



جامعة البلقاء التطبيقية

الخطة الدراسية لبرنامج الدرجة الجامعية المتوسطة في تخصص  
ميكانيك المركبات الثقيلة

الوصف التفصيلي لمواد تخصص ميكانيك المركبات الثقيلة المتخصصة

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
20205221	Course Number
محركات الديزل	Course Title
(٢)	Credit Hours
(٢)	Theoretical Hours
(٠)	Practical Hours

**Brief Course Description:**

Introduction, specifications, components & types of heavy-duty diesel engines, tow stroke, four stroke, water cooled, air-cooled, shape in line cylinders, v-shape (6-v, 8-v, 12-v) cylinders, fuel systems air supplies systems, exhaust systems, lubrication systems, tuning & adjusting, applications on armor vehicles engine.

**Course Objectives:**

This course aims at:

- After presenting this course the student should: classify different types of diesel engines according to their operation, specifications, applications and different types of sub-systems related to.

الوصف التفصيلي للمادة:-

Unit	Unit Name	Unit Content	Time needed
١	Two Stroke Diesel engines	<ul style="list-style-type: none"> <li>-Advantages and disadvantages of diesel engines</li> <li>-Comparison between two strokes: diesel and gasoline engines</li> <li>-Inlet air and exhaust systems, Blowers, Types of cylinders, Inlet air heating, Air box</li> <li>- Cooling system: operation, Types and components: thermostat, fan, hoses, water pump, And water jackets</li> <li>-Lubrication System: types and operation, components</li> <li>-Fuel system: operation, single unit injection system, tank, fuel pipes, low pressure pump, filters .</li> </ul>	
٢	Four Stroke Water Cooled diesel Engines	<ul style="list-style-type: none"> <li>-Engine components: Inlet air and Exhaust Systems, types of cylinders, and turbo charger</li> <li>-Cooling system operation and Components</li> <li>-Lubrication system, types, cooling Lubricant</li> <li>-Fuel system: operation, straight in line injection pumps</li> </ul>	
٣	Air cooled diesel engines	<ul style="list-style-type: none"> <li>-Engine components, types of cylinders, fins</li> <li>-Advantages and disadvantages</li> <li>Air fans, flow of cooling air</li> </ul>	
٤	Fuel system	<ul style="list-style-type: none"> <li>-Fuel tanks types and specifications</li> <li>-Fuel filters types and specifications Low pressure fuel pumps types , mechanical and electrical.</li> <li>-Single point injection pumps, principle, operation, fuel pressure</li> <li>-components In-line (straight) injection pumps, principles, operation</li> <li>-Injectors, operation, types, components</li> <li>-Rotary injection fuel pumps, principle, types, hydraulic head</li> </ul>	
٥	Trouble Shooting	<ul style="list-style-type: none"> <li>-Fault finding for different engine systems</li> </ul>	

**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methodology:**

Lectures, Power point presentation, Discussion

**Text Books & References:****Textbook:**

1. Diesel engines 2001, by phc.

**References:**

1. TM 2350-p-100-201

2. TM 2350-P-100-711

3. TM92350-317-34

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
20205222	Course Number
مشغل محركات الديزل	Course Title
(٢)	Credit Hours
(٠)	Theoretical Hours
(٦)	Practical Hours

**Brief Course Description:**

-Practicing on armor vehicle engines, starting on the vehicles & switching it off dismounting the power pack off the vehicle & mounting it back, recognizing the external & internal components disassembling the engines and assembling it, following the systems on the engine, practicing tuning & adjustment practicing preventive maintenance.

**Course Objectives:**

This course aims at:

1. After this work shop the students should be able to :
2. Identify the diesel engines components
3. Mounting and dismounting the engines of the vehicles
4. Disassemble and assemble engines
5. Tuning

الوصف التفصيلي للمادة :-

Unit	Workshop Name	Workshop Content	Time needed
١	Vehicles Using Two Stroke Diesel Engines:	Dismounting the power pack off the vehicle & mounting it back, recognizing the external & internal components, disassembling the engines and assembling it following the systems on the engine, practicing tuning & adjustment, and practicing preventive maintenance.	
٢	Vehicles Using Four Stroke –Water cooled Diesel Engines	Dismounting the power pack off the vehicle & mounting it back, recognizing the external & internal components, disassembling the engines and assembling it, following the systems on the engine, practicing tuning & adjustment and practicing preventive maintenance	
٣	Vehicles Using Four Stroke –Air cooled Diesel Engines	Dismounting the power pack off the vehicle & mounting it back, recognizing the external & internal components disassembling the engines and assembling it, following the systems on the engine, practicing tuning & adjustment practicing preventive maintenance	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

Lecture, Laboratory

## Text Books &amp; References:

Textbook:

1. Diesel engines 2001, by phc.

References:

1. TM 2350-p-100-201

2. TM 2350-P-100-711

3. TM92350-317-34

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204241	Course Number
أنظمة نقل وتعليق للآليات الثقيلة	Course Title
(٢)	Credit Hours
(٢)	Theoretical Hours
(٠)	Practical Hours

**Brief Course Description:**

Introduction types of gears planetary gear sets and its laws fluid couplings & torque converters clutches for planetary gear sets engagement automatic transmission integrated gear boxes: power transmission steering – braking in on unit hydraulic circuits controlling gear boxes lubrication system troubleshooting. Suspension systems for heavy –duty vehicles: components types of suspension, trouble shooting .

**Course Objectives:**

This course aims at:

After presenting this course the student should : classify types of gears, gear trains, torque converters, how different types of hydraulic and automatic transmission mounted on heavy armored vehicles operate, braking systems integrated inside gearbox, steering units integrated also inside gearbox operate and the different types of steer units and their operation. Different suspension units, operation and components .how to troubleshoot different ferules

Unit	Unit Name	Unit Content	Time needed
١	GEER Trains	-Type of gears, gear ratio, gear trains, planetary gear set, components. -operation, ratio calculations. Fluid coupling .Torque converter.	
٢	Hydraulic and automatic transmission gear system	-Principle of operation. Cross drive, components, gear trains, shafts Wet clutches. -Relationship between gear groups and clutches Different speed operation, shift	
٣	Steer units	-Introduction. - Principle of operation. -The relationship between the gear trains and the steer unit inside the hydraulic gear unit Steer units using clutches, components, -principle of operation, steer on different speeds. -relationship between final gear train components and steer unit. -Hydro-static- steer unit: components, principle of operation, variable displacement pumps, hydraulic motors, steer unit operation inside the gear box, relationship between final gear train components and steer unit.	
٤	Brake System	-Introduction -Principle of operation. -Brake system inside gear unit. -Relationship between final drive unit. -Inside cross drive hydraulic gear unit. and brake system Clutches, plates, activation ,boost. -hydraulic pumps. -Operation of brake system inside gear box unit.	
٥	Hydraulic systems for gear box	-Introduction. -principles. -pumps, types, parts, operation of different types of pumps. -valves: pressure regulation valves, flow control valves, spool valves. -Actuators, different types of actuators, special actuators for hydraulic gear box units. -Hydraulic circuit. -Control circuit. -Hydraulic circuit for gear box unit.	
٦	Suspension systems for armor vehicles	-Introduction -Suspension system using oil Dampers Types of oil dampers. -Springs: types, torsion bars, spiral ,leaf springs. -Suspension as a unit for armored vehicles. -Hydro-Gas suspension units: operation principle, components, charging with nitrogen and oil, pressures of nitrogen. -Track system operation ,components, Idle wheel, track carriers, spur track wheel. -Calibration.	

**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methodology:**

-Lectures, Power point presentation, Discussion

**Text Books & References:****Textbook:**

1. TM92350253-20P

**References:**

1. AESP2350-p-100-302/522/523

2. TM92300-257-35

3. TM92350253-20P



البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020300101	Course Number
أساسيات الكهرباء و الالكترونيات	Course Title
(٢)	Credit Hours
(٢)	Theoretical Hours
(٠)	Practical Hours

**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).

Unit	Unit Name	Unit Content	Time needed
١	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.	
٢	Alternating Current Circuits	-Sine wave voltage. Main characteristics of sine waves. Single-phase and three-phase circuits. -Basic calculations. Power factor.	
٣	Transformers	-Basic construction and principle operation of single-phase transformer. -Basic relationships between primary and secondary windings.	
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.	
٥	Semiconductor devices	-Diodes and transistors. Main characteristics, symbols. Basic applications.	
٦	Control and protection devices	-Switches, relays, circuit breakers, electromagnetic, thermal and bi-metallic contactors. Ratings, applications, symbols, basic principle of operation.	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

Teaching Methodology:  
Lecture and presentations

## Text Books &amp; References:

٠١٣٢٣٨٣٥١٩: ١٠, ISBN-٢٠٠٧1. Thomas L. Floyd " principles of electric circuits" ,Prentice Hall,

## Textbook:

أساسيات الكهرباء و الالكترونيات، دار الصفاء للنشر

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020300102	Course Number
مختبر أساسيات الكهرباء و الالكترونيات	Course Title
(1)	Credit Hours
(0)	Theoretical Hours
(3)	Practical Hours

**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

Unit	Unit Name	Lab Content	Time needed
١	Series and parallel DC circuits	-Current and voltage measurements. Voltage and current dividers	
٢	Power measurements in DC circuits	To check “the of conservation of energy”	
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 device	

**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methodology:**

Laboratory

**Text Books & References:**

٠١٣٢٣٨٣٥١٩: ١٠, ISBN-٢٠٠٧1. Thomas L. Floyd “ principles of electric circuits” ,Prentice Hall,

Textbook:

Instructional Lab. Sheets

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
٠٢٠٢٠٠١١٢	Course Number
الرسم الميكانيكي	Course Title
(٢)	Credit Hours
(0)	Theoretical Hours
(٦)	Practical Hours

**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

Unit	Unit Name	Lab Content	Time needed
١	Introducing 3D modelling	<ul style="list-style-type: none"> <li>-Introduction</li> <li>-The 3D Modelling workspace</li> <li>-Methods of calling tools for 3D modelling</li> <li>-The Polysolid tool</li> <li>-2D outlines suitable for 3D -models</li> <li>-The Extrude tool</li> <li>-The Revolve tool</li> <li>-Other tools from the 3D Make control panel</li> <li>-The Chamfer and Fillet tools</li> <li>-Constructing 3D surfaces using the -Extrude tool</li> <li>-The Sweep tool</li> <li>-The Loft tool</li> <li>-Revision notes</li> <li>-Exercises</li> </ul>	
٢	3D models in viewports	<ul style="list-style-type: none"> <li>Aim of this chapter</li> <li>-Setting up viewport systems</li> <li>-Revision notes</li> <li>-Exercises</li> </ul>	
٣	The modification of 3D models	<ul style="list-style-type: none"> <li>Aims of this chapter</li> <li>-Creating 3D model libraries</li> <li>-Constructing a 3D model</li> <li>-The 3D Array tool</li> <li>-The Mirror 3D tool</li> <li>-The Rotate 3D tool</li> <li>-The Slice tool</li> <li>-The Section tool</li> <li>-Views of 3D models</li> <li>-The Helix tool</li> <li>-Using DYN</li> <li>-3D Surfaces</li> <li>-Revision notes</li> <li>-Exercises</li> </ul>	
٤	Rendering	<ul style="list-style-type: none"> <li>Aims of this chapter</li> <li>-Setting up a new 3D template</li> <li>-The Render tools and dialogs</li> <li>-The Lights tools</li> <li>-Setting rendering background colour</li> <li>-First example – rendering a 3D model</li> <li>-Adding a material to a model</li> <li>-The 3D Orbit tool</li> <li>-Producing hardcopy</li> <li>-Other forms of hardcopy</li> <li>-Saving and opening 3D model drawings</li> <li>-Exercises</li> </ul>	

Unit	Unit Name	Lab Content	Time needed
٥	3D space	Aims of this chapter -3D space -The User Coordinate System (UCS) -The variable UCSFOLLOW -The UCS icon -Examples of changing planes using the UCS -Saving UCS views -Constructing 2D objects in 3D space -The Surfaces tools -Surface meshes -The Edge surf tool -The Rule surf tool -The Tab surf tool -Revision notes -Exercises	
٦	Editing 3D solid models	Aims of this chapter -The Solid Editing tools -Examples of more 3D models -Exercises	
٧	Other features of 3D modelling	Aims of this chapter -Raster images in AutoCAD drawings -Printing/Plotting -Polygonal viewports -Exercises	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

Teaching Methodology:  
Laboratory

## Textbooks:

1. Introduction to AutoCAD 2008 2D AND 3D.ALF YARWOOD
2. Solid Works for Designers Release 2007, CAD/CIM Technologies, USA.

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
٠٢٠٢٠٠١١٥	Course Number
الموانع والآلات الهيدروليكية	Course Title
(٣)	Credit Hours
(٣)	Theoretical Hours
(٠)	Practical Hours

**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.



الوصف التفصيلي للمادة :-

Unit	Unit Name	Unit Content	Time needed
١.	Introduction	-Introduction -Units of measurement -Fluid physical properties, Density, specific weight, viscosity, surface tension, compressibility	
٢	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 -Meta center and meta centric height -Condition of Equilibrium -Oscillation of 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-Wies 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	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

1. Lectures
2. Power point presentations
3. Discussion

## Text Books &amp; References:

## 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.

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
٠٢٠٢٠٠١١٦	Course Number
مختبر الموانع والآلات الهيدروليكية	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**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.

Unit	Lab Name	Lab Content	Time needed
١		Density and viscosity measurements	
٢		Force of pressure on immersed plate	
٣		Demonstrating of Bernoulli's equation	
٤		Flow rate measurements (flow through orifice and venture)	
٥		Energy loss and friction coefficient measurements	
٦		Head loss in smooth and rough pipes	
٧		Pipe flow, Reynolds number, laminar and turbulent flow in pipes	
٨		Flow over notches and Weirs	
٩		Pump Testing in Series	
١٠		Reciprocating pump performance	
١١		Gear pump efficiency	
١٢		Performance of Reciprocation air compressor	
١٣		Centrifugal Pump Testing	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

## 2. Laboratory

## Text Books &amp; References:

## Instructional Lab. Sheets

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020200101	Course Number
مبادئ الهندسة الحرارية	Course Title
(٣)	Credit Hours
(٣)	Theoretical Hours
(٠)	Practical Hours

**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

وصف التفصيلي لمادة مبادئ الهندسة الحرارية :-

Unit	Unit Content	Time needed
١	Concepts and definitions: System, control volume, properties, state of substance, processes, cycles, specific volume, pressure, temperature scales, zeroth law of thermodynamics, units	
٢	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, carnot 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	
٩	Heat exchangers: types, overall heat transfer coefficient, the log-mean temperature difference, heat exchanger effectiveness	

**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Text Books :**

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

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020200102	Course Number
مختبر مبادئ الهندسة الحرارية	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**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.



الوصف التفصيلي للمادة:-

Unit	Lab Content	Time needed
١	Saturation Pressure- Saturation Temperature relation (Marcet Boiler)	
٢	Heat losses in Heat pump condenser	
٣	Energy balance of Heat pump	
٤	Coefficient of performance of heat pump	
٥	Air compressor polytropic work	
٦	Isothermal efficiency of reciprocating air compressor	
٧	Volumetric efficiency of reciprocating air compressor	
٨	longitudinal Condition in simple bar	
٩	radial Condition in simple bar	
١٠	Conduction in composite bar	
١١	Effect of insulation on conduction heat transfer	
١٢	Forced convection heat transfer	
١٣	performance of parallel and counter flow heat exchangers	
١٤	performance of cross flow heat exchangers	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

## 2. Laboratory

## Text Books &amp; References:

## Instructional Lab. Sheets

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020201223	Course Number
محركات الاحتراق الداخلي	Course Title
(٣)	Credit Hours
(٣)	Theoretical Hours
(٠)	Practical Hours

**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 heavy vehicle mechanics 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.

Unit	Unit Name	Unit Content	Time needed
١	Introduction to internal combustion engines	<ul style="list-style-type: none"> <li>-Types of (ICE)</li> <li>-System of ( ICE )</li> <li>-Important of ( ICE ) in different fields</li> <li>-Differences between ( ICE ) and other engine</li> <li>-types like steam engine, electrical vehicles</li> </ul>	
٢	Classification of (ICE) according to	<ul style="list-style-type: none"> <li>-Number and arrangement of cylinders</li> <li>-Valve arrangement in cylinder head</li> <li>-Type of cooling systems</li> <li>-Type of fuel</li> </ul>	
٣	Engine operation	<ul style="list-style-type: none"> <li>-Four stroke operation for Gasoline and diesel Engine.</li> <li>-Engine diagram between pressure and crankshaft angles for four stroke engine( Gasoline and diesel )</li> <li>-Engine pressure volume diagram with the relation of rpm and piston displacement for Gasoline engine</li> <li>-Engine pressure – volume diagram for all Gasoline engine</li> </ul>	
٤	Piston , cylinder construction	<ul style="list-style-type: none"> <li>-Engine cylinder block types and operation.</li> <li>-Piston types and operation.</li> <li>-Piston rings types and operation.</li> <li>-Cylinder head types and operation.</li> <li>-Combustion chamber types.</li> <li>-Connecting rods, types and operation.</li> <li>-Crankshaft types and operation.</li> <li>-Vibration dampers.</li> <li>-Intake and exhaust manifolds.</li> </ul>	
٥	Valves and valves Trains	<ul style="list-style-type: none"> <li>-Cam and cam shaft and operation Mechanical and Hydraulic valves.</li> <li>-construction parts and cooling</li> <li>-Springs and oil seals for valves</li> <li>-Valve seats and types</li> <li>-Valve lifters and types</li> <li>-Rocker Arms</li> <li>-Valve timing and types</li> <li>-Engine timing gears and types</li> <li>- Valve operation and engine timing operation</li> </ul>	
٦	Engine – performance measurements	<ul style="list-style-type: none"> <li>-Bore and stroke ,Piston displacement.</li> <li>-Top and bottom Dead centers.</li> <li>-Compression ratio ( CR ) and effects and increasing CR on engine operation.</li> <li>-Mean effective pressure.</li> <li>-Engine friction and indicated power output.</li> <li>-Volumetric friction and indicated efficiency.</li> <li>-Power output calculation.</li> <li>-Engine torque and relation with power output and engines speed and diagrams.</li> <li>-Delivery of air-fuel mixture.</li> </ul>	

٧	Automotive engine fuels	<ul style="list-style-type: none"> <li>-Gasoline , sources ,types and volatility</li> <li>-Antiknock value in gasoline engine and facts effect knocking</li> <li>-Octane No. rating, measuring, antiknock value during combustion and chemical control effectuating</li> <li>-Types of abnormal combustion and normal Combustion</li> <li>-Diesel fuel, types, classification, volatility, and viscosity</li> <li>-Cetane NO. and conditions effects its value</li> <li>-Diesel fuel additives</li> <li>-Diesel fuel combustion and conditions effect on it</li> <li>-Detonation of diesel fuel and factors effect on it</li> </ul>	
٨	Gasoline engine fuel and Exhaust system	<ul style="list-style-type: none"> <li>-Purpose of fuel system</li> <li>-Components of gasoline fuel system and operation (Tank, fuel pump, lines, carburetors , indicators and others )</li> <li>-Components of Gasoline carburetor operation and types</li> <li>-Carburetor cycles and systems</li> <li>-Mechanical and electrical fuel pumps</li> <li>-Conditions effect cerebration Fuel filters</li> <li>-Crank case ventilation, and exhaust gas recalculation</li> <li>-Exhaust system, muffler and exhaust pipes</li> <li>-Exhaust gases treatment and its effect on environment</li> </ul>	
٩	Diesel fuel – injection systems	<ul style="list-style-type: none"> <li>-Diesel fuel – injection systems requirements</li> <li>-Types of fuel – injection systems</li> <li>-Cam operated 1-line plunger pump, components and operation</li> <li>-Rotary distributor pump, components and operation</li> <li>-Governors, types ( centrifugal weights, vacuum )</li> <li>-Automatic advance system of injection</li> <li>-Diesel fuel injection and different factors effected by</li> <li>-Fuel injectors- types and classifications, components and operation</li> <li>-Diesel engine combustion chambers, types and its effect on combustion</li> </ul>	
١٠	Engine cooling system	<ul style="list-style-type: none"> <li>-Purpose of the cooling system</li> <li>-Types of the cooling systems ( water, air)</li> <li>-Components of water cooling system, function of each part, and explain cooling circulation in the system</li> <li>-Operation of air cooling system</li> <li>-Radiators types and materials</li> <li>-Antifreeze solution</li> <li>-Temperature indicators</li> </ul>	
١١	Engine lubricating systems	<ul style="list-style-type: none"> <li>-Purpose of the lubricating system Types of lubricating systems</li> <li>-Components of lubricating system, operation of each part</li> <li>-Oil filters, types and purpose</li> <li>-Oil indicators</li> </ul>	
١٢	Wangle ( rotary) engines , and turbo charge engines , and increase power engine systems	<ul style="list-style-type: none"> <li>-Wangle ( rotary ) engines, components and operation</li> <li>-Turbo – charges components and operation</li> <li>-Super charge components and operation</li> <li>-Inter cooler components and operation</li> </ul>	

**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
<b>Homework and Projects</b>		10%	--/--/----
<b>Discussions and lecture Presentations</b>			

**Teaching Methodology:**

-Lectures and presentations

**Text Books & References:****Textbook:**

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. Crouce and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020201224	Course Number
مختبر محركات الاحتراق الداخلي	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**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.

Unit	Lab Name	Lab Content	Time needed
١	Introduction to internal combustion engine		
٢	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		
٩	Engine torque, brake power, and Mechanical efficiency		
١٠	Compression pressure		
١١	Cylinder leakage		
١٢	Timing advance test, firing order		
١٣	Timing valves adjustment and Clearances		

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

## Laboratory

## Text Books &amp; References:

## 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. Crouce and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204233	Course Number
تشخيص وإصلاح الأعطال في الآليات الثقيلة	Course Title
(٣)	Credit Hours
(٣)	Theoretical Hours
(٠)	Practical Hours

**Brief Course Description:-**

Introduction to vehicle diagnostics, maintenance and repair, theoretical background about Heavy vehicle diagnostics, maintenance and repair, types of vehicle diagnostics, maintenance and repair, types of vehicle maintenance Inspection and service of vehicle components: engine engine system, transmission, broke system, suspension system, steering

**Course Objectives**

- Name the diagnosis tools and equipments commonly used in vehicle repair works
- Describe the basic applications and operation of these tools
- Know the types of maintenance and repair of heavy vehicle



Unit	Unit Name	Unit Content	Time needed
١	Theoretical back ground of vehicle service , types of service	-Theoretical background -Pre delivery service -Preventive maintenance -Season maintenance -1st and 2nd maintenance	
٢	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	-Torque converter inspection - automatic gear box inspection -automatic gear box maintenance and adjustment -Final drive inspection and service -Final drive inspection and service -Axis and track and service	
٤	Suspension and steering inspection and service	-Suspension components inspection and service -Steering components inspection and Service -track calibration	
٥	Brake system inspection and service	-Master cylinder inspection and service -Wheel cylinder inspection and service -Hand brake inspection and service - brake system calibration	
٦	Electrical system diagnose	-Battery System diagnose -Charging system faults -Starting system faults	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

-Lectures and presentations

## Text Books &amp; References:

## Textbook:

1. كراسة تشخيص الأعطال للآليات الثقيلة ، كلية الأمير الحسين بن عبد الله الثاني
2. TM9-8000 general mechanics
3. US army technical manuals

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204234	Course Number
مشغل تشخيص وإصلاح الأعطال في الآليات الثقيلة	Course Title
(٢)	Credit Hours
(٠)	Theoretical Hours
(٦)	Practical Hours

**Brief Course Description:**

-Equipments and devices for heavy vehicle diagnosis Maintenance repair personal skills in performing inspection and service of heavy vehicle

Components: engine, transmission, brake system, steering system, suspension system, suspension system and electrical equipments.

**Course Objectives:**

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

Unit	Workshop Name	Workshop Content	Time needed
١	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	
٢	Transmission inspection and service	-Gear box and transport train inspection -Final drive adjustment	
٣	Suspension and steering systems inspection and service Practically	-Inspection and service of suspension system components -Steering system inspection and service - track calibration - Suspension system charging	
٤	Brake system inspection and service practically	-Master cylinder and wheel cylinder inspection and service -brakes clearance adjustment -Hand brake adjustment	
٥	Electrical system diagnosis	-battery system checks - starting system checks -charging system diagnosis	

## Evaluation Strategies:

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

-Lab

## Text Books &amp; References:

## Textbook:

1. كراسة تشخيص الأعطال للأليات الثقيلة ، كلية الأمير الحسين بن عبد الله الثاني
2. TM9-8000 general mechanics
3. US army technical manuals

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204111	Course Number
الأنظمة الكهربائية في الآليات الثقيلة	Course Title
(٣)	Credit Hours
(٣)	Theoretical Hours
(٠)	Practical Hours

**Brief Course Description:**

-Introduction, battery, starting system, charging system, air heating system, electronic fuel injection system, lights, safety and signaling, driver information and control devises, wiring harnesses, instrument panel,

**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.

Unit	Unit Name	Unit Content	Time needed
١	Electricity and electronic control	<ul style="list-style-type: none"> <li>-Electricity and the engine</li> <li>-Electricity and electric current</li> <li>-Electrical charges</li> <li>-Measuring electricity</li> <li>-Ohm's law</li> <li>-Introduction to electronics</li> <li>-Semiconductors, diodes, transistor</li> <li>-Electronic control module ( ECM )</li> <li>-Sensors</li> </ul>	
٢	Battery construction	<ul style="list-style-type: none"> <li>-Battery operation</li> <li>-Chemicals in battery</li> <li>-Connecting cells</li> <li>-Battery rating</li> <li>-Battery efficiency</li> <li>-Variations in thermal voltage</li> </ul>	
٣	Starting system	<ul style="list-style-type: none"> <li>-Need for starting system</li> <li>-Basic motor principles</li> <li>-Starting motor construction and operation</li> <li>-Starting motor drive</li> <li>-Overrunning the overrunning clutch</li> </ul>	
٤	Charging system	<ul style="list-style-type: none"> <li>-Purpose of charging system</li> <li>-Alternator operation</li> <li>-Alternator principles</li> <li>-Alternator regulator</li> <li>-Alternator terminal</li> <li>-Alternator cooling</li> </ul>	
٥	Air Heating system	<ul style="list-style-type: none"> <li>-Purpose of air heating system</li> <li>-Components in air heating system</li> <li>- Air temperature sensor</li> </ul>	
٦	Lights, Safety, and signaling and driver information and control devices	<ul style="list-style-type: none"> <li>-Vehicle lights</li> <li>-Head lamps</li> <li>-Light bulbs</li> <li>-Turn signal lights</li> <li>-Computer controlled lighting</li> <li>-Distributed lighting system</li> <li>-Horn and horn relay</li> <li>-Vehicle security systems</li> <li>-Instrument panel</li> <li>-Speedometer and odometer</li> </ul>	
٧	Diesel fuel injection systems	<ul style="list-style-type: none"> <li>-Diesel engine construction operation</li> <li>-Diesel engine characteristics</li> <li>-Diesel fuel</li> <li>-Cetan number</li> <li>-Cleaning diesel fuel</li> <li>-Diesel fuel-injection pump</li> <li>-Rotary-distributor injection pump</li> <li>-Distributor –pump control</li> <li>-</li> </ul>	

		<b>Mechanical governors</b> -Diesel electronic control system -Injection nozzle -Direct and indirect injection -Diesel starting procedures -Coolant and fuel heater -Vacuum pump	
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**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methodology:**

-Lectures and presentations

**Text Books & References:****Textbook:**

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. Crouce and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.
4. Tm9-8000
5. Us Army technical manuals
6. كراسة الأنظمة الكهربائية، إعداد المهندس صلاح مصلح المعاني كلية الأمير الحسين بن عبد الله الثاني الفنية العسكرية

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204121	Course Number
الأنظمة الهيدروليكية والهوائية في الآليات الثقيلة	Course Title
(٣)	Credit Hours
(٣)	Theoretical Hours
(٠)	Practical Hours

**- Brief Course Description:**

hydraulic systems, function, components, diagrams defect inspection for hydraulic systems used in heavy vehicles

**Course Objectives:**

-To enable the Hydraulic specialists to and list the hydraulic, pneumatic systems in the army our vehicles operating the Jordan army forces – which include the study of schematic diagrams of the system send to know its components such as motors, pumps, reservoirs, valves, Gages, filters, cylinders, hydraulic gear boxes, recoil, hydraulic suspension, torque, Converter etc

Unit	Unit Name	Unit Content	time needed
١	hydraulic component and pascals law	-pascal law - main components: - reservoir, filters, pumps, lines, hydraulic cylinder , valves , accumulators , heat exchanger , motors .	
٢	pumps	-types of pumps (positive and negative displacement) -centrifugal pumps - screw type pump - reciprocating pumps	
٣	motors	-centrifugal motor - screw type motor - reciprocating motor	
٤	valves	-check valve - relief valve - control valves - signal valve	
٥	filters and accumulators	type of filters :- metallic filter , paper filters , fabric filters , ceramic filters . types of accumulators :- gas powered spring loaded force loaded	
٦	pneumatic systems and components	- air vessel , filters and dryers , compressors , lines , valves , heat exchanger , motors .	
7	controlling devices	- sensors - switches - feed back signals	



**Evaluation Strategies:**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methodology:**

Lectures .

Textbook:

1. Tmer – 7910-34-2-2, US Army.
2. Tmer – 7910-34-2, US Army.
3. TM9 – 2350-275-20-2, US Army.
4. TM9 – 2350 - 253-20 - 2 US Army.
5. TM9 – 1000 – 213 – 3 US Army.
6. TM9 – 2400 – 378 – 35 – 2 – 2 - US Army.
7. Trouble shooting of hydraulic system , prepared by Mustafa Shaban, University of Jordan, Industrial Engineering Department 1993 – 1992.
8. Fluid power handbook, directory by Editors of hydraulic and pneumatics. 1992- 1993.
9. Using industrial hydraulic
10. hydraulic by T.C Franken Enfield

كراسة الأنظمة الهيدروليكية والهوائية للأليات الثقيلة' كلية الأمير الحسين بن عبد الله الثاني

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204122	Course Number
مشغل الأنظمة الهيدروليكية والهوائية في الآليات الثقيلة	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**Brief Course Description:-**

following and troubleshooting of hydraulic systems, components, inspection for hydraulic systems used in heavy vehicles.

**Course Objectives:**

-To enable the mechanic recognize and troubleshoot hydraulic, pneumatic systems in the army our vehicles operating the Jordan army forces – which include the study of schematic diagrams of the system send to know its components such as motors, pumps, reservoirs, valves, Gages, filters, cylinders, hydraulic gear boxes, recoil, hydraulic suspension, torque, Converter etc

Unit	Unit Name	Workshop Content	time needed
١	hydraulic component	- describing and recognizing main components: - reservoir, filters, pumps, lines, hydraulic cylinder, valves, accumulators, heat exchanger, motors.	
٢	pumps	connecting pumps in series and parallel assembling and disassembling pumps	
٣	motors	assembling and disassembling motors	
٤	valves	analyzing types of valves in hydraulic systems	
٥	filters and accumulators	knowing type and specifications for filters	
٦	pneumatic systems and components	following schematics and pneumatic systems on vehicle	
7	controlling devices	- sensors inspection - switches inspection - feed back signals inspection	

**Teaching Methodology:**

Experiment  
lab

**Textbook:**

1. Tmer – 7910-34-2-2, US Army.
2. Tmer – 7910-34-2, US Army.
3. TM9 – 2350-275-20-2, US Army.
4. TM9 – 2350 - 253-20 - 2 US Army.
5. TM9 – 1000 – 213 – 3 US Army.
6. TM9 – 2400 – 378 – 35 – 2 – 2 - US Army.
7. Trouble shooting of hydraulic system, prepared by Mustafa Shaban, University of Jordan, Industrial Engineering Department 1993 – 1992.
8. Fluid power handbook, directory by Editors of hydraulic and pneumatics. 1992- 1993.
9. Using industrial hydraulics
10. ics by T.C Franken Enfield

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204231	Course Number
مشغل أجهزة فحص الآليات الثقيلة	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**Brief discretion**

Thorough Study for the Functions, Operation and also The Purpose of the maintenance ,overall and rebuilt of the power unit (which consist of the engine and the transmission) to evaluate and judging on the effective of the process, by use the dynamometer with the scanning and measurement devices.

**Course Objectives:**

By the end of this course students are expected to be able to:

-At the end of this course, students will be able to:

- to learn the right way of hocking the engine on the dynamometer and scanning Control devices
- to evaluates and judges on the engine if it passes the test of the loading engagement on the dynamometer by using the right tools.
- to evaluates and judges on the transmission if it passes the test of the loading engagement on the dynamometer by using the right tools.
- To enable the student to appreciate the reason for the different sub-systems and how they are integrated.
- To understand how all the information gathering up to evaluate the unit.
- To enable the student to interpret faults correctly when fault finding.
- To teach the student the role of the testing before assembling.

Unit	workshops Name	Unit Content	time needed
١	Data receiving from the dynamometer	<ul style="list-style-type: none"> <li>what is dynamometer, description and theory.</li> <li>what reading should we get</li> <li>Computer interface unit</li> <li>Signal interconnections</li> <li>Control Data</li> <li>Display Data</li> <li>Power supply distribution</li> </ul> System protection	
٢	Auxiliary system	<ul style="list-style-type: none"> <li>cooling system</li> <li>ventilation system</li> <li>breaking power system</li> </ul> electric systems	
٣	Sensor Subsystem and scanning devices	<ul style="list-style-type: none"> <li>Meteorological data</li> <li>Sensor of vehicle moving</li> <li>scanning devices</li> </ul> spatial tool and Control units	

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methods:**

- \_ lecture
- \_ workshop

**Books and references:****Textbook:****References:**

USA ARMY,  
TANK MANUL·USA ARMY  
technical manual

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204232	Course Number
مشغل تقييم الآليات ودراسة فعاليتها	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**Brief Description**

Inspection and adjustment for military vehicle systems in addition to practical application on all subjects studied theoretically for the evaluating to the work done by the driver and the technician

**Course Objectives:**

Upon the completion of the course, the student will be able to:

- Testing and fault diagnosis procedures for wrong maintenance.
- To study the layouts of right procedures for good maintenance
- Identification of wrong records of the vehicle comparing to the real procedures done in fact.
- making sure regulations periodical maintenance that been done in time
- estimating the liquids life by using devices and comparing it to schematic diagrams
- knowing the working life of the parts and substance and if they been change on time.

Unit	workshops Name	Unit Content	time needed
١	periodical maintenance.	<ul style="list-style-type: none"> <li>- daily maintenance</li> <li>- monthly maintenance</li> <li>- semiannually maintenance</li> <li>- annually maintenance</li> </ul>	
٢	inspection in periodical maintenance	<ul style="list-style-type: none"> <li>- Electric Power system checkup</li> <li>- mechanical system checkup</li> <li>- Fault finding and diagnosis</li> <li>-Removal and replacement schedule of part</li> </ul>	
٣	Liquids and parts inspection	<ul style="list-style-type: none"> <li>- testing liquids life in laps</li> <li>- Measuring parts life by devices due to wearing and corruption</li> <li>-Fault finding and diagnosis</li> </ul>	

## Evaluation method:-

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methods:

-workshpos

-Laboratory

## Text Books &amp; References:

Textbook:

## References:

UK ARMY periodical maintenance inspection sheets,412,413,415

US Army periodical maintenance inspection sheets,412,413,415

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
020204242	Course Number
مشغل أنظمة النقل للآليات الثقيلة	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**brief Description:-**

Practicing on transmission systems for different types of heavy duty vehicles (tanks): disassembling the transmission units and assembling it back, troubleshooting & repairs, applying preventive maintenance.

**Course Objectives:**

By the end of this course students are expected to be able to:

1. troubleshooting of transmission hydraulic system of heavy vehicles
2. Hydraulic fluid types used in system
3. hydraulic clutch troubleshooting
4. troubleshooting four wheel driving mode and axes engagement

For (For M88 , M109,M108 , cheaften ,M113A3 vehicles ) heavy vehicle



Unit	workshops Name	Unit Content	time needed
١	Torque transmission	-Torque converter removal and replace -Torque converter troubleshooting For M88 , M109,M108 , cheaften ,M113A3 vehicles	
٢	Hydraulic fluid	Hydraulic fluid refill and examine	
٣	Hydraulic circuit chart	Hydraulic system circuit following	
٤	Hydraulic machines	Hydraulic pumps (removing , assembling , trouble shooting )	
٥	Hydraulic actuators	Wet clutch examining and troubleshooting and assembling	

**Evaluation method:-**

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

**Teaching Methods:**

-lab .

**Books and references:****Text Books & References:****Textbook:**

1. TM92350253-20P

**References:**

1. AESP2350-p-100-302/522/523

2. TM92300-257-35

3. TM92350253-20P

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
٠٢٠٢٠٤٢٤٣	Course Number
مشغل أنظمة التعليق للآليات الثقيلة	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**Brief Description:**

Practicing on suspension systems for different types of heavy duty vehicles (tanks):  
applying preventive maintenance, disassembling the different components of suspension units  
and assembling it back, charging with Nitrogen and oil troubleshooting & repairs, applying.

**Course Objectives:**

By the end of this course students are expected to be able to:

1. troubleshooting of suspension system of heavy vehicles
2. calibrating of suspension system of heavy vehicles
3. assembling and dis assembling of suspension system and suspension hydraulic systems
5. Hydraulic fluid types used in system (oil, grease ,gas )
6. final drive train inspection

For (For M88 , M109,M108 , cheaften ,M113A3 vehicles ) heavy vehicle

Unit	Workshops Name	Workshop Content	time needed
١	Hydraulic fluid	Hydraulic fluid refill and examine	
٢	Suspension system	Suspension system( calibrating, removing , assembling )	
٣	Hydraulic machines Used in suspension system	Hydraulic pumps and compressor (removing , assembling , trouble shooting )	
٤	Mechanical suspension system	Examine suspension system Replace suspension system	
٥	Hydraulic suspension system	Examine suspension system Examine Oil and gas leakage Testing valves	
٦	Automatic inflating system	Troubleshoot of automatic inflating system	

## Evaluation method:-

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methods:

-lab .

## Books and references:

## Text Books &amp; References:

## Textbook:

1. TM92350253-20P

## References:

1. AESP2350-p-100-302/522/523

2. TM92300-257-35

3. TM92350253-20P

البرنامج الهندسي	
ميكانيك المركبات الثقيلة	Specialty
٠٢٠٢٠٤١١٢	Course Number
مشغل الأنظمة الكهربائية في الآليات الثقيلة	Course Title
(١)	Credit Hours
(٠)	Theoretical Hours
(٣)	Practical Hours

**Brief Course Description:**

-applying ,troubleshooting and examining of battery, starting system, charging system, air heating system, electronic fuel injection system, lights, safety and signaling, driver information and control devises, wiring harnesses, instrument panel,

**Course Objectives:**

1. diagnose and define battery system faults .
2. testing voltage, current and resistance and explain how they are related.
3. troubleshoot of charging system
4. troubleshoot stating, charging, fuel injection, and electronics system.
- 6- troubleshoot lighting system
- 6 replacing the ECM

Unit	Workshops Name	Workshop Content	time needed
١	Battery Testing Service	<ul style="list-style-type: none"> <li>-Battery construction</li> <li>-Analyzing Battery</li> <li>-Open circuit voltage test</li> <li>-Hydrometer test</li> <li>-Specific gravity</li> <li>-Charging – Indicator</li> <li>-Battery load test</li> </ul>	
٢	Starting system service	<ul style="list-style-type: none"> <li>-Cranking voltage test</li> <li>-Voltage prop test</li> <li>-Current Draw test</li> <li>-Starting motor Bench tests</li> <li>-No – load test</li> <li>-Removing and Installing starting motor</li> <li>-Servicing starting motor</li> </ul>	
٣	Lights, Safety ,and Signaling, Driver Information, and control devices	<ul style="list-style-type: none"> <li>-Testing the light bulbs and service</li> <li>-Testing horn and horn relay and service</li> <li>-Testing security system and service</li> <li>-Testing, seat belts, air bags and service</li> <li>-Testing wind shield wipers and washers and service</li> <li>-Testing Instrument band and service</li> <li>-Networks and multiplexing testing and service</li> <li>-Testing other electrical and electronic devices</li> </ul>	
٤	Electronic fuel injection service	<ul style="list-style-type: none"> <li>-Fuel Injection trouble</li> <li>-Checking fuel injection</li> <li>-Testing fuel pump and capacity and pressure</li> <li>-Testing fuel pressure regulator</li> <li>-Testing fuel injectors</li> <li>-Malfunction – Indicator light</li> <li>-Sensor diagnosis</li> <li>-ECM diagnosis</li> <li>-Air and fuel filter service</li> <li>-Electric fuel pump service</li> <li>-Cleaning and service fuel injectors</li> <li>-Cleaning throttle- body and injector service</li> </ul>	
٥	Air heating system	<ul style="list-style-type: none"> <li>Testing air heaters</li> <li>- Air heater sensor testing</li> </ul>	

## Evaluation method:-

Exams		Percentage	
	mid	40%	--/--/----
	final	50%	--/--/----
Homework and Projects		10%	--/--/----
Discussions and lecture Presentations			

## Teaching Methodology:

-Lectures and presentations

## Text Books &amp; References:

## Textbook:

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. Crouce and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.
4. Tm9-8000
5. Us Army technical manuals
6. كراسة الأنظمة الكهربائية، إعداد المهندس صلاح مصلح المعاني كلية الأمير الحسين بن عبد الله الثاني الفنية العسكرية