



كلية الهندسة التكنولوجية



جامعة البلقاء التطبيقية

الخطط الدراسية لبرنامج الشهادة

الجامعية المتوسطة

تخصص تكنولوجيا الإنتاج

2008/2009

جامعة البلقاء التطبيقية

كلية
الهندسة
التكنولوجية

بإشرافه عميد الكلية الأستاذ الدكتور قاسم جابر



Curriculum for Associate Degree Program in Production Technology Specialization

The curriculum of associate degree in “Production Technology” specialization consists of (72 credit hours) as follows:

Serial No.	Requirements	Credit Hours
First	University Requirements	12
Second	Engineering Program Requirements	17
Third	Specialization Requirements	43
Total		72



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

**The curriculum of associate degree
in
Production Technology Specialization**

First: University requirements (12 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
22001101	Arabic Language	3	3	-	
22002101	English Language	3	3	-	
21901100	Islamic Culture	3	3	-	
21702101	Computer Skills	3	1	4	
Total		12	10	4	

Second: Engineering program requirements (17 credit hours) as follow:

Course No	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20201111	Engineering Workshops	1	-	3	-
20204111	AutoCAD	2	-	6	-
20506111	Occupational Safety	2	2	-	-
21301111	General Mathematics	3	2	2	-
21302111	General Physics	3	2	2	-
21302112	General Physics Laboratory	1	-	3	-
21702111	Communication Skills and Technical Writing	3	2	2	22002101
20201121	Engineering Materials	2	2	-	-
Total		17	10	18	



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Third: Specialization Requirements (43 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20301111	Electricity and Electronics	2	2	0	21302111*
20301112	Electricity and electronics Laboratory	1	0	3	20301113*
20207121	Mechanics	3	3	0	21302111
20204121	Strength of Materials	2	2	0	20207121
20204122	Strength of Materials Laboratory	1	0	3	20204121*
20207111	Fluids and Hydraulic Machines	3	3		21302111*
20207112	Fluids and Hydraulic Machines Laboratory	1	0	3	20207111*
20209111	Thermal Engineering	3	3	0	21302111*
20209112	Thermal Engineering Laboratory	1	0	3	20209111*
20204211	Mechanical Drawing	2	0	6	20204111
20201231	Theory of Machines	2	2	0	20207121
20201232	Theory of Machines Laboratory	1	0	3	20201231*
20203211	Welding Technology	2	2	0	
20203212	Welding Technology Workshops	1	0	3	20203211*
20201241	Forming Technology	2	2	0	
20201242	Forming Technology Workshops	1	0	3	20201241*
20201251	Machining Technology	3	3	0	
20201252	Machining Technology Workshops	1	0	3	20201251*
20201261	CNC Workshops	2	0	6	20201251*
20201271	Metallurgical Heat Treatment	2	2	0	20209111
20201272	Metallurgical Heat Treatment Laboratory	1	0	3	20201271*
20201291	Training**	3	0	-	-
20201292	Project	3	0	-	-
Total		43	24		

*-Co-requisite

** Equivalent to 280 training hours

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Guiding Plan

First Year					
First Semester			Second Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
22001101	Arabic Language	3	20209111	Thermal engineering	3
21302111	General Physics	3	20209112	Thermal Engineering Lab	1
			22002101	English Language	3
21702101	Computer Skills	3	20207121	Mechanics	3
21301111	General Mathematics	3	20204111	AutoCAD	2
20201111	Engineering Workshops	1	20506111	Occupational Safety	2
21901100	Islamic Culture	3	20207111	Fluids and Hydraulic Machines	3
20201121	Engineering Materials	2	20207112	Fluids and Hydraulic Machines Lab.	1
Total		18	Total		18

Second Year					
Third Semester			Fourth Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
20204211	Mechanical Drawing	2	20201251	Machining Technology	3
20204121	Strength of Materials	2	20201252	Machining Technology workshops	1
20204212	Strength of Materials Lab.	1	20201261	CNC Workshops	2
20203211	Welding Technology	2	20201291	Training	3
20203212	Welding Technology Workshops	1	20201292	Project	3
20201241	Forming Technology	2	20201231	Theory of Machines	2
20201242	Forming Technology Workshops	1	20201232	Theory of Machines Lab.	1
20201271	Metallurgical Heat Treatment	2	21702111	Communication Skills and Technical Writing	3
20201272	Metallurgical Heat Treatment Lab.	1			
21302112	General Physics Lab	1			
20301111	Electricity and Electronics	2			
20301112	Electricity and electronics Lab	1			
Total		18	Total		18

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description

University Requirements

Course Title	Course No	Credit Hours (Theoretical /Practical)
Arabic Language	22001101	3 (3-0)
<p>تتضمن هذه المادة مجموعة من المهارات اللغوية بمستوياتها وأنظمتها المختلفة: الصوتية، والصرفية، والنحوية، والبلاغية، والمعجمية، والتعبيرية، وتشتمل نماذج من النصوص المشرفة: قرآنية، وشعرية، وقصصية، من بينها نماذج من الأدب الأردني؛ يتوخى من قراءتها وتدقيقها وتحليلها تحليلاً أدبياً؛ تنمية الذوق الجمالي لدى الطلاب الدارسين.</p>		
English Language	22002101	3 (3-0)
<p>English 1 is a general course. It covers the syllabuses of listening, speaking, reading, writing, pronunciation and grammar, which are provided in a communicative context. The course is designed for foreign learners of the English language, who have had more than one year of English language study. The extension part would be dealt with in the class situation following the individual differences.</p>		
Islamic Culture	21901100	3 (3-0)
<ol style="list-style-type: none"> 1. تعريف الثقافة الإسلامية وبيان معانيها وموضوعاتها والنظم المتعلقة بها - وظائفها وأهدافها. 2. مصادر ومقومات الثقافة الإسلامية والأركان والأسس التي تقوم عليها. 3. خصائص الثقافة الإسلامية. 4. الإسلام والعلم، والعلاقة بين العلم والإيمان 5. التحديات التي تواجه الثقافة الإسلامية. 6. رد الشبهات التي تثار حول الإسلام. 7. الأخلاق الإسلامية والآداب الشرعية في إطار الثقافة الإسلامية. 8. النظم الإسلامية. 		
Computer Skills	21702101	3 (1-4)
<p>An introduction to computing and the broad field of information technology is given. Topics covered include the basic structure of digital computer system, microcomputer, operating systems, application software, data communication and networks, and the internet. Hands-on learning emphasizes Windows xp, MS-office2000, and the internet.</p>		

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Engineering Program requirements

Engineering Workshops	20201111	1 (0-3)
Development of basic manual skills in Mechanical and Electrical works. Use of manual tools and measuring devices. Hand filing, welding, metal cutting and forming. Electrical wiring.		
AutoCAD	20204111	2 (0-6)
Introduction to AutoCAD, application of AutoCAD, commands, geometric entities. Geometric construction. Dimensioning, free –hand sketching, object representation, orthographic drawing and projections.		
Occupational safety	20506111	2 (2-0)
Role of technicians in economic development First aid accident prevention. Protective devices and equipment. Industrial safety standards. Nature of fire hazards. Sand fire regulations. Physiological effects of electrical shock on human body. First aid and treatment for the effects of electric shock. Rules of spare and chemicals storage and handing.		
Communication Skills and Technical Writing	21702111	3 (2-2)
The main goal of this course is to equip the students with the necessary communication skills in everyday life & work situations and improve their abilities in technical writing to meet market needs. For this course, the English language is the language of teaching & the means of communication for all classroom situations.		
Engineering Materials	20201121	2 (2-0)
Definition of engineering materials. Classification of materials and their properties. Metallic and non-metallic materials. Metals, alloys and composite materials. Conductors, insulators and semiconductors. Mechanical, Magnetic, Thermal and electrical characteristics of materials. Industrial applications of different types of materials.		
General Mathematics	21301111	3 (2-2)
Real numbers coordinate planes, lines, distance and circles. Functions: (operations and graphs on functions), limits, continuity, limits and continuity of trigonometric functions. Exponential and logarithmic functions. Differentiation (techniques of differentiation, chain rule, implicit differentiation). Application of differentiation (increase, decrease, concavity). Graphs of polynomials. Applications: Rolle's Theorem and Mean-Value Theorem, Integration (by substitution, definite integral, fundamental theorem of Calculus). Application of definite integral (area between two curves, volumes)		
General Physics	21302111	3 (2-2)
The physical concepts to be studied includes: vectors, motion in one dimension, motion in two dimensions, the laws of motion, applications of Newton's laws, circular motion, energy and energy transfer, potential energy, linear momentum, electricity, electrical potential, capacitance, current and resistance .		
General Physics lab	21302112	1 (0-3)

In this course, the student performs thirteen experiments in mechanics and in electricity.

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Specialization Requirements

Electricity and Electronics	20301111	2 (2-0)
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.		
Electricity and Electronics Lab.	20301112	1 (0-3)
DC and AC circuits. Current and voltage measurements. Simple electronic circuits. DC and AC machines. Single-phase transformers. Protection devices and circuits.		
Mechanics	20207121	3 (3-0)
Basic definitions and concepts. SI units. Equilibrium. Free body diagrams. Simple structural analysis. Internal forces. Friction. Moment of inertia. Kinematics of particles.		
Strength of Materials	20204121	2 (2-0)
Principles of static including equilibrium and static equivalence, determination of moment and force resultants in slender members, introduction to mechanics of deformable bodies, concept of stress and strain, classification of material behavior, stress-strain relations and generalized Hook's law, application to engineering problems involving members under axial load, torsion of circular rods and tubes, bending and shear stress in beams ,combine stresses , deflection of beams, buckling of columns.		
Strength of Materials Lab.	20204122	1 (0-3)
Applying theory gained within the strength of materials theoretical through practical experimentation.		
Fluids and Hydraulic Machines	20207111	3 (3-0)
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.		
Fluids and Hydraulic Machines Lab.	20207112	1 (0-3)
Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoullis equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.		
Thermal Engineering	20209111	3 (3-0)
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		

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Thermal Engineering Lab.	20209112	1 (0-3)
Pressure – Temperature relation in the saturation region; Compressor cycles and analyses; Heat pump performance; Conduction heat transfer; Radiation heat transfer; and Heat exchanger performance		
Mechanical Drawing	20204211	2 (0-6)
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 modeling.		
Theory of Machines	20201231	2 (2-0)
Introduction, linkages and mechanisms, cams, spur gears, .nonstandard spur gears, bevel, helical and worm gears, gear trains, velocity and acceleration analysis, force analysis of machinery, Blanca of machinery introduction to synthesis, governors, special mechanisms and robotics		
Theory of Machines Lab.	20201232	1 (0-3)
This course give the student an opportunity to apply the theory gained within the theory of machines theoretical course through practical experimentation. Balancing motion transmission through mechanisms .speed changing.		
Welding Technology	20203211	2 (2-0)
This course introduces the student to the different systems of welding to acquire the necessary skills to be a welding supervisor. It also familiarizes the student with the most important procedures for welding inspection.		
Welding Technology Workshops	20203212	1 (0-3)
Application of welding techniques. Including safety, shop practicing for different welding methods, inspections of welding defects.		
Forming Technology	20201241	2 (2-0)
This course covers the basics of major of forming processes used in manufacturing. Topics include forming metal casting, extrusion, rolling, forging, sheet metal forming and wire and pipe drawing.		
Forming Technology Workshops	20201242	1 (0-3)
Practicing forming processes (hot and cold working processes) and analyzing structure and properties of metals and alloys, providing casting processes, cold rolling, pressing, bending, and shearing process.		

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Machining Technology	20201251	3 (3-0)
This course will resume the study of machining principles with an emphasis on the mechanics of chip formation and cutting forces. Cutting tool material and its geometry, Machinability and the factors that influence tool life, surface integrity and machining power.		
Machining Technology workshops	20201252	1 (0-3)
Operating different kinds of machine tools(Drilling, Turning, Milling, Grinding) safely and be able to trouble shoot machining problems as they arise.		
CNC Workshops	20201261	2 (0-6)
This course is designed to develop the student's ability in the programming, set-up, and operation of Computerized Numerical Control machine tools as well as construct and execute basic operation programs.		
Metallurgical Heat Treatment	20201271	2 (2-0)
Property change due to heat treatment. Iron-carbon system. Surface hardening. Powder metallurgy, metal surface treatment. Composite materials. Electro plating. Chemical and mechanical treatment of ferrous materials and alloys. Destructive and non-destructive evaluation.		
Metallurgical Heat Treatment Lab.	20201272	1 (0-3)
Preparation of specimen: Microscopic inspection, Cooling curves and phase diagrams, Corrosion rate measurement. Materials structure analysis. Surface-hardening. Electro plating processes. Iron-carbon system. Heat treatment and tests. Preparation and using of powders and composites.		
Training	20201291	3 (280 training hours)
Equivalent to (280 hours) of field training targeted to emphasize the ability of students to apply the theories in the real world of the profession.		
Project	20201292	3
An integrated assembly/design practical work related to the major fields of study.		





Engineering Program

Specialty	Manufacturing, Production Technology
Course Number	20201261
Course Title	CNC Workshops
Credit Hours	2
Theoretical Hours	0
Practical Hours	6



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ This course is designed to develop the student's ability in the programming, set-up, and operation of Computerized Numerical Control machine tools as well as construct and execute basic operation programs.

Course Objectives:

This course aims to:

1. Explain the basic concepts of CNC and describes its historical development.
2. Compare between the conventional machines and CNC machines.
3. Explain practically the CNC preparatory, miscellaneous, and technological commands for turning and milling machines.
4. Explain practically the procedures for constructing and executing CNC programs.
5. Execute applied projects involving the construction and execution of various basic operating programs on CNC turning and milling machines.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction	<ul style="list-style-type: none"> ▪ Introducing the computer numerical control (CNC) systems and their historical development ▪ Programmable automated versus fixed automated machines ▪ Comparing numerical control (NC), computer numerical control (CNC), and direct numerical control (DNC) machines ▪ Conventional versus CNC machines 	
2.	The coordinate systems Cartesian coordinate system (X,Y,Z)	<ul style="list-style-type: none"> ▪ Polar coordinate system ▪ Degrees of freedom and their dependency on the coordinate systems ▪ Motion directions (right-hand rule) ▪ Types of movements (positional, linear, continuous) ▪ Manual movement of axes and with Jog step and Teach In ▪ Various zero points of CNC turning and milling machines 	
3.	The basic CNC commands	<ul style="list-style-type: none"> ▪ Preparatory words (G-functions) <ul style="list-style-type: none"> - Milling: G0, G1, G2, G3, F17, G18, G51, G52, G90, G91, G40- - G44, F98, F99 - Turning: G00, G01, G02, G03, G96, G94, G95, G92, G53, - G59 	

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		<ul style="list-style-type: none"> ▪ Miscellaneous words (M-functions) <ul style="list-style-type: none"> - Milling: M3, M4, M5, M6, M8, M9, M30, M66 - Turning: M03, M04, M05, M08, M30 - Technological words: F, S, T 	
4.	Construction and execution of CNC programs	<ul style="list-style-type: none"> ▪ Determination of the following on the working drawing: specifications of cutting tool, operating conditions (feed rate, cutting speed), fixture tools ▪ Development the operating program and entering it into the computer for simulation purposes using available software like Mastercam, Walli etc. ▪ Transferring the program as well as tool and operating data from the computer to the machine ▪ Program simulation on the machine without tool ▪ Actual operating program 	
5.	Applied projects	<ul style="list-style-type: none"> ▪ Execution of practical exercises involving the construction and miscellaneous execution of basic and programs on the CNC turning and milling machines 	





Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	--/------
	Midterm Exam	20%	--/------
	Final Exam	50%	--/------

Teaching Methodology:

- ❖ Workshops

Text Books & References:

Textbook:

1. "Computer Numerical control of machine tools", Thyer, G., E.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20301111
Course Title	Electricity and Electronics
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

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	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Sine wave voltage. Main characteristics of sine waves. Single-phase and three-phase circuits. Basic calculations. Power factor. 	4
3.	Transformers	<ul style="list-style-type: none"> Basic construction and principle operation of single-phase transformer. Basic relationships between primary and secondary windings. 	2
4.	Electrical machines	<ul style="list-style-type: none"> 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
5.	Semiconductor devices	<ul style="list-style-type: none"> Diodes and transistors. Main characteristics, symbols. Basic applications. 	4
6.	Control and protection devices	<ul style="list-style-type: none"> Switches, relays, circuit breakers, electromagnetic, thermal and bi-metallic contactors. Ratings, applications, symbols, basic principle of operation. 	4

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Assignments	10%	--/--/----
	Final Exam	50%	--/--/----

Teaching Methodology:

- ❖ Lecture and presentations

Text Books & References:**Textbook:**

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Engineering Program

Specialization	Common
Course Number	20301112
Course Title	Electrical Engineering Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



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:

Lab Number	Lab Name	Lab Content	Time Needed
1.	Series and parallel DC circuits	<ul style="list-style-type: none"> Current and voltage measurements. Voltage and current dividers 	
2.	Power measurements in DC circuits	<ul style="list-style-type: none"> To check “the of conservation of energy” 	
3.	AC circuits	<ul style="list-style-type: none"> Use oscilloscope and measuring devices to determine and measure the main features of sine waves 	
4.	Transformer	<ul style="list-style-type: none"> Study the relationships between primary and secondary windings 	
5.	DC machines	<ul style="list-style-type: none"> Characteristics of DC motors and generators 	
6.	Three-phase induction motor	<ul style="list-style-type: none"> Study the characteristics of three-phase induction motors 	
7.	Electronic devices	<ul style="list-style-type: none"> Investigate the characteristics of diodes and transistors. Build simple rectification circuits 	
8.	Control and protection devices	<ul style="list-style-type: none"> Construct and test simple circuits to demonstrate the operation of control and protection devices 	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Med term	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

- Laboratory

Text Books & References:

Instructional Lab. Sheets

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Engineering Program

Specialization	Common
Course Number	20207111
Course Title	Fluids and Hydraulic Machines
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

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	<ul style="list-style-type: none"> ▪ Introduction ▪ Units of measurement ▪ Fluid physical properties, Density, specific weight, viscosity, surface tension, compressibility 	
2.	Hydrostatics	<ul style="list-style-type: none"> ▪ 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 	
3.	Equilibrium of Floating Bodies	<ul style="list-style-type: none"> ▪ Archimedes principle ▪ Metacenter and metacentric height ▪ Condition of Equilibrium ▪ Oscillation of floating body 	
4.	Fluid Flow Concept	<ul style="list-style-type: none"> ▪ 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 	
5.	Flow through pipes	<ul style="list-style-type: none"> ▪ 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 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none">▪ Pumps performance and characteristics curves▪ Power and efficiency calculations	
6.	Pumps	<ul style="list-style-type: none">▪ Types of Pumps, Principle of operation▪ Pump power and efficiency▪ Net positive section head▪ Reciprocating pumps: Construction, reducing flow fluctuations	
7.	Compressors	<ul style="list-style-type: none">▪ Types of Air compressors▪ Reciprocating compressors▪ Centrifugal compressors	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homeworks and quizzes		10%	

Teaching Methodology:

1. Lectures
2. Power point presentations
3. Discussion

Text Books & 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.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20207112
Course Title	Fluids and Hydraulic machines Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

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 venturi 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 venturi).
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 Course Description:

Lab Number	Lab Name	Lab Content	Time Needed
1.	Density and viscosity measurements		1
2.	Force of pressure on immersed plate		1
3.	Demonstrating of Bernoulli's equation		1
4.	Flow rate measurements (flow through orifice and venture)		1
5.	Energy loss and friction coefficient measurements		1
6.	Head loss in smooth and rough pipes		1
7.	Pipe flow, Reynolds number, laminar and turbulent flow in pipes		1
8.	Flow over notches and Weirs		1
9.	Pump Testing in Series		1
10.	Reciprocating pump performance		1
11.	Gear pump efficiency		1
12.	Performance of Reciprocation air compressor		1
13.	Centrifugal Pump Testing		1

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

2. Laboratory

Text Books & References:

Instructional Lab. Sheets



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Manufacturing, Production Technology
Course Number	20201241
Course Title	Forming Technology
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ This course covers the basics of major of forming processes used in manufacturing. Topics include forming metal casting, extrusion, rolling, forging, sheet metal forming and wire and pipe drawing.

Course Objectives:

This course aims at:

1. Understand the basics of forming processes to be able to select the proper technique to manufacture a certain product.
2. Control the performance of the specified forming process and product quality as a result of the concepts and hypotheses that gained after performing sets of experiments and studies regarding the variables and factors affecting each of the forming processes.
3. Understand the most important and various forming processes of plastics and study these processes for their importance in industry.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Metal casting	<ul style="list-style-type: none"> ▪ Technical terminology of casting technology, Melting and pouring, Consumable casting, Permanent mold 	
2.	Primary techniques for metal forming	<ul style="list-style-type: none"> ▪ Rolling ▪ Forging ▪ Extrusion ▪ Wire and pipe drawing 	
3.	Sheet metal working	<ul style="list-style-type: none"> ▪ Principles and basics of shearing ▪ Shearing processes ▪ Bending processes ▪ Deep drawing 	
4.	Presses	<ul style="list-style-type: none"> ▪ Elements and accessories of presses ▪ Types of presses 	
5.	Powder metallurgy	<ul style="list-style-type: none"> ▪ Fundamentals of powder metallurgy ▪ Products of powder metallurgy ▪ Powder manufacturing ▪ Testing and evaluation of powders ▪ Mixing and blending of powders ▪ Types of patterns 	
6.	Plastic processing	<ul style="list-style-type: none"> ▪ Compact and compression molding ▪ Injection ▪ Blow molding ▪ Extrusion ▪ Foams ▪ Material selection ▪ Classification of plastics 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/------
	Second Exam	20%	--/------
	Final Exam	50%	--/------
Homework and Projects		10%	

Teaching Methodology:

- ❖ Lectures

Text Books & References:

Textbook:

1. "Material and processes in manufacturing, Paul Degarmo.
2. Introduction to Manufacturing Process, John A. Schey.
3. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
4. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.

References:

1. Material and processes in manufacturing, Paul Degarmo.
2. Introduction to Manufacturing Process, John A. Schey.
3. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
4. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Manufacturing, Production Technology
Course Number	20201242
Course Title	Forming Technology Workshop
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Practicing forming processes (hot and cold working processes) and analyzing structure and properties of metals and alloys, providing casting processes, cold rolling, pressing, bending, and shearing process.

Course Objectives:

This course aims at:

1. Understand the basics of forming processes to be able to select the proper technique to manufacture a certain product.
2. Control the performance of the specified forming process and product quality as a result of the concepts and hypotheses that gained after performing sets of experiments and studies regarding the variables and factors affecting each of the forming processes.
3. Understand the most important and various forming processes of plastics and study these processes for their importance in industry.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Metal casting	<ul style="list-style-type: none"> ▪ Sand casting ▪ Permanent mold 	
2.	Extrusion of Metals	<ul style="list-style-type: none"> ▪ Equipment and tools ▪ Material selection Extrusion parameters (force and speed) ▪ Process evaluation 	
3.	Deep drawing of Metals	<ul style="list-style-type: none"> ▪ Equipment and tools ▪ Preparation of raw material ▪ Drawing punches and dies ▪ Forces and speed of drawing ▪ Lubrication ▪ Factors affecting the product quality 	
4.	Injection of plastics	<ul style="list-style-type: none"> ▪ Equipment and tools ▪ Material selection ▪ Injection mold ▪ Process parameters (temp. and pressure) 	
5.	Sheet metal working	<ul style="list-style-type: none"> ▪ Principles and basics of shearing ▪ Shearing processes ▪ Bending processes ▪ Deep drawing 	
6.	Compact molding of plastic	<ul style="list-style-type: none"> ▪ Equipment and tools ▪ Material selection ▪ Process parameters 	
7.	Thermoforming of plastics	<ul style="list-style-type: none"> ▪ Equipment and tools ▪ Preparation of plastic sheets ▪ Process parameters ▪ Product quality 	
8.	Extrusion of plastics	<ul style="list-style-type: none"> ▪ Extrusion machine (extruder) ▪ Heating of plastics ▪ Processes variables ▪ Process evaluation 	
9.	Blow molding of plastics	<ul style="list-style-type: none"> ▪ Equipment and tools ▪ Process variables ▪ Product quality 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

10.	Piercing and blanking	<ul style="list-style-type: none">▪ Shearing processes▪ Shearing punches and dies selection▪ Shearing forces▪ Equipment and tools▪ Operating factors	
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Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	--/--/----
	Midterm Exam	20%	--/--/----
	Final Exam	50%	--/--/----

Teaching Methodology:

- ❖ Workshops

Text Books & References:

Textbook:

1. Technology of production and workshops”, Shapman, part I.
2. Workshop technology by W. A. J. Chapion.
3. Material and processes in manufacturing, Paul Degarmo.
4. Introduction to Manufacturing Process, John A. Schey.
5. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
6. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.

References:

1. Technology of production and workshops”, Shapman, part I.
2. Workshop technology by W. A. J. Chapion.
3. Material and processes in manufacturing, Paul Degarmo.
4. Introduction to Manufacturing Process, John A. Schey.
5. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
6. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Manufacturing, Production Technology
Course Number	20201251
Course Title	Machining Technology
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ This course will resume the study of machining principles with an emphasis on the mechanics of chip formation and cutting forces. Cutting tool material and its geometry, Machinability and the factors that influence tool life, surface integrity and machining power.

Course Objectives:

This course aims at:

1. Determine suitable operating conditions for various cutting processes.
2. Operate and control the cutting machines properly.
3. Plan for products and determine the required manufacturing phases.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Cutting theory		
2.	Cutting tools	<ul style="list-style-type: none"> ▪ Cutting tool materials ▪ Cutting tools geometry ▪ Cutting forces 	
3.	Cutting forces Drilling	<ul style="list-style-type: none"> ▪ Cutting tools ▪ Cutting variables (feed rate, cutting depth, cutting speed, rotation speed) ▪ Cutting time 	
4.	Turning	<ul style="list-style-type: none"> ▪ Cutting tools ▪ Cutting variables (feed rate, cutting depth, cutting speed, rotation speed) ▪ Cutting time 	
5.	Milling	<ul style="list-style-type: none"> ▪ Cutting tools ▪ Cutting variables (feed rate, cutting depth, cutting speed, rotation speed) ▪ Cutting time 	
6.	Grinding	<ul style="list-style-type: none"> ▪ Abrasives ▪ Grinding wheels (materials, mounting) ▪ Grinding processes 	
7.	Cooling	<ul style="list-style-type: none"> ▪ Distribution of heat ▪ Cooling fluids ▪ Cooling methods 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and Projects		10%	

Teaching Methodology:

- ❖ Lectures

Text Books & References:

Textbook:

1. Material and processes in manufacturing, Paul Degarmo.
2. Introduction to Manufacturing Process, John A. Schey.
3. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
4. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.

References:

1. Material and processes in manufacturing, Paul Degarmo.
2. Introduction to Manufacturing Process, John A. Schey.
3. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
4. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialty	Manufacturing, Production Technology-MPT
Course Number	20201252
Course Title	Machining Technology Workshop
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Operating different kinds of machine tools(Drilling, Turning, Milling, Grinding) safely and be able to trouble shoot machining problems as they arise.

Course Objectives:

This course aims at:

1. Determine suitable operating conditions for various cutting processes.
2. Operate and control the cutting machines properly.
3. Plan for products and determine the required manufacturing phases.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Drilling	<ul style="list-style-type: none"> ▪ Types and mounting of twist drills ▪ Sharpening of twist drills ▪ Reaming ▪ Principles of safety for drilling processes 	
2.	Turning	<ul style="list-style-type: none"> ▪ Different types of lathes and their components ▪ Cutting tools ▪ Mounting of work pieces on lathes Longitudinal, face, and internal turning ▪ Taper turning ▪ Internal and external thread cutting ▪ Eccentric Turning 	
3.	Milling	<ul style="list-style-type: none"> ▪ Different types of milling machines and their components. ▪ Milling cutting tools (milling cutters) and their uses ▪ Mounting and of milling cutters. ▪ Manufacturing of flat surfaces of specified dimensions ▪ Grooving ▪ Using dividing tool ▪ Gear cutting 	
4.	Grinding	<ul style="list-style-type: none"> ▪ Grinding wheels ▪ Mounting arrangements ▪ Grinding of flat surfaces ▪ External grinding of cylindrical surfaces ▪ Internal grinding of cylindrical surfaces 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports Exam	30%	
	Midterm Exam	20%	
	Final Exam	50%	

Teaching Methodology:

- ❖ Workshops

Text Books & References:

Textbook:

1. "Technology of production and workshops", Shapman, part I.
2. Workshop technology by W. A. J. Chapion.
3. Material and processes in manufacturing, Paul Degarmo.
4. Introduction to Manufacturing Process, John A. Schey.
5. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
6. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.

References:

1. Technology of production and workshops", Shapman, part I.
2. Workshop technology by W. A. J. Chapion.
3. Material and processes in manufacturing, Paul Degarmo.
4. Introduction to Manufacturing Process, John A. Schey.
5. Manufacturing Engineering and Technology, Kalpakjian S., 5th edition, Prentice Hall 2005.
6. The Science and Engineering of materials, Askeland, D.R., 5th edition, Thomson 2006.



Engineering Program

Specialization	Common
Course Number	20204211
Course Title	Mechanical Drawing
Credit Hours	2
Theoretical Hours	0
Practical Hours	6



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

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PART II – 3D Design (Solid Works)

1. User Interface:

1. Part
2. Assembly
3. Drawing
4. Tool Bars
5. Design Library
6. Materials
7. lights
8. Drawing Planes
9. Exercises

2. Sketch

1. Line
2. Rectangle
3. Parallelogram
4. Polygon
5. Circle, Perimeter Circle
6. Ellipse, Partial Ellipse
7. Arc (Centerpoint Arc, Tangent Arc, 3 Point Arc)
8. Parabola
9. Centreline



10. Point
- 11 . Exercises

2. Modifying Objects

1. Fillet
2. Chamfer (Distances, Distance and Angle)
3. Offset (Add dimensions, Reverse, Select chain, Bi-directional)
4. Trim (Trim to Closest, Trim away outside, Trim away inside, Corner)
5. Extend
6. Mirror
7. Move
8. Rotate
9. Scale
10. Linear and Circular Sketches
11. SpLine (Add Curvature Control, Insert Spline Point, Simplify Spline, Fit Spline, Show Spline Handles, Show Inflection Points, Show Minimum Radius, Show Curvature Combs.
12. Exercises

3. Dimensions

- Smart Dimensions
- Dimensions/Relations
 1. Vertical and horizontal dimensions, continuous dimensions
 2. Angles Dimensions
 3. Circles and arcs dimensions
 4. Auto Dimensions
 5. Full defined objects
 6. Relations between dimensions
 7. Add Relations
 8. Delete Relations
 9. Exercises

4. Quick Snap

1. point Snap
2. Center Point Snap
3. Nearest Snap
4. Midpoint Snap
5. Quadrant Snap
6. Intersection Snap
7. Tangent Snap
8. Exercises



5. 3D Sketch

6. Solid Part

1. Extrude

- Extrude-Boss/Base
- Extrude-Cut
- Edit Feature
- Reference Geometry-Planes:-
 1. Through Lines/Points
 2. Parallel Plane at Point
 3. Plane passing through line at Angle
 4. Plane with offset distance
 5. Plane Normal to Curve
 6. Plane tangent to cylindrical. Conical and Undefined Surfaces.
 7. Reference Axes
 8. Reference Point
- Extrude part of sketch
- Extrude opening sketch
- Extrude Path
- Revolve, Boss/Base revolve, revolve cut
- Sweep, Boss/Base sweep, sweep along path, sweep along path with normal Constant, sweep cut
- Twist, twist along path, twist along path with normal constant
- Loft, Boss/Base Loft, loft following leaders paths, loft cut, loft features.

7. Editing 3D Object

- Fillet/Round, constant radius, variable radius, full round fillet
- Chamfer, Angle distance ,distance distance, chamfer vertex

8. Ribs, insert rib, stress analysis

9. Shells, equal thickness setting and multi thickness settings

10.3D Curves, projected curve, Composite curve, Helix and Spiral, Curve through Reference Points, Split line.

11. Draft, natural plane, parting line, step draft

12. Pattern, Linear pattern ,circular pattern, curve drive pattern, sketch driven Pattern, coordinate system.

13. Mirror and Scale

14. Body Flex. Bending, Twisting, Tapering. Stretching, Dome.

15. Deform, deform using point, deform using path, shape deform.

16. Warp and combine.

17. Simple Holes and Holes Wizard.

18. Surfaces Creating, Extruded Surfaces, Revolve Surfaces, Swept Surfaces, Lofted Surfaces, offset Surfaces, Filled Surfaces, Ruled Surfaces, Planner Surfaces, Trim Surfaces, Knit Surfaces, Thicken Surfaces, Replace Surfaces

19. Assembly
20. Work Shop Drawing

Grading:

Lab works	30%
Midterm exam	20%
Final exam	50%

Textbooks:

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





Engineering Program

Specialty	Common
Course Number	20207121
Course Title	Mechanics
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

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).

Detailed Course Description:

Unit	subject
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 a line, Dot product. .
3	Equilibrium of a particle: Equilibrium condition, Free body diagram, Coplanar force system.
4	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.
5	Equilibrium of rigid body: Conditions of rigid body Equilibrium, Equilibrium in two dimensions.
6	Analysis of structures: Simple trusses, The method of joints, Zero force members, The method of section, frame.
7	Internal forces: Internal forces in structural members.
8	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 of a 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.



Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/------
	Second Exam	20%	--/------
	Final Exam	50%	--/------
Homeworks and quizzes		10%	

Text Book:

- Engineering Mechanics- Statics & Dynamics ,By Hibbeler, 10th edition.

References:

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



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20201271
Course Title	Metallurgical Heat Treatment
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Property change due to heat treatment. Iron-carbon system. Surface hardening. Powder metallurgy, metal surface treatment. Composite materials. Electro plating. Chemical and mechanical treatment of ferrous materials and alloys. Destructive and non-destructive evaluation.

Course Objectives:

This course aims at:

1. Distinguish between the different phases of iron.
2. Create heat treating for nonferrous and alloys.
3. Analyze the metal properties due to the heat treatment.
4. Create the necessary destructive and non-destructive testing of the materis.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Phase diagram	<ul style="list-style-type: none"> ▪ Introduction ▪ Two metals completely soluble in the liquid and solid state 	
2.	Iron-carbon system	<ul style="list-style-type: none"> ▪ Definition of the structure ▪ Carbon solubility in iron ▪ The critical temperature lines 	
3.	Heat treatment of steels	<ul style="list-style-type: none"> ▪ Introduction ▪ The isothermal diagram of steel ▪ Full annealing ▪ Quenching ▪ Surface treatment 	
4.	Heat treatment of iron		

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	

Teaching Methodology:

- ❖ Lectures

Text Books & References:

Textbook:

1. Introduction to physical metallurgy, sidney H. Avner.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20201272
Course Title	Metallurgical Heat Treatment Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Preparation of specimen: Microscopic inspection, Cooling curves and phase diagrams, Corrosion rate measurement. Materials structure analysis. Surface-hardening. Electro plating processes. Iron-carbon system. Heat treatment and tests. preparation and using of powders and composites.

Course Objectives:

This course aims at:

1. Use the microscope to study the microstructure.
2. Harden the surface of the metals by electroplating process.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Heat treatment method		
2.	Surface-hardening by electroplating		
3.	Quenching		
4.	Surface hardening		
5.	Tempering		

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/------
	Second Exam	20%	--/------
	Final Exam	50%	--/------
Homework and Projects		10%	
Discussions and lecture Presentations			

Teaching Methodology:

- ❖ Laboratory

Text Books & References:

Textbook:

1. Introduction to physical metallurgy, sidney H.Avner.





Engineering Program

Specialization	Common
Course Number	20204121
Course Title	Strength of Materials
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Principles of statics including equilibrium and static equivalence. Determination of moment and force resultants in slender members. Introduction to mechanics of deformable bodies; concepts of stress and strain, classification of material behavior, stress-strain relations and generalized Hook's Law. Application to engineering problems involving members under axial load, torsion of circular rods and tubes, bending in beams, buckling of columns.

Course Objectives:

After presenting this course student should:

1. Analyze the different types of loading
2. Classify the types of beams support.
3. Distinguish between the effect of concentrated or distributed load



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Axial Loading	<ul style="list-style-type: none"> ▪ Introduction, static review, types of loads ▪ Normal and shear stresses, concept of strain ▪ Stress strain diagram ▪ Hokes law and modulus of elasticity (Young's modulus) ▪ True stress and true strain ▪ Strain energy and factor of safety ▪ Stresses in stepped bars ▪ Stresses in compounded columns ▪ Poison's ratio ▪ Stresses in thin-walled vessels due to internal pressure 	
2.	Torsion	<ul style="list-style-type: none"> ▪ Torsion stress and strain in solid and hollow shafts ▪ Torsion in stepped shafts ▪ Power transmitted by rotating shafts ▪ Twist angle in elastic range 	
3.	Bending of beams	<ul style="list-style-type: none"> • Bending stresses and axial strain in symmetric sections • Curvature of beams under bending • Types of bending loads, concentrated and uniformly distributed loads • Shear and bending moment diagrams for beams under concentrated and uniformly distributed loads 	
4.	Buckling of columns	<ul style="list-style-type: none"> ▪ Euler's formula for pin ended columns ▪ Types of end conditions of columns ▪ Column design under axial 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



		loading	
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Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and Quizzes		10%	

Teaching Methodology:

- ❖ Lectures and presentations

Textbook:

1. Mechanics of materials R.C. Hibler 5th edition , Prentice Hall, 2003



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Program Engineering

Specialty	Common
Course Number	20204122
Course Title	Strength of Materials Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

- ❖ Applying theory gained within the strength of materials theoretical through practical experimentation

Course Objectives:

After presenting this course student should:

1. Distinguish between the behavior of brittle and ductile materials under tensile.
2. Distinguish between the behavior of brittle and ductile materials under torsion test.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Tensile test	<ul style="list-style-type: none"> ▪ Identification of the tensile testing machine, its specifications and standard specimen ▪ Test procedure ▪ Performing the test on different specimen ▪ Plotting stress-strain curve using load-elongation curve ▪ Studying the effect of percentage of carbon in steel on the tensile test results ▪ Comparison among mild steel ▪ Cast iron, brass and aluminum 	
2.	Compression test	<ul style="list-style-type: none"> ▪ Test procedure ▪ Compression test specimen ▪ Plotting stress-strain for compression test ▪ Comparison the test results for different specimen 	
3.	Impact test	<ul style="list-style-type: none"> ▪ Identification of the pendulum ▪ Impact testing machine and standard specimen ▪ Test procedure and the specifications of specimen (Izod-Charpy) ▪ Performing and comparing the test results for specimen under different temperatures 	
4.	Hardness tests	<ul style="list-style-type: none"> ▪ Elements of the 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<p>hardness testing machine</p> <ul style="list-style-type: none"> ▪ Testing specimen and procedure ▪ Conducting hardness tests using Brinnell method, Vickers method and Rockwell method 	
5.	Non-destructive inspection NDI	<ul style="list-style-type: none"> ▪ Elements of the following NDI equipment: X-ray inspection Ultrasonic inspection Magnetic particle inspection ▪ Methods of determination of internal defects of metals 	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	--/--/----
	Med- term	20%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

❖ Laboratory

Textbook:**Instructional Lab. Sheets**

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20201231
Course Title	Theory of machines
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Introduction, linkages and mechanisms, cams, spur gears, nonstandard spur gears, bevel, helical and worm gears, gear trains, velocity and acceleration analysis, force analysis of machinery, Blanca of machinery introduction to synthesis, governors, special mechanisms and robotics

Course Objectives:

Analyze the velocity and acceleration of the points in the different type of linkages

1. Distinguish between the static and dynamic balance of the machines.
2. Classify gears type and their notations.
3. Distinguish between the different linkages to transmit motion and power.
4. Analyze the force effecting on the governors.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction to study mechanisms	<ul style="list-style-type: none"> ▪ Mechanisms machine ▪ Motion ▪ Cycle period and phase of motion ▪ Pairing elements ▪ Link. chain 	
2.	Linkages and mechanisms	<ul style="list-style-type: none"> ▪ Four bar linkage ▪ Slider crank mechanisms ▪ Scotch yoke ▪ Quick return acceleration ▪ Hooks coupling 	
3.	Velocity and acceleration	<ul style="list-style-type: none"> ▪ Linear and angular motion of particle ▪ Relative motion ▪ Graphical determination of velocity in mechanisms ▪ Instantaneous center of velocity ▪ Graphical determination of acceleration in mechanisms ▪ Relative acceleration of coincident particles on separate links carioles component of acceleration 	
4.	Cams	<ul style="list-style-type: none"> ▪ Disc cam with radial follower ▪ Disc cam with oscillating follower ▪ Cylinder cam ▪ Disc cam with redial roller follower 	
5.	Gear	<ul style="list-style-type: none"> ▪ Introduction to involate spur gear ▪ Spur gear detail ▪ Characterization of involate action ▪ Nonstandard spur gears ▪ Gear train ▪ Introduction to gear trains ▪ Planetary gear trains ▪ Applications of planetary trains 	
6.	Belts	<ul style="list-style-type: none"> ▪ Flat belt ▪ V- belt 	
7.	Balance of machinery and governors	<ul style="list-style-type: none"> ▪ Introduction ▪ Balance of rotors ▪ Dynamic and static balance ▪ Balancing machines ▪ Governors, types of governors 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

Teaching Methodology:

1. Lecture
2. Power point presentation
3. Discussion

Text Books & References:

References:

1. Mechanisms and dynamics of machinery By Hamilton H. and Fred W. Ocvirk.
2. Theory of machines by R. S. Khurmi and J. K. GUPTA.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20201232
Course Title	Theory of machines lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ This course give the student an opportunity to apply the theory gained within the theory of machines theoretical course through practical experimentation. Balancing motion transmission through mechanisms .speed changing and.

Course Objectives:

1. Classify types of motion.
2. Classify the linkages types.
3. Classify the gears types and their function.
4. Create balance testing for the rotating bodies.



Detailed Course Description:

lab Number	lab Name	lab Content	Time Needed
1.	Slider crank mechanisms (velocity and acceleration)		1
2.	Scotch yoke mechanisms (velocity and acceleration)		1
3.	Mass balance of rotating masses Gear box arrangement		1
4.	Friction in the belt		1

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	
	Discussion of Sheets	30%	
	Final Exam	50%	

Teaching Methodology:

- Laboratory

Text Books & References:**References:**

- Theory of machines by R.S Khurmi and J. K. Gupta.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20209111
Course Title	Thermal Engineering
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

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

Detailed Course Description:

Unit	subject
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.
6	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.
7	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.
8	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.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and quizzes		10%	

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
- 4.

اساسيات الديناميكا الحرارية الكلاسيكية، وايلي وسونتاغ، ترجمة مركز الكتب الاردني، الطبعة الثانية.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20209112
Course Title	Thermal Engineering Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

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

Detailed Course Description:

Unit Number	Content	Time Needed
1.	Saturation Pressure- Saturation Temperature relation (Marcel Boiler)	
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 Condition in simple bar	
9.	radial Condition 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	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Midterm Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----
Homework and Projects		10%	

Text Books & References:**Instructional Lab. Sheets**

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialty	Manufacturing, Production Technology
Course Number	20203211
Course Title	Welding Technology
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

- ❖ This course introduces the student to the different systems of welding to acquire the necessary skills to be a welding supervisor. It also familiarizes the student with the most important procedures for welding inspection.

Course Objectives:

This course aims at:

1. Distinguish among different welding techniques (principle and procedure, equipment and tools, and advantages and disadvantages.)
2. Performing various welding processes (arc welding, Tungsten-Inert Gas (TIG) Welding, Metal-Active Gas (MAG) welding, and spot welding.)
3. Inspect welding defects.
4. Apply the safety precautions during the execution of welding processes.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Welding principles and safety precautions	<ul style="list-style-type: none"> ▪ Different welding techniques ▪ Welding methods (manual, mechanical) ▪ Arc welding (analysis, electrical arc, electro-magnetic phenomenon, welding factors) 	
2.	Resistance welding Pressure welding		
3.	Gas welding		
4.	Principles and applications of TIG welding	<ul style="list-style-type: none"> ▪ Equipment ▪ Technical data table 	
5.	Principles and applications of MAG welding	<ul style="list-style-type: none"> ▪ Equipment ▪ Applications of MAG 	
6.	Inspection of Weld defects	<ul style="list-style-type: none"> ▪ Incomplete penetration ▪ Porosity and cracks ▪ Inspection of surface defects ▪ Inspection of internal defects 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/------
	Second Exam	20%	--/------
	Final Exam	50%	--/------
Homework and Projects		10%	

Teaching Methodology:

- ❖ Lectures

Text Books & References:

Textbook:

1. "Welding skills", Miller, R. T.
2. "Welding skills: workbook to accompany Miller", Gosse.

References:

1. Welding skills", Miller, R. T.
2. "Welding skills: workbook to accompany Miller", Gosse.





Engineering Program

Specialty	Manufacturing, Production Technology-MPT
Course Number	20203212
Course Title	Welding Technology Workshop
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Application of welding techniques. Including safety, shop practicing for different welding methods, inspections of welding defects.

Course Objectives:

This course aims at:

1. Distinguish among different welding techniques (principle and procedure, equipment and tools, and advantages and disadvantages).
2. Performing various welding processes (arc welding, Tungsten-Inert Gas (TIG) welding, Metal-Active Gas (MAG) welding, and spot welding).
3. Inspect welding defects.
4. Apply the safety precautions during the execution of welding processes.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	ARC welding	<ul style="list-style-type: none"> ▪ Striking the arc ▪ Flat position feeding lines ▪ Plane internal angle exercise ▪ Overlap exercise 	
2.	TIG welding	<ul style="list-style-type: none"> ▪ Aluminum fusion welding lines exercise ▪ Feeding line welding exercise 	
3.	MAG welding	<ul style="list-style-type: none"> ▪ Steel welding using MAG exercise 	
4.	Other welding techniques	<ul style="list-style-type: none"> ▪ Spot welding ▪ Soldering of thin sheet metals using the soldering iron ▪ Plasma cutting ▪ Gas welding 	
5.	Inspection of weld defects	<ul style="list-style-type: none"> ▪ Performing weld inspection tests 	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Reports	30%	
	Midterm Exam	20%	
	Final Exam	50%	

Teaching Methodology:

- ❖ Workshops

Text Books & References:

1. "Welding skills", Miller, R. T.
2. "Welding skills: workbook to accompany Miller", Gosse.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008