systems Fundamental of electronic ignition Pickup-coil voltage pulse High-energy ignition system Electronic spark advance Hall-effect switch Optical photodiode distributor Fundamentals of distributor less ignition Multiple-coil distributor ignition	

		Crankshaft-position sensor Camshaft-position sensor Direct multiple-coil ignition Direct capacitor discharge ignition	
6.	**Ignition system diagnosis**	Ignition system trouble diagnosis Oscilloscope patterns Reading scope patterns Stored ignition-system trouble codes	
7.	**Lights, Safety, and signaling and driver information and control devices**	Automotive lights Head lamps Light bulbs Head lamp switch Automotive head lamp controls Turn signal lights Computer controlled lighting Distributed lighting system Horn and horn relay Vehicle security systems Seat belts Air bags Wind shield wiper and washers Instrument panel Speedometer and odometer Other electronic and electronic devices Multiplex system Data bus network	
8.	**Electronic fuel injection systems**	Introduction to gasoline fuel-injection systems Comparing port and throttle-body injection Air fuel metering Operation of fuel injection systems Type of fuel injection Cold-start valve Throttle-position sensor Measuring in tank-air flow Indirect measurement of air flow Main fold absolute pressure Direct measurement of air flow Air temperature sensor Coolant-temperature sensor	

		Oxygen sensor Engine speed sensor Purpose of actuators Idle air control valve Electronic air control valve Electronic port-injection timing	

Text Books & References:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
2. John Remling , Automotive Electricity, John Wikly & sons,Inc., U.S.A. 1987.
3. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing
company, USA, 1993.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مشغل النظم الكهربائية والالكترونية في المركبات
رقم المادة	٠٢٠٢٠١٢٣٤
الساعات المعتمدة	١
ساعة نظري	٠
ساعة عملي	٣

Brief Course Description:

Safety rules and standards in Autotronics workshops. Use of SCAN tools for testing and inspection of modern cars.

Course Objectives:

Upon the completion of this course, the student will be able to:
1.Inspect and test different systems in modern cars
2.Use SCAN Tools in testing and inspection

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Safety in Autotronics workshops	Personal safety Tools safety Universal hand tools Special tools	
2.	Ignition system testing	Diagnoses and testing :- Waste spark Ignition system Coil per plug Ignition system Coil pick-up Ignition system	
٣.	Sensors system	Disassembly/ assembly and diagnoses and repair all sensors Use SCAN tools	
4.	Actuators system	Diagnoses and testing:- Idle air control valve Electronic air control valve EGR Valve	
5.	Injection system testing	Single point fuel Injection system Multi point fuel Injection system	
٤.	Diesel engine	Diagnoses and testing Use SCAN tools	
٥.	ABS system	Diagnoses and testing Use SCAN tools	
٦.	Air conditioning system	Diagnoses and testing Use SCAN tools	
٧.	SCAN tools OBD1, OBD2 systems	Diagnoses and testing New car technology	

Text Books & References:

Instructional materials and Lab. Sheets prepared by Instructor

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	تكنولوجيا المركبات الهجينة و الكهربائية
رقم المادة	٠٢٠٢٠١٢٣٥
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Introduction to hybrid and electric automobile, the principle of hybrid system, Hybrid types and classification, hybrid components, driving patterns in hybrid cars, safety procedures, hybrid vehicle testing and diagnosis.

Course Objectives:

1. Defined the hybrid system.
2. learn the basics of safety when working on hybrid systems.
3. Study hybrid system control modes.
4. To familiarize student with classification of electrical machines.
5. Describe the main hybrid and electric vehicle development considerations and performance requirements for various vehicle system.
6. Compare and contrast the various industry and regulatory standards for hybrid vehicle components, batteries, and charging systems.
7. Study hybrid power train, battery, inverter and special systems.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Electric vehicles introduction**	EVs and Hybrids Cost and Emissions	
2.	**Safe working, tools and hazard management**	General safety precautions High-voltage safety precautions	
٣.	**Hybrid system components**	Engine Motor and generator HV battery Inverter ECU Planetary gear set	
٤.	**Batteries**	Battery range Battery life and recycling Types of battery Electrochemical Principles Components Pack information Operation	
٥.	**Brake system**	Master cylinder and actuator Pads System diagram Hydraulic and wiring system Sensor ECU and MG	
٦.	**Engine and transaxle**	Cycle Planetary gear unit Transaxle damper	
٧.	**Body electrical**	Air conditioning system	
٨.	**Electric Motors**	Introduction Types of motor Construction and function of electric motor	
9.	**Inverter and Converter**	Assembly diagram	

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مشغل المركبات الهجينة و الكهربائية
رقم المادة	٠٢٠٢٠١٢٣٦
الساعات المعتمدة	٢
ساعة نظري	٠
ساعة عملي	٦

Brief Course Description:

Personal safety, automotive workshop safety area, special tools used in hybrid automotive workshop, hybrid car's units disassembly / assembly and adjustments, Install and remove hybrid units, diagnosis the hybrid automobile.

Course Objectives:

1. Obtain applied stills in disassembly / assembly of all hybrid automotive systems and subsystems (HV battery, powertrain, inverter, water pump).
2. Obtain practical skills for using the hybrid automotive diagnosis tools and devices , maintenance and repair.
3. Obtain practical skills for implementing the maintenance and repair procedures for hybrid units and components.

Unit Number	Unit Name	Unit Content
1.	Introduction to hybrid modes	
2.	Battery testing	
٣.	High voltage battery install and remove	
٤.	Engine and inverter cooling system	
٥.	Body electrical	
٦.	Hybrid transaxle inspection	
٧.	Motors	
٨.	Inverter connections	

برنامج الدرجة الجامعية المتوسطة	
التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	نظم القياس و التحكم في المركبات
رقم المادة	٠٢٠٢٠١٢٣٧
الساعات المعتمدة	٢
ساعة نظري	٢
ساعة عملي	٠

Brief Course Description:

Electronic computer controlled, Data acquisition, Control loops, automobile sensor and transducers.

Course Objectives:

1. Describe the basic control loop of the computer control system.
2. Describe the operation of the electronic control module.
3. Explain the operation of major input sensors.
4. Explain the operation of major output devices.
5. List the major circuits of the electronic control module.

6. Explain how efficiency is obtained by electronic engine controls.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Automotive sensors	• Automotive control system application of sensor . • Mass air flow rate (MAF) sensor • Indirect measurement of mass air flow • Manifold absolute pressure(MAP) sensor • Engine crank shaft angular position sensor (engine speed sensor ,timing sensor for ignition and fuel delivery , Hall effect position sensor , out put wave form optical crank shaft position sensor) • Throttle angle sensor (TPS) • Temperature sensor • Typical coolant sensor - Sensors for Feedback control • Exhaust gas oxygen sensor (EGO) • Desirable EGO characteristics • Switching characteristics • Heated EGO sensors • Knock sensor - Automotive engine control actuators • Fuel injection • Fuel injection signal • Exhaust gas recirculation actuator • Ignition system	
2.	, Data acquisition	Input and out put signal covert ion Multiplexing	
3	signal processing	Digital signal processing Analog signal processing	
4	, interface,	i/o parallel interface	

		Digital- to - Analog convertor Analog -to – Digital convertor Polling Sampling	
5.	Control loop	- Control systems • Open-loop control • Closed-loop control • Closed-loop limit –cycle control • Closed-loop fuel control system • Closed-loop operation • Simplified waveform in a closed –loop fuel control system. • Open-loop mode - Control modes for fuel control • Engine crank • Engine warm-up • Open -loop control • Closed-loop control • Acceleration enrichment • Deceleration leaning • Idle speed control • EGR control -Electronic ignition control • Closed –loop ignition timing • Spark advance correction scheme	
6.	examples	Cooling system Ignition system Other systems	

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مختبر نظم القياس و التحكم في المركبات
رقم المادة	٠٢٠٢٠١٢٣٨.
الساعات المعتمدة	١
ساعة نظري	٠
ساعة عملي	٣

Brief Course Description:

Testing and inspection of sensors and computer control.

Course Objectives:

1. Testing and troubleshooting automobile sensor and transducers.
2. Practical experiments related to automobile instrumentation and control.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Diagnosis and trouble shooting Electronic control unite	computer control system	
2.	Diagnosis and trouble shooting : Sensors	• Mass air flow rate (MAF) sensor • Indirect measurement of mass air flow • Manifold absolute pressure(MAP) sensor • Engine crank shaft angular position sensor (engine speed sensor ,timing sensor for ignition and fuel delivery , Hall effect position sensor , out put wave form optical crank shaft position sensor) • Throttle angle sensor (TPS) • Temperature sensor	
3.	Test and diagnosis Actuators	• Idle speed control system • EGR control system • Injectors ……. Etc	
4.	Diagnosis and trouble shooting instrumentation panel	Fuel level gauge Coolant temperature gauge Speedometer Charging gauge Oil pressure gauge	

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	تشخيص وإصلاح الأعطال في المركبات
رقم المادة	٠٢٠٢٠١٢٢٥
الساعات المعتمدة	٣
ساعة نظري	٣
ساعة عملي	٠

Brief Course Description:

Introduction to automotive diagnostics, maintenance and repair, theoretical background about automotive diagnostics, maintenance and repair, types of automotive diagnostics, maintenance and repair, types of automotive maintenance Inspection and service of car components: engine, engine system, transmission, brake system, suspension system, steering system .

Course Objectives:

1. Name the diagnosis tools and equipments commonly used in vehicle repair works.
2. Describe the basic applications and operation of these tools.
3. Know the types of maintenance and repair of automobiles.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Theoretical back ground of automotive service , types of service**	Theoretical background Pre_delivary service Preventive maintenance Season maintenance 1st and 2nd maintenance	
2.	**Engine diagnostics ,maintenance and repair**	Engine condition inspection and evaluation Engine maintenance engine systems maintenance Engine adjustments, engine systems adjustments	
٣.	**Transmission diagnostics, maintenance and repair**	Clutch inspection Clutch maintenance and adjustment Manual and automatic gear box inspection Manual and automatic gear box maintenance and adjustment Final drive inspection and service Final drive inspection and service Axis and wheel and service	
٤.	**Suspension and steering inspection and service**	Suspension components inspection and service Steering components inspection and service Wheel alignment	
٥.	**Brake system inspection and service**	Master cylinder inspection and service Wheel cylinder inspection and service Hand brake inspection and service Anti – lock brake system (ABS) inspection and service	

Text Books & References:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
2. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.

برنامج الدرجة الجامعية المتوسطة

التخصص	صيانة المركبات الكهربائية و الهجينة
اسم المادة	مشغل تشخيص وإصلاح الأعطال في المركبات
رقم المادة	٠٢٠٢٠١٢٢٦
الساعات المعتمدة	٢
ساعة نظري	٠
ساعة عملي	٦

Brief Course Description:

Equipments and devices for automotive diagnosis
Maintenance repair personal skills in performing inspection and service of cars
Components: engine, transmission, brake system, steering system, suspension system, suspension system and electrical equipments.

Course Objectives:

1. Studding the equipments for automotive diagnosis and repair.
2. Obtain the applied skills needed to come over the works related to automotive diagnosis, maintenance and repair.

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Engine inspection and service**	Engine condition inspection and evaluation thru **:** compression test, leakage test, vacuum test Engine applied service Engine applied adjustment : RPM, CO% In exhaust gases Engine systems applied service and adjustments	
2.	**Transmission inspection and service**	Applied clutch inspection Clutch service and clutch pedal free travel adjustment Gear box and dire shaft inspection Final drive gear clearance adjustment Axises and wheel inspection and service Wheel bearing clearance adjustment	
٣.	**Suspension and steering systems inspection and service Practically**	Inspection and service of suspension system components Steering system inspection and service Wheel alignment	
٤.	**Brake system inspection and service practically**	Master cylinder and wheel cylinder inspection and service Shoes_ drum clearance adjustment Hand broke adjustment abs) inspection and service	

Text Books & References:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
2. William H. Crource and Donald Anglin, Automotive Mechanics, Hill school publishing company,
USA, 1993.