مركز الاعتماد وضمان الجودة

Study plan for the bachelor's degree

1.	School	**School of Engineering**
2.	Department	**Mechanical Engineering**
3.	Program title (Arabic)	**بكالوريوس الهندسة الميكانيكية**
4.	Program title (English)	**Bachelor of Mechanical Engineering**

5. Components of Curriculum:

The curriculum for the bachelor's degree in consists of (165) credit hours distributed as follows

Number	**Type of requirement**	**credit hours**
First	University Requirements	27
Second	Faculty Requirements	27
Third	Department Requirements	111
Total		165

6. Numbering System:

A- Department number

Number	**Department**
1	Civil Engineering
2	Architectural Engineering
3	Electrical Engineering
4	Mechanical Engineering
5	Chemical Engineering
6	Industrial Engineering
7	Computer Engineering
8	Mechatronics Engineering

B- Course number

Domain number	Domain title
0	Miscellaneous
1	Vibration and Control
2	General Mechanics
3	Engineering Drawing and Machine Design
4	Thermal Science
5	Energy
6	Fluids
7	Materials
8	Applied Mechanics
9	Project and Selected Topics

C- Course number consists of 7 digits

School		Department		Level	Serial number	
0	**9**	**0**	**4**			

First: University Requirements:

All students admitted to the university must apply for a degree examination in Arabic and English and the computer is prepared or approved by the university to determine their level. Based on the results of the examinations, either the student will study one or more of the requirements of the preparatory program

Preparation Program Requirements (0 - 15 Credit Hours)					
No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Basics of Arabic	3201099	3		Pass/Fail
2	Arabic Languages Skills	3201100	3	3201099	Pass/Fail
3	Basics of English	3202099	3		Pass/Fail
4	English Language Skills	3202100	3	3202099	Pass/Fail
5	Basics of Computing	1932099	3		Pass/Fail

Compulsory Requirements (18 Credit Hours)					
No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Military Science	2200100	3		
2	National Culture	3400100	3		
3	Learning & Research Skills	3400101	3	3202099 3201099 1932099	
4	Communication Skills	3400102	3	3400101	
5	Introduction to Philosophy and Critical Thinking	3400103	3	3400101	
6	Human Civilization	3400104	3		

Electives
(9 Credit Hours)

credit hours to be chosen from the first, second and third groups mentioned below. The student has to choose one course from each of the groups.

(3 Credit hours From Each Group)

(First Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Great Books	3400107	3		
2	Islam and Current Issues	0400101	3		
3	Arab-Islamic Civilization	2300101	3		
4	Jordan: History and Civilization	2300102	3		
5	Jerusalem	3400108	3		

Electives

(Second Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Legal Culture	1000102	3		
2	Environmental Culture	0300102	3		
3	Physical Fitness Culture	1100100	3		
4	Islamic Culture	0400102	3		
5	Health Culture	0720100	3		

Electives

(Third Group)

No.	Course Title	Course No.	Credit Hours	Prerequisites	Notes
1	Entrepreneurship & Creativity	3400109	3		
2	Foreign Language	2200103	3		
3	Electronic Commerce	1600100	3		
4	Social Media	1900101	3		
5	Appreciation of Arts	2000100	3		
6	Special Subject	3400106	3		
7	Administrative skills	1601105	3		3

Second: School courses: distributed as follows:

A. Obligatory school courses: (27) credit hours

B. Elective school courses: (0) credit hours

A. Obligatory school courses: (27) credit hours:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0301101	Calculus I	3	-	3	-
0301102	Calculus II	3	-	3	0301101
0301201	Calculus III	3	-	3	0301102
0302101	General Physics I	3	-	3	
0302111	General Physics Lab I	-	3	1	0302101*
0302102	General Physics II	3	-	3	0302101
0302112	General Physics Lab II	-	3	1	0302102*
0904131	Engineering Graphics and Descriptive Geometry	2	2 Hand drawing + 2Computer	3	-
0966111	Engineering Workshop	-	3	1	-
0901420	Engineering Economy	3	-	3	Completing **90** Cr. Hrs
0907101	Computer Skills for Engineers	3	-	3	1932099

** or Co-requisite*

B. Elective school courses: (0) credit hours:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		

Third: Specialty courses: (111) credit hours distributed as follows:

A. Obligatory specialty courses: (99) credit hours
B. Elective specialty courses: (12) credit hours

A. Obligatory specialty courses: (99) credit hours:

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0303101	General Chemistry I	3	-	3	-
0303109	General Chemistry Lab I	-	3	1	0303101
0301202	Engineering Math I	3	-	3	0301201
0331302	Engineering Math II	3	-	3	0301202
0903203	Electrical Engineering	3	-	3	0302102
0973373	Electrical Machines	3	-	3	0903203
0953374	Electrical Engineering & Machines Lab	-	3	1	0973373
0901241	Statics	3	-	3	0302101 + 0301102*
0904222	Dynamics	3	-	3	0901241
0914202	Computer Programming for Engineers	-	3	1	0907101+ 0301202*
0904233	Machine Drawing	-	3	1	0904131
0904274	Materials Science for Mechanical Engineers	3	-	3	0303101
0904302	Engineering numerical Methods	3	-	3	0914202+ 0301202
0906310	Manufacturing Processes	3	-	3	0904274+0934372
0944331	Mechanics of Machines	3	-	3	0904222 + 0904233*+0914202
0904341	Thermodynamics I	3	-	3	0302102
0904342	Thermodynamics II	3	-	3	0904341
0904361	Fluid Mechanics I	3	-	3	0331302* + 0904222*
0904466	Turbomachinery	3	-	3	0904361 + 0904342
0934345	Thermodynamics Lab	-	3	1	0904341 + 0904342*
0904362	Fluid Mechanics Lab	-	3	1	0904361
0934372	Strength of Materials I	3	-	3	0901241 or 0901241
0934411	Mechanical Vibrations	3	-	3	0904222 + 0301202
0954412	Mechanical Vibrations Lab.	-	3	1	0934411

0934374	Materials Lab.	-	3	1	0934372
0904422	Engineering Measurements	3	-	3	0904361 + 0904418
0904484	Computer Aided Design	2	3	3	0944331 0934372
0904435	Machine design I	3	-	3	0934372
0904436	Machine design II	3	-	3	0944331+ 0904435
0914538	Applications in Mechanical Design	1	2	2	0904436+0904302 +0904484
0914537	Design of Hydraulic and Pneumatic Systems	2	-	2	0904418 + 0904361
0914518	Design of Hydraulic and Pneumatic Systems lab.	-	3	1	0914537*
0904441	Heat Transfer I	3	-	3	0904361 + 0904341
0934445	Air Conditioning-I	3	-	3	0904342+0904441
0904418	System Dynamics and Control	3	-	3	0934411
0904446	Heat Transfer Lab.	-	3	1	0904441
0904424	Measurements Lab.	-	3	1	0904422
0904419	Control Lab.	-	3	1	0904418
0934545	Internal Combustion Engines	3	-	3	0904342
0924590	Applications in Thermo-Fluid Systems Design	1	2	2	0904441 + 0904342+0904302
0904500	Practical Training	-	-	3	Successfully completing **115** Cr. Hrs
0974598	Project (1) for mechanical engineer **	-	-	1	0904500*
0974599	Project (2) for mechanical engineer **	-	-	2	0974598

* or Co-requisite,
** The duration of the project is two regular semesters with the final marks given at the end of the second semester.

Training: The student is given a practical training for 8 weeks after completion (115 credit hours) according to the training instructions in the Faculty of Engineering.

B. Elective specialty courses: (12) credit hours:

I) Thermal and Energy Group

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0914443	Power and Desalination Plants	3	-	3	0904342
0904453	Refrigeration Systems	3	-	3	0904342 +0904441
0904462	Fluid Mechanics II	3	-	3	0904361
0904467	Design of Sanitary Systems	3	-	3	0904361
0944541	Air Conditioning II	2	3	3	0934445
0904542	Heat Transfer II	3	-	3	0904441
0904459	Energy Conversion	3	-	3	0904342
0904554	Solar Energy	2	3	3	0904441
0914555	Energy Conservation and Management	3	-	3	0901420
0904556	Renewable Energy Systems	2	3	3	0904342
0904558	Fuel and Combustion	3	-	3	*0934545*
0954594	Special Topics in thermal science	3	-	3	Completing **120** Cr. Hrs

II) Applied Mechanics and Machine Design Group

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0904472	Strength of Materials II	3	-	3	0934372
0904493	Introduction to Finite Element Method	3	-	3	0904302 + 0934372
0904521	Robotics	3	-	3	0944331 +0904418
0944582	Noise and Vibration Control	3	-	3	0934411
0914571	Introduction to Composite Materials	3	-	3	0934372
0904536	Design of Mechatronics Systems	2	3	3	0904418
0914587	Smart Structures	3	-	3	0904274+ 0903203
0914530	Rapid prototyping	3	-	3	0904274+ 0934372
0914514	Building and Factory Automation	3	-	3	0903203 + 0904422
0914586	Introduction to Flight Mechanics	3	-	3	0904361+ 0934372
0914583	Automotive Technologies	3	-	3	0904418 + 0934545
0934596	Special Topics in Applied Mechanics	3	-	3	Completing **120** Cr. Hrs

Fourth: Courses offered by other faculties and departments

Course Number	Course Title	Contact Hours		Credit Hours	Pre-requisite
		Theoretical	Practical		
0303101	General Chemistry I	3	-	3	-
0303109	General Chemistry Lab I	-	3	1	0303101
0301202	Engineering Math I	3	-	3	0301201
0331302	Engineering Math II	3	-	3	0301202
0301101	Calculus I	3	-	3	-
0301102	Calculus II	3	-	3	0301101
0301201	Calculus III	3	-	3	0301102
0302101	General Physics I	3	-	3	
0302111	General Physics Lab I	-	3	1	0302101*
0302102	General Physics II	3	-	3	0302101
0302112	General Physics Lab II	-	3	1	0302102*
0901241	Statics	3	-	3	0302101 + 0301102*
0903203	Electrical Engineering	3	-	3	0302102
0973373	Electrical Machines	3	-	3	0903203
0953374	Electrical Engineering & Machines Lab	-	3	1	0973373
0966111	Engineering Workshop	-	3	1	-
0901420	Engineering Economy	3	-	3	Completing **90** Cr. Hrs
0907101	Computer Skills for Engineers	3	-	3	1932099
0906310	Manufacturing Processes	3	-	3	0904274+0934372

Fifth: Advisory Study Plan

First Year

1st Semester				2nd Semester	
Course Number	*Course Title*	*Credit Hours*	*Course Number*	*Course Title*	*Credit Hours*
0301101	Calculus I	3	0301102	Calculus II	3
0302101	General Physics I	3	0302102	General Physics II	3
0303101	General Chemistry I	3	0302111	General Physics Lab 1	1
0904131	Engineering Graphics and Descriptive Geometry	3	0966111	Engineering Workshop	1
	University Requirement	3	0303109	General Chemistry Lab. 1	1
			0907101	Computer skills for engineers	3
				University Requirement	3
Total		**15**			**15**

Second Year

1st Semester				2nd Semester	
Course Number	*Course Title*	*Credit Hours*	*Course Number*	*Course Title*	*Credit Hours*
0901241	Statics	3		University Requirement	3
0301201	Calculus (3)	3	0301202	Engineering Math I	3
0904233	Machine Drawing	1	0904222	Dynamics	3
0903203	Electrical Engineering	3	0904341	Thermodynamics I	3
0914202	Computer programming for Engineers	1	0973373	Electrical Machines	3
	University requirement	3			
0302112	General Physics Lab II	1			
Total		**15**			**15**

Third Year

1st Semester				2nd Semester	
Course Number	*Course Title*	*Credit Hours*	*Course Number*	*Course Title*	*Credit Hours*
0904361	Fluid Mechanics I	3	0944331	Mechanics of Machines	3
0934372	Strength of Materials	3	0904302	Engineering numerical Methods	3
0331302	Engineering math II	3	0934411	Mechanical Vibrations	3
0904342	Thermodynamics II	3	0906310	Manufacturing Processes	3
	University Requirement	3	0904362	Fluid Mechanics Lab.	1
0904274	Materials Science for Mechanical Engineers	3		University Requirement	3
			0953374	Electrical Engineering & Machines Lab	1
Total		**18**			**17**

Fourth Year

1st Semester				2nd Semester	
Course Number	*Course Title*	*Credit Hours*	*Course Number*	*Course Title*	*Credit Hours*
	Technical elective	3	0904418	System Dynamics and Control	3
0904435	Machine Design I	3	0904436	Machine Design II	3
0904441	Heat Transfer I	3	0934345	Thermodynamic lab.	1
0901420	Engineering Economy	3	0934445	Air Conditioning I	3
	University Requirement	3	0904484	Computer Aided Design	3
0934374	Materials Lab.	1	0904500	Practical training	3
0954412	Mechanical Vibrations Lab	1	0904446	Heat transfer Lab.	1
Total		**17**			**17**

Fifth Year

1st Semester				2nd Semester	
Course Number	*Course Title*	*Credit Hours*	*Course Number*	*Course Title*	*Credit Hours*
0904422	Engineering Measurements	3	0904419	Control lab.	1
0914537	Design of Hydraulic and Pneumatic Systems	2		Technical Elective	3
0934545	Internal Combustion Engines	3		Technical Elective	3
0924590	Applications in Thermal-fluid systems design	2	0904424	Measurements Lab.	1
	Technical Elective	3	0914538	Applications in Mechanical Design	2
0914518	Design of Hydraulic and Pneumatic Systems Lab.	1		University Requirement	3
0904466	Turbomachinery	3		University Requirement	3
0974598	Project (1) for mechanical engineer	1	0974599	Project (2) for mechanical engineer	2
Total		**17**			**17**

Course Description of ME B. Sc. Plan

0301101 Calculus I ***(3 Credit Hours)***

Prerequisite: (None)

Functions: domain, operations on functions, graphs of functions, trigonometric functions, limits: meaning of a limit, computational techniques, limits at infinity, infinite limits, continuity, limits and continuity of trigonometric functions, the derivative: techniques of differentiation, derivatives of trigonometric functions, the chain rules, implicit differentiation, differentials, Roll's Theorem, the mean value theorem, the extended mean value theorem, L'Hopital's rule, increasing and decreasing functions, concavity, maximum and minimum values of a function, graphs of functions including rational functions (asymptotes) and functions with vertical tangents (cusps), antiderivatives, the indefinite integral, the definite integral, the fundamental theorem of calculus, the area under a curve, the area between two curves, transcendental functions: inverse functions, logarithmic and exponential functions, derivatives and integrals, limits (the indeterminate forms), hyperbolic functions and their inverses, inverse trigonometric functions.

0301102 Calculus II ***(3 Credit Hours)***

Prerequisite: 0301101

Techniques of integration: integration by substitution, integration by parts, integrating powers of trigonometric functions, trigonometric substitutions, integrating rational functions, partial fractions, rationalization, miscellaneous substitution, improper integrals, application of definite integral: volumes, length of a plane curve, area of a surface of revolution polar coordinates and parametric equations: polar coordinates, graphs in polar coordinates, area in polar coordinates, infinite series: sequences, infinite series, convergence tests, absolute convergence, conditional convergence, alternating series, power series: Taylor and Maclurine series, differentiation and integration of power series.

0301201 Calculus III ***(3 Credit Hours)***

Prerequisite: 0301102

Three-dimensional space and vectors rectangular coordinates in 3-space, spheres, cylindrical surfaces, quadric surfaces, vectors: dot product, projections, cross product, parametric equations of lines. Planes in 3-spaces, vector-valued functions: calculus of vector valued functions, change of parameters, arc length, unit tangent and normal vectors, curvature, functions of two or more variable: domain, limits, and continuity, partial derivatives, differentiability, total differentials, the chain rule, the gradient, directional derivatives, tangent planes, normal lines, maxima and minima of functions of two variables, Lagrange multipliers, multiple integrals: double integral, double integrals in polar coordinates, triple integrals, triple integrals in cylindrical and spherical coordinates, change of variables in multiple integrals, Jacobian.

0301202 ***Engineering Math I*** ***(3 Credit Hours)***

Prerequisite: 0301201

Ordinary differential equations, linear differential equations of second and higher order, systems of differential equations, phase plane, stability, series solutions of differential equations, orthogonal functions, Laplace transforms, linear systems of equations, matrices and determinants.

0331302 ***Engineering Math II*** ***(3 Credit Hours)***

Prerequisite: 0301202

Vector differential calculus, line and surface integrals, integral theorems, Fourier series, Fourier integrals, Fourier transforms, partial differential equations.

0302101 ***General Physics I*** ***(3 Credit Hours)***

Prerequisite: Physics of secondary stage or equivalent or 0302099

Motion in One Dimension, Vectors, Motion in Two Dimensions, The Laws of Motion, Circular Motion and Other Applications of Newton's Laws, Work and Kinetic Energy, Potential Energy and Conservation of Energy, Linear Momentum and Collisions, Rotation of a Rigid Object About a Fixed Axis, Rolling Motion and Angular Momentum.

0302111 ***General Physics Lab. I*** ***(1 Credit Hour)***

Prerequisite: 0302101 or concurrent

11 experiments each of 3 hrs/week duration: collection and analysis of data, measurements and uncertainties, vectors: force table, kinematics of rectilinear motion, force and motion, collision in two dimensions, rotational motion, simple harmonic motion: simple pendulum, gas's Laws, ballistic pendulum, specific heat capacity of metals.

0302102 ***General Physics II*** ***(3 Credit Hours)***

Prerequisite: 0302101

Electric field, Gauss's law, electric potential, capacitance and dielectrics, current and resistance, direct current circuits, magnetic field, sources of the magnetic field, Faraday's law, inductance, alternating current circuits, the nature of light and the principles of ray optics, image formation.

0302112 ***General Physics Lab. II*** ***(1 Credit Hour)***

Prerequisite: 0302101 or concurrent

12 experiments each of 3 hrs/week duration: electric field mapping, specific charge of copper ions, power transfer, potentiometer, capacitors: RC time constant, Kirchoff's laws, magnetic field of a current, lenses, Young's double-slit experiments, electromagnetic induction, Ohm's law, Wheatstone bridge.

0901420 ***Engineering Economy*** ***(3 Credit Hours)***

*Prerequisite: (*Completing **90** Cr. Hrs.*)*

Major elements of feasibility studies. Principles of engineering economy. Equivalence and compound interest formulas. Single payment model. Uniform payment model.

Gradient payment model. Exponential payment model. Decision criteria for single and multiple alternatives: present worth, annual worth, future worth, internal rate of return, benefit cost ratio and payback methods. Income-tax effect on decision making.

0303101 ***General Chemistry I*** ***(3 Credit Hours)***

Prerequisite: None

Measurements and significant figures, chemical reactions, stoichiometry, the gaseous state, thermochemistry, electronic structure and periodicity, chemical bonding, molecular shapes, states of matter and intermolecular forces.

0303109 ***General Chemistry Lab I*** ***(1 Credit Hour)***

Prerequisite: 0303101

Safety and laboratory rules, chemical observations, Avogadro's number, stoichiometry, volumetric analysis, oxidation and reduction, colligative properties, thermochemistry and equilibrium.

0966111 ***Engineering Workshops*** ***(1 Credit Hour)***

Prerequisite: None

General safety, materials and their classifications, measuring devices and their accuracy, fits and tolerances, theoretical background for the practical exercises including fitting, forging, carpentry, casting, welding, mechanical saws, shearers, drills, lathes, milling machines, shapers and grinders.

0907101 ***Computer Skills for Engineers*** ***(3 Credit Hours)***

Prerequisite: 1932099

This course presents the fundamental concepts of programming using one high level programming language like C++, Java, or Python. It covers the basic structures of the programming language such as variables, data types, control structures, arrays, functions, and introduction to records (struct) and object oriented programming (classes and objects). The course will focus on providing the students with practical programming skills through home works and exams which require writing whole programs.

0906310 ***Manufacturing Processes*** ***(3 Credit Hours)***

Prerequisite 0904274 +0934372

Mechanical behavior and forming of metals, different types of mechanical behavior and main factors affecting it. Yield criteria, representative stress and representative strain, work due to plastic deformation, classification of forming processes with respect to strain rate and temperature. Temperature rise in dynamic forming. Bulk deformation processes: forging, extrusion, rolling, rod and wire drawing. Sheet forming processes: blanking, deep-drawing and bending.

0904131 ***Engineering Graphics and Descriptive Geometry*** ***(3 Credit Hours)***

Prerequisite: None

Drawing equipment and use of instruments. Lettering, Geometric construction, Sketching and shape description. Basic descriptive geometry, Developments and

intersections. Axonometric, oblique and perspective drawings, Multiview projection, Principal views, Conventional practice, and sectional views. Auxiliary views. Dimensioning techniques. Parallel: Introduction to computer drawing, Drawing aids, Geometrical construction, and the appropriate commands of text, editing, plotting, sections, layers, pictorial views, and dimensioning. Auxiliary views.

0901241 ***Statics*** ***(3 Credit Hours)***

*Prerequisite: 0302101+ 0301102**

Force systems (2D and 3D), equilibrium of particles and rigid bodies (2D and 3D), structures (trusses, frames and machines), distributed forces (centroids and centers of mass), beams (shearing force and bending moment diagrams), friction, moments of inertia and virtual work.

0904222 ***Dynamics*** ***(3 Credit Hours)***

Prerequisite: 0901241

Kinematics of particles, Rectilinear and curvilinear motion in various coordinate systems. Kinetics of particles, Newton's second law, Central force motion, Work-energy equation, Principle of impulse and momentum, Impact, Conservation of energy and momentum, Application to a system of particles. Kinematics of rigid bodies, Relative velocity and acceleration, Instantaneous center, Analysis in terms of a parameter. Plane kinetics of rigid bodies with application of Newton's second law, Energy and angular impulse impulse-angular momentum.

0904233 ***Machine Drawing*** ***(1 Credit Hours)***

Prerequisite: 0904131

Mechanical engineering drawing conventions and abbreviations, various systems of size description, including precision dimensioning, fastening elements, standard organization and preparation of engineering drawings, assembly and detailed drawings, design applications.

0914202 ***Computer Programming for Engineers*** ***(1 Credit Hours)***

Prerequisite: 0907101+0301202

This course introduces students to technical computing environment (MATLAB) software that is used extensively in solving real life problems in different fields of engineering. The class focuses on the specific features of MATLAB that are useful for engineering applications. Solve nonlinear implicit equations including systematic development of programming via flowcharts and pseudo. Solution of nonlinear and linear systems of equations. Interpolation, approximation and curve fitting and statistics tool boxes. Numerical differentiation and integration. Solution of ordinary differential equations. Applied examples, Simulink and Symbolic modules, and simmechanics.

0904302 ***Engineering numerical Methods*** ***(3 Credit Hours)***

Prerequisite: 0301202+ 0914202

Mathematical preliminaries, numerical errors, loss of significance and error propagation. Numerical solution of nonlinear algebraic equations in single variable and systems of linear and non-linear algebraic equations. Numerical approximations:

Interpolation and regression. Numerical differentiation and integration. Numerical solution of ordinary differential equations of initial value, boundary-value and characteristic-value problems. Introduction to numerical solution of partial differential equation: elliptic, parabolic and hyperbolic. Where appropriate, Software packages is used in the numerical solutions mentioned above.

0903203 Electrical Engineering ***(3 Credit Hours)***

Prerequisite: 0302102

Ohm's and Kirchhoff's laws. Series and parallel connections. Voltage and current division. Nodal and mesh analysis. Superposition theorem. Thevenin's and Norton's theorems. Source transformation. Maximum power transfer. Inductance and capacitance. Behavior of R, L and C under steady-state DC or AC conditions. Characteristics of sinusoids. The phasor concept. Phasor relationships for R, L, and c elements. Impedance and admittance. Effective values of current and voltage. Instantaneous, average and apparent power. Power factor. Resonance. Three-phase systems. Three-phase wye and delta connections. Introduction to semiconductors. The PN junction. Diode characteristics. Applications of diodes: switches, rectifiers, etc. Transistors: operation, model, voltage-current characteristics. Applications of transistors: amplifiers, switches, etc. Operational Amplifiers. Safety considerations. Protective grounding.

0973373 Electrical Machines ***(3 Credit Hours)***

Prerequisite: 0903203

Magnetic circuits, single-phase and three-phase transformers: Principles, analysis, performance characteristics and testing, electromechanical energy conversion, principles and classification of DC generators, DC motors: analysis, performance characteristics, starting, testing and speed control, 3-ph synchronous generator and motors: analysis, performance characteristics, applications, starting, and testing, three-phase induction motors: analysis, performance characteristics, testing, starting and speed control, introduction to single-phase induction motors, special types of motors: stepper motors, universal motors, reluctance motors, burshless DC motors.

0953374 Electrical Engineering & Machines Lab ***(1 Credit Hours)***

Prerequisite (0973373)

Electric measurement equipment. Ohm's law. Resistors and DC Circuits. Series and parallel connections. Voltage and current division. Nodal and mesh analysis. Superposition theorem. Thevenin's and Norton's theorems. Maximum power transfer. Inductance and capacitance. AC systems. Impedance concept and phase shift in RL and RC circuits. Measurement of power and power factor. Diodes and their applications: half-wave rectifiers, full-wave rectifiers, etc. Single-phase transformers. DC motors: characteristics and speed control. Testing and operational characteristics of three-phase synchronous motors. Testing and operational characteristics of three-phase induction motors. Testing and operational characteristics of single-phase induction motors.

0904274 ***Materials Science for Mechanical Engineers*** ***(3 Credit Hours)***

Prerequisite: 0303101

This course introduces the basic principles underlying the behavior of materials. Provide the scientific foundation for understanding of the relations among material properties, microstructure, macrostructure, and behavior of metals, polymers, and ceramics. Deals with atomic structure and bonding, structure of crystalline solids, imperfection in solid, dislocations and strengthening mechanisms, phase diagrams and alloys formation, ferrous metals and nonferrous metals and alloys.

0944331 ***Mechanics of Machines*** ***(3 Credit Hours)***

Prerequisite: 0904222 + 0904233*+0914202

Mechanisms and applications, mobility and linkages. Cams, gears and gear trains. Velocity and acceleration analysis in mechanisms. Inertia forces. Principles of balance in rotating & reciprocating masses.

0904341 ***Thermodynamics I*** ***(3 Credit Hours)***

Prerequisite: 0302102

Thermodynamic concepts and definitions, states, properties, systems, control volume, processes, cycles, and units, pure substances, equation of states, table of properties, work and heat, the first law, internal energy and enthalpy, conservation of mass, SSSF and USUF processes, the second law, heat engines and refrigerators, reversible processes, Carnot cycle, entropy, Clausius inequality, principle of the increase of entropy, Efficiencies.

0904342 ***Thermodynamics II*** ***(3 Credit Hours)***

Prerequisite: 0904341

Review of basic laws and principles. Irreversibility and availability, Vapour and air power and refrigeration cycles. Mixtures of real gases and vapours. Psychrometry. Combustion. Elementary chemical kinetics, Principles of Flow through a Nozzle.

0934345 ***Thermodynamics Lab.*** ***(1 Credit Hours)***

Prerequisite: 0904341 + 0904342

Experimental methods in the following : Mechanical equivalent of heat, The adiabatic exponent, Marcet boiler, Bomb calorimeter, Flow through nozzle, Refrigeration system, Air conditioning system, Heat pump and air cooler, single stage air compressor, cooling tower, Thermic unit (steam turbine power plant).

0904349 ***Technology of the Built Environment.*** ***(3 Credit Hours)***

Prerequisite: None

Heating and Air conditioning, Psychrometry, Heating and cooling, Load calculations, Heating networks, Boilers, Radiators, Pumps, Air conditioning, Air distribution and domestic hot water. Building sanitary systems, cold water networks, pumps, fire fighting networks and drainage systems and materials. Lifts design, load, speeds and control systems. Elevator room dimensions.

0904361 ***Fluid Mechanics I*** ***(3 Credit Hours)***

Prerequisite: 0904222 + 0331302**

Introduction, Fluid properties, Basic units. Fluid statics, Pressure and its measurements, Forces on plane and curved submerged surfaces, buoyancy & stability, Fluids in motion, Flow kinematics and visualization, Basic control volume approach, Differential and integral continuity equation. Pressure variation in flowing fluids, Euler's and Bernoulli's equations, Applications of Bernoulli equation. Momentum equation and its applications, Energy equation, Hydraulic and energy grade lines. Dimensional analysis and similitude. Flow in conduits, laminar and turbulent flows, Frictional and minor losses, Piping systems, Pumps, Concept of Hydraulic jump.

0934372 ***Strength of Materials I*** ***(3 Credit Hours)***

Prerequisite: 0901241 or 0901241

Axial loading, Material properties obtained from tensile tests, Stresses and strains due to axial loading, Thermal Stresses, Elementary theory of torsion, Solid and hollow shafts, Thin-walled tubes, Rectangular cross-section, Stresses in beams due to bending, shear and combined forces. Composite beams, Analysis of plane stress, Mohr's Circle, Combined stresses, Thin-walled pressure vessels, Deflection of beams, Buckling of columns, Energy Methods.

0934411 ***Mechanical Vibrations*** ***(3 Credit Hours)***

Prerequisite: 0904222+ 0301202

Simple harmonic motion. Elements of vibratory systems. Systems with single degree of freedom and applications, damped free vibration, rotating and reciprocating unbalance, vibration isolation and transmissibility, and period excitation, systems with multiple degrees of freedom and applications, methods of finding natural frequencies.

0954412 ***Mechanical Vibrations Lab.*** ***(1 Credit Hours)***

*Prerequisite: **0934411***

Static and dynamic balancing. Centrifugal force. Simple and compound pendulums. Bifilar suspension. Centre of percussion. Kater's reversible pendulum. Torsional oscillations of single and two rotors system. Vibration of a rigid body spring system. Undamped vibration absorber. Dunkerley's equation.

0904418 ***System Dynamics and Control*** ***(3 Credit Hours)***

Prerequisite: 0934411

Review of complex variables and Laplace transform. Poles and element transfer function and block diagram. Modelling of physical systems, electrical, mechanical, hydraulic and pneumatic systems. Linearization of nonlinear systems. System representations. Thermal, System block diagrams and signal flow graphs. Overall transfer function, block diagrams reduction techniques and Mason's gain formula. Time response analysis and performance indices of first and second order systems. Dominate poles of high order systems. Routh - Hurwitz stability criterion. Stability analysis using root locus. Bode diagrams and Nyquist stability criterion. Introduction to analysis using state-space equations.

0904422 ***Engineering Measurements*** ***(3 Credit Hours)***

Prerequisite: 0904361+ 0904418

Report writing, basics of metrology, inspection and measurements. Errors & error analysis, uncertainty analysis, Engineering Statistics and statistical methods, least squares method. Basics of transducers. Static and dynamic characteristics of systems. Measurement of flow, pressure, and temperature. Strain gauges, strain rosettes

0904435 ***Machine Design I*** ***(3 Credit Hours)***

Prerequisite: 0934372

Meaning, phases, evaluation, considerations of design, stress analysis, deflection analysis, static strength and theories of failure, fatigue strength. Design of fasteners and connections, riveted joints, bolts and screws, force-deflection diagrams of bolted connections. Welded joints. Mechanical springs, helical, leaf, torsional spring shafts. Case studies and applications.

0904436 ***Machine Design II*** ***(3 Credit Hours)***

Prerequisite: 0944331+ 0904435

Rolling contact bearings, selection, mounting and enclosure. Lubrication and journal bearings. Clutches, coupling and brakes. Gearing : Geometry, kinematics gear trains and force analysis. design of spur, helical, bevel and worm gears. multi-speed gear boxes. design and analysis of belts, ropes, chains, term project. Case studies and applications.

0904441 ***Heat Transfer I*** ***(3 Credit Hours)***

Prerequisite: 0904361+0904341

Introduction to modes of heat transfer, one-dimensional steady state conduction, unsteady state conduction, lumped heat capacity system, introduction to convection, flow and thermal boundary layers. Laminar and turbulent boundary layers, convection in internal and external flows, empirical relations for forced convection heat transfer, natural convection systems, condensation and boiling, introduction to thermal radiation.

0904446 ***Heat Transfer Lab.*** ***(1 Credit Hours)***

Prerequisite: 0904441

Conduction heat transfer, One-dimensional conduction, Transient conduction, Convection heat transfer, External flow, Internal flow, Natural convection, Boiling and condensation, Heat exchangers and Thermal radiation.

0914443 ***Power and Desalination Plants*** ***(3 Credit Hours)***

Prerequisite: 0904342

This course is concerned with the types, construction, working principles and performance of different types of conventional and non-conventional power plants. The construction, operation and performance of various components of steam, gas and diesel power plant e.g condensers, cooling towers, fuel and air handling systems, steam generators, super heaters, intercoolers, re-heaters and regenerators. It also discusses the basics of nuclear energy and operation of nuclear power plants. The course also covers basics and methods of water desalination, economics and the impact of power and

desalination plants on the environment, water treatment, corrosion and load management.

0934445 ***Air Conditioning I*** ***(3 Credit Hours)***

Prerequisite: 0904342+ 0904441

This course is designed to introduce students to basics of heating, ventilation, and air conditioning (HVAC) for residential buildings. The following topics will be discussed: Review of psychrometry. Air conditioning processes. Thermal comfort. Inside and outside design conditions. Heat transfer in building envelope. Ventilation and infiltration. Heating load calculations. Hot water heating systems layout and design. Under floor heating system. Solar radiation. Cooling load calculations. Air systems design.

0904453 ***Refrigeration Systems*** ***(3 Credit Hours)***

Prerequisite: 0904342 + 0904441

Basic definitions and concepts, review of vapor compression and absorption cycles, compressors, condensers, evaporators, expansion devices, refrigerants, cooling towers, components of an absorption cycles, controls.

0904459 ***Energy Conversion*** ***(3 Credit Hours)***

Prerequisite: 0904342

Energy classification, sources and utilization, Energy growth and economics, Fossil-Fuel Systems and combustion in steam power plants. Steam generators. Boiler rating and performance. Environmental aspects of thermal power plants. Overview on renewable energy sources with emphasis on solar and wind energy systems. Introduction to direct energy conversion systems, Thermoelectric, photovoltaic and thermionic converters. Energy Storage.

0904462 ***Fluid Mechanics II*** ***(3 Credit Hours)***

Prerequisite: 0904361

Review of basic definitions, system and control volume, Foundations of flow analysis, differential from of the basic laws, general viscous flow, boundary layer theory, Navier–Stokes equations, Blasius equation, Irrotational flow, stream function, vorticity and rotationality, Incompressible inviscid frictionless flow, Introduction to Aerodynamics, compressible flow, adiabatic and isentropic flow, Normal shock waves, Nozzles.

0904466 ***Turbomachinery*** ***(3 Credit Hours)***

Prerequisite: 0904342+ 0904361

Review of basic thermodynamics and fluid mechanics, types of turbomachines, 2-D cascades, Fans Laws, Principles of operation of compressors and pumps, centrifugal pumps, axial-flow pumps, axial-flow turbines, radial-flow turbines and different types of turbines.

0904362 ***Fluid Mechanics Lab.*** ***(1 Credit Hours)***

Prerequisite: 0904361

The purpose of this laboratory is to expose the students to the measurement tools and equipment and to provide them training in using these instruments in order to strengthen and deepen their understanding of the principles of these subjects
The students will be exposed to the experimental methods in the following systems: centre of pressure, impulse-momentum principle, pumps, friction losses in pipes, streamlines and flow fields, buoyancy, Radial flow fan, Water turbine, and Flow visualization.

0904467 ***Design of Sanitary Systems*** ***(3 Credit Hours)***

Prerequisite: 0904361

Basic definitions, Water sources, water quality and treatment, drinking water quality. Basic fluid mechanics principles, building cold water supply systems and design, building hot water supply systems and design. Valves in water supply systems and selection, plumbing materials, plumbing fixtures. Building soil and waste drainage systems (internal and external), traps, clean-outs, interceptors, and back water valves, indirect waste piping and special wastes, drainage systems design, vents and venting, design of storm water drains, building fire fighting systems.

0904472 ***Strength of Materials II*** ***(3 Credit Hours)***

Prerequisite: 0934372

This course covers the following subjects: Deflection of beams (discontinuity functions, moment-area method, method of superposition, strain energy, principle of virtual work, Castigliano's theorems). Bending of unsymmetrical sections, torsion of non-circular sections, bending and torsion of thin-walled sections, buckling of columns and curved beams, theory of elasticity in 3D, plane stress and plane strain problems, any modern computer-aided application that can be added to the subject like "pipe-stresses or tire-design with the aid of a modern commercial program".

0904484 ***Computer Aided Design*** ***(3 Credit Hours)***

Prerequisite: 0934372 + 0944331

Fundamentals of Hardware and Software. Techniques for Geometric Modeling (Line, Surface and Volume Modeling). Elements of Interactive Computer Graphics. Entity Manipulation. Introduction to Finite Element Techniques. Using in-house software: Introduction to Graphics User Interface, Sketcher Environment, Parametric & Feature-Based Solid Modeling, Surface Modeling, Concept of Parent/Child Relationships, Part Construction Techniques, Patterns, Advanced Features, Cross-Sections, Parametric Relations, Component Assembly Techniques, Drafting (Drawing) Techniques, Animation, Introduction to Mechanism Design and Analysis, Introduction to Structural and Thermal Simulation.

0904493 ***Introduction to Finite Element Method*** ***(3 Credit Hours)***

Prerequisite: 0904302+ 0934372

Preliminary aspects of finite element method, basic concepts of the finite element method (strong and weak forms, Hamilton's principle, implicit and explicit methods). Formulation techniques, assembly of element equations, solution of equations with

applications in 1D and 2D problems in: trusses, beams, frames, plane stress and strain problems, heat transfer, fluid flow and thermal stresses. Use a modern professional software to solve various problems in the field of mechanical engineering.

0904521 ***Robotics*** ***(3 Credit Hours)***

Prerequisite: 0944331+ 0904418

In this course students are familiarized with the basics of robotics. It covers: applications of robots, spatial descriptions and transformations, forward and inverse kinematics, velocities and static forces, Lagrange formulation, Newton-Euler Method, manipulator dynamics, trajectory generation and methods of controlling a robotic arm.

0924590 ***Applications in Thermo-Fluid Systems Design*** ***(2 Credit Hours)***

Prerequisite: 0904302+0904441 + 0904342

A project-oriented course aimed at applying design principles of thermo-fluids' systems (TFS) and selection techniques covered in TFS courses into an integrated project using modern software packages. In lecture session the following should be discussed: soft skills like presentation, report writing, literature review, trading and scoring among different designs of thermos-fluid systems, selection, modelling, simulation and analysis of thermos-fluid components, simplified economic analysis. In laboratory sessions Students will work in teams on real-life mechanical design problems capped by project final report and presentation along with biweekly progress reports and presentations.

0914537 ***Design of Hydraulic and Pneumatic Systems*** ***(2 Credit Hours)***

Prerequisite: 0904418 or 0904361

The objective of this course is to familiarize student with fluid power systems design control and operation. It covers the fundamentals of fluid flow, modeling and n-port concepts, fluid power modulation, static and dynamic modeling of pumps, motor, control valves, transmission lines and fluid drives. It also deals with design control and operation of mechanical and electrical hydraulic servo drives with feedback. Emphasis is placed on linear hydraulic systems behavior.

0914518 ***Design of Hydraulic and Pneumatic Systems lab.*** ***(1 Credit Hours)***

Co-requisite: 0914537

The course deals with design of hydraulic and pneumatic system and their components. The lab introduces students to Automation Studio software used in hydraulic and pneumatic system design and analysis. Pneumatic, Electro-pneumatic and sequential control technologies of double-acting cylinders, hydraulic circuits, hydraulic motor circuit, design and operation of regenerative fluid power circuit, valving system in fluid power systems.

0944541 ***Air Conditioning II*** ***(3 Credit Hours)***

Prerequisite: 0934445

This course is designed to prepare students for employment in the Heating, Ventilation and Air Conditioning field. Review of psychometric, heating and cooling load calculation. Supply design conditions. Design options for HVAC distribution systems. Central air condition system. Chiller, boiler, air handling unit sizing and

selection. Variable refrigerant flow systems. Duct design. Energy consumption in buildings.

0904542 ***Heat Transfer II*** ***(3 Credit Hours)***

Prerequisite: 0904441

Review of basic concepts, radiation properties and processes, radiation exchange among surfaces, two dimensional steady state conduction, analytical, graphical, and numerical solutions, one-dimensional transient conduction, topics in convective heat transfer, exact and approximate problem solutions, combined entry length solution in pipe flow, heat transfer in turbulent and high speed flows, liquid metal heat transfer, freezing, melting, heat-pipe heat transfer, multimode heat transfer.

0934545 ***Internal Combustion Engines*** ***(3 Credit Hours)***

Prerequisite: 0904342

Fundamentals of engines and their types. Review of air-standard, fuel-Air and actual cycles. Fuel and combustion. Fuel feeding systems. Engine testing and performance characteristics. Air pollution. Forced induction systems. The course also includes an experimental part which allows the student to estimate the performance of both spark ignition and compression ignition engines, effect of some parameters on engine performance like ignition timing, Air/Fuel ratio, compression ratio and perform an energy balance of the compression ignition engine.

0904554 ***Solar Energy*** ***(3 Credit Hours)***

Prerequisite: 0904441

Fundamentals of Solar radiation: The properties of sunlight. Spectral distribution of sunlight. Calculation of solar irradiance at surfaces. Solar thermal: Thermo-dynamical description of solar collectors. Optical properties of solar collectors. Selection of solar collectors. Solar thermal systems design for different applications: schemes and components. Solar electric: Solar cell systems. System components and their functions. Calculating output and dimensioning of solar cell systems. Analysis and simulation of a solar collector and panel system by computerized tools.

0914555 ***Energy Conservation and Management*** ***(3 Credit Hours)***

Prerequisite: 0901420

Concepts of energy management, Value of energy management, Energy performance models, Concepts of energy auditing, Phases of energy auditing, Energy auditing in buildings, Energy auditing in Industry, Energy auditing in transportation, Introduction to energy and economics, Energy use index, Capital investment characteristics, Cash flow diagrams, Time value of money, electricity generation costs, rate tariff structures, Introduction to lighting energy considerations, energy conservation opportunities in lighting systems, Energy Conservation Opportunities in Building Envelope, Energy Conservation Opportunities in HVAC systems.

0904556 ***Renewable Energy Systems*** ***(3 Credit Hours)***

Prerequisite: 0904342

Introduction to climate change, Global Warming, Solar Energy, Passive and active solar systems, Photovoltaic systems, On-Grid and Off-Grid systems. Wind energy and

hybrid of wind - solar power systems. Biomass and Bio-energy, Hydroelectric power, Geothermal heat use systems, Ocean Energy, Tidal Energy, Wave Energy. Basic introduction to the relevant market and financial management, policies, regulations and incentives, dissemination of both positive and negative national and international practices and experience.

0904536 **Design of Mechatronics Systems** ***(3 Credit Hours)***

Prerequisite: 0904418

This course provides the basis of Mechatronics and Manufacturing Automation systems design/ integration. Overview: Mechatronics in manufacturing, products and design. Overview: Microprocessors controllers, PLCs and industrial PID controllers. Drives and mechanisms of an automated system: stepper motors, servo drives, ball screws, linear motion bearings, magnetic bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, and transfer systems. Industrial CNC machines and part programming. Overview of Industrial Robotics.

0904558 ***Fuel and Combustion*** ***(3 Credit Hours)***

Prerequisite: 0934545

Energetic study of fuels, alternative fuels and their use: Origins and formation of fuels, oil shale, biofuel and biomass. Conditioning and specification of fuels. Global mass and energy balance laws in combustion. Explosively and flammability limits, flame temperature. Practical implications of combustion, Thermochemistry and energy conservation, Elementary reactions/chemical kinetics, General conservation equations, Ignition and extinction, Flame propagation in gas mixtures, Liquid fuel combustion, Gas fuel jet diffusion flames, Solid fuel combustion and nuclear fuels.

0914587 ***Smart Structures*** ***(3 Credit Hours)***

Prerequisite: 0904274+ 0903203

Introducing newly developed smart materials, which starts to appear in many smart based commercial products. Smart materials such as Shape Memory Alloy Materials, Rheological Fluids, Fiber Optics, Piezo Electric Materials will be modeled, analyzed and put into design applications. Also, the course introduces Micro-Electro-Mechanical Systems and Health Monitoring using Smart Materials. An internal experimental lab will be used to enable the student's hands on experience on smart materials.

0914530 ***Rapid Prototyping*** ***(3 Credit Hours)***

Prerequisite: 0904274+ 0934372

Fundamentals of Rapid Prototyping, Rapid Prototyping Process Chain, Liquid-Based Rapid Prototyping Systems, Solid-Based Rapid Prototyping Systems, Powder-Based Rapid Prototyping Systems, and Rapid Prototyping Data Formats: utilizing in-house-software packages, Applications in: Design, Manufacturing and Tooling, Aerospace Industry, Automotive Industry, etc.

0914514 ***Building and Factory Automation*** ***(3 Credit Hours)***

Prerequisite: 0903203 + 0904422

Introducing Building Automation Systems (BAS) and Factory Automation designs. Programmable Logic Controller (PLC) systems automation based design strategies, sensors, actuators, and PLC programming will be covered in theory and in a lab environment. Dedicated Digital Controllers (DDC) for managing buildings, sensors, actuators, and software based programming will be covered in theory and in a lab environment. The course is designed to be given as an on-line course.

0914586 ***Introduction to Flight Mechanics*** ***(3 Credit Hours)***

Prerequisite: 0904361+0934372

Fundamentals of Aerodynamics, Development of Flight, Fundamentals of flowing gas, the standard atmosphere, Aerodynamic shapes: wings, fuselage, flaps, etc., airplane performance, principles of stability and control, Flight Vehicle Structures and Materials, hypersonic vehicles.

0914571 ***Introduction to Composite Materials*** ***(3 Credit Hours)***

Prerequisite: 0934372

Definition of Composite Materials, Fiber and Matrix, Classification of Composites, Advantages, Applications, Fabrication Methods, Review of Basic Solid Mechanics and Matrices, Constitutive Equations, Transformation Equations, Micromechanics, Classical Lamination Theory, Applications: Composite Beams and Tubes under Axial, Bending and Torsion Loads.

0904419 ***Control Lab.*** ***(1 Credit Hours)***

Prerequisite: 0904418

The lab consists of experiments that are related to: First and second order system analysis control experiments. Servo systems. Stability of dynamical systems. System identification. Design and tuning of a PID controller in closed loop systems. Simulation of systems using Simulink or Matlab.

0904424 ***Engineering Measurements Lab.*** ***(1 Credit Hours)***

*Prerequisite: 0904422**

Experimental methods on the following systems: pressure measurement, flow measurement, temperature measurement, strain gauges, strain rosettes.

0914538 ***Applications in Mechanical Design*** ***(2 Credit Hours)***

Prerequisite: 0904436+0904302+0904484

A project-oriented course aimed at applying the design and selection techniques covered in machine design courses into an integrated project using modern software packages. In lecture session the following should be discussed: soft skills like presentation, report writing, literature review; trading and scoring among different designs, mechanism design, selection, modelling, simulation and analysis of machine elements design, simplified economic analysis. In laboratory sessions Students will work in teams on real-life mechanical design problems capped by project final report and presentation along with biweekly progress reports and presentations.

0944582 ***Noise and Vibration Control*** ***(3 Credit Hours)***

Prerequisite: 0934411

Nature and propagation of sound, Measurement of sound, Sound Absorption, room acoustics sound Isolation, Mechanical systems Noise and vibration, control of noise in machinery and Enclosures design, Measurements of Vibrations, Vibration Isolation and control of vibration in machines. Discussion.

0914583 ***Automotive Technologies*** ***(3 Credit Hours)***

Prerequisite: 0934545+0904418

Design and control of Fuel Feeding system, Ignition system, Suspension system, Steering systems, Hydraulic speed gear box, Brake system, Differential gear box. Hybrid and electric cars, Navigation system, Air conditioning and Car safety.

0954594 ***Special Topics in thermal science*** ***(3 Credit Hours)***

Prerequisite: Completing **120** Cr. Hrs

The contents of this course are outlined after the approval of the department council.

0934596 ***Special Topics in Applied Mechanics*** ***(3 Credit Hours)***

Prerequisite: Completing **120** Cr. Hrs

The contents of this course are outlined after the approval of the department council.

0934374 ***Materials Lab.*** ***(1 Credit Hours)***

Prerequisite: 0934372

This laboratory serves mainly the measuring and/or determination of some material properties (strain and stress, yield stress, ultimate stress, fracture stress). Non destructive testing of materials (NDT), micro and macro examination of materials and phase diagrams for steel. It is equipped with machines for conducting tests, such as: Tension, impact fatigue, bending, creep, hardness, and photo elasticity tests.

0974598 ***Project (1) for mechanical engineer*** ***(1Credit Hours)***

Prerequisite: Practical training 0904500*

The final year project extends over a two-regular-semesters period. In Project (1), student teams are assigned engineering problems involving a major engineering design component in which students apply the accumulated knowledge and skills gained throughout the mechanical engineering program. The assigned engineering problems may be theoretical, experimental or both. In the first semester, the students study the problem assigned and its theoretical background, set the approach, review the state of the art, make the problem analysis and preliminary design and write a progress report including a cost estimate (if applicable) and time table for achieving the whole project.

0974599 ***Project (2) for mechanical engineer*** ***(2Credit Hours)***

Prerequisite: 0974598

The students carry out detailed design, construction and testing (if any), write a comprehensive report on the work as per the format posted on the department web site. The report should include, where applicable, economical and environmental assessments. The project work is presented by the students to an examination panel who judge the work.

1.	School	**Sport Science**
2.	Department	**Physical education**
3.	Program title (Arabic)	دكتوراه فلسفة الاشراف والتدريس في التربية البدنية
4.	Program title (English)	PHD of Supervision and Instruction in Physical Education

	Specialization #	Degree	Dep #	Faculty #	Year	Track
Plan Number		9		11	2022	T

First: General Rules & Conditions:

1. This plan conforms to valid regulations of the programs of graduate studies.
2. Specialties of Admission:
   - MA. In Physical Education
   - MA. In Sport Administration
   - MA. In Sport Training Science
   - MA. In Health and Physical Fitness
   - MA in teaching Physical Education
   - MA. In Rehabilitation in Physical education

Second: Special Conditions:

There are no special conditions

Third: Study Plan: Studying (54) Credit Hours as following:

1. Obligatory Courses/ General Specialization (9) Credit Hours:

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
3802901	Designing Studies and Researches in Sport Sciences	3	3		
3802902	Motor Science	3	3		
3801901	Advanced social systems in Physical Education	3	3		

2. Obligatory Courses/ Specialization (12) Credit Hours:

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
3801902	Curricula and Programs Design in Physical Education	3	3		
3801903	Advanced Studies in Motor Learning of human behaviour and development	3	3		
3801904	Seminar of teaching skills in Physical Education	3	3		
3801905	Studies in Sport psychology	3	3		

3. Elective Courses/ Specialization: Studying (15) Credit hours from the following:

Course No.	Course Title	Credit Hrs	Theory	Practical.	Pre/Co-requisite
3802907	Olympic and Paralympics' Movement	3	3		
3801906	Programs Of Supervisory Behaviour in Physical Education	3	3		
3801907	Contemporary Administration Systems in Physical Education	3	3		
3801908	Designing Strategies in Sport	3	3		
3801909	Professional Preparation for Physical Education Teaching and Supervision	3	3		
3801910	Designing Sport Programmers and Curriculum for Disabled People.	3	3		
3801911	Philosophy and contemporary issues in sports science	3	3		
3801912	Implementation of teaching technology on physical Education curriculum	3	3		

4. Pass the qualifying exam (1101988).

5. Thesis: (18) Credit hours (1101999).

*notes

(3802901) **Designing Studies and Research in Sport Sciences**

This course will examine research methods and designs used in a variety of exercise and sport-related settings. Emphasizes the development of research techniques, including the ability to define research problems, write hypotheses, review and interpret literature, apply research designs, organize, analyze, and present data. Studies basic descriptive statistics for measurement and research (statistical notation, measures of central tendency and variability, probability and sampling techniques, linear regression and correlation and an introduction to statistical inference. And to provide the student with an understanding of the role of measurement and evaluation in the educational process, the ability to select and/or develop and administer appropriate tests, and the ability to use appropriate mathematical and statistical techniques in data analysis. Additionally the student will gain an introduction to the research process as practiced in health, physical education and sport.

(3802902) **Motor Science**

This course examines human motor development from conception throughout the life span. Through current research and practices, the course examines biological, psychological, sociological and physiological factors that effect such diverse areas as reflexes, reactions and postural control, and voluntary and skilled movements. The content includes understanding methodological, measurement, and evaluation issues related to motor development.

Introduction to the processes of control and coordination in the performance of motor skills. Neurophysioloical, mechanical, and cognitive bases of motor skill acquisition. This course provides an overview of the role of the brain and nervous system in the control of human movement. In this course, students will gain a better understanding of the neurophysiological principles underlying movement behavior. Concepts in sensory and motor systems physiology will be discussed in the context of the control of balance, locomotion and other skilled movements. These fundamental concepts of normal motor control will also be applied to understand motor deficits in clinical populations. We will also focus on motor learning and skill acquisition, with an emphasis on applications to motor development and rehabilitation.

(3801901) **Advanced social systems in Physical Education**

The objective of this course is to provide with knowledge in social system in sport by study different types of social systems and there effects on sports movements, as related to time efficiency, intensity in grope work (team work) topics like leadership on social and sport movements, social and psychological factors that affect work as a team. Also social and recreational problem will be discussed

(3801902) **Curricula and Programs Design in Physical Education**

This course designs to expose student to school curriculum structure and principles of school curriculum, different topics related to physical education curriculum in both the school level as well the undergraduate level. This course will discuss selected topics like principle of teaching special needs in physical education. Organized plans, teaching unite, teaching strategy in physical education for different educational level occurring to the education curriculum.

(3801903) **Advanceds Studies in Motor Learning of human behavior**

This seminar course will examine the perceptual, cognitive, and neurophysiological aspects of human motor control. The graduate student will develop an advanced knowledge of human motor control and different theoretical and methodological approaches will be examined and applied to the understanding of functional movements in all environment, through the work and analysis of associated studies

(3801904) **Seminar of teaching skills in Physical Education**

This course includes modern trends in the teaching of physical education. It includes an introduction to the concept and ethics of modern teaching in physical education. It includes principles of teaching based on critical thinking skills, problem solving, active learning and multiple intelligences. It includes effective teaching skills based on modern terminology (knowledge economy, Life skills, teaching in the digital world, good citizenship in teaching), as well as the characteristics of the teacher in the world of the knowledge society, scientific standards in teaching

(3801905) **Studies in Sport psychology**

This course will increase students' understanding of the diverse personal, socio-cultural, and institutional factors that influence health, physical activity, and nutrition-related behaviors, and ultimately intervention design and approach. The course will cover the social determinants of health and health disparities, theoretical models of health behavior change, and intervention/behavior change strategies and tools. Students coming away from this course will have a better understanding of how to apply health behavior change models to promote physical activity and healthy eating in diverse populations through tailored interventions. Keeping your head in the game is one of the hallmarks of success for high performance athletes and this course explores the psychological aspects of achieving that capability. Through examining research-based evidence of successful practices and techniques to produce that winning edge, students will become versed in the process of coaching athletes to possess and function with athletic mental toughness. Provides an in-depth focus on the conceptual elements of contemporary psychoanalytic, cognitive, social, existential and systematic theories of personality and behaviour change as applied to sport.

(3802907) **Olympic and Paralympics Movement**

This course aims to Identify the Olympic movement and to know the goal and objectives of the Olympic movement and to know the Olympic constitution.

(3801906) **Programs Of Supervisory Behavior in Physical Education**

The course deals with identifying supervisory behavior to the students, providing information regarding the process of improving teacher behavior in physical education. Some programs among supervision and educational leadership and practical implementation are of concern. In addition to some topics such as resistance of changes in the field, supervisory systems to develop tasks and processes in physical education, as well as supervisory quality control circle in the field.

(3801907) **Contemporary Administration Systems in Physical Education:**

Objectives of this course is deep understanding to modern administration systems in sport planning for different level of sports, also modern principles in organizing and supervising in sport, developing public relation programs, marketing and sport communication methods.

Time and individual management, modern research in public relation and communication in PE.

(3801908) **Designing Strategies in Sport**

The objective of this course is to provide the students with experience and skills of SWOT analysis of sports institutions to be able to build strategy for the development of the organization which contains vision, mission, values, axes, objectives, executive plans and performance evaluation criteria

(3801909) **Professional Preparation for Physical Education Teaching and Supervision**

This course deals with theoretical information and related practical experience in relation to the process of preparing physical education teachers and supervisors to develop their skills and competencies. The integrative role of each one of them to enhance the critical and creative thinking of individuals, the pre-service and in- service training as well as workshops sessions to develop student teachers and future teachers professional practices.

(3801910) **Designing Sport Programmers and Curriculum for Disabled People.**

This aim of this course is to enable PhD students studying physical education of preparing and designing exercise training programmes and rehabilitation programmes for disabled persons. This course also will enable PhD students of designing sport curriculum for disabled students at mainstream schools, special schools of disabled persons and centres for those with disabilities. This course will also enable PhD students of assessing existing exercise programmes and sport curriculum at ordinary schools or special schools of disabled persons and centres for those with disabilities and amend it, if needed, to suit the aims and needs of these persons.

(3801911) **Philosophy and contemporary issues in sports science**

This course will introduce students to the effect and important of sports science and physical activity, also will focus on philosophic studies in sport science< The relationship education and physical education with emphasis on philosophic values and education goals and it application on many sports science and physical Activity aspects

(3801912) **Implementation of teaching technology on physical Education curriculum**

Promotes the acquisition and application of effective teaching skills in physical education, including focus on the current educational technology hardware, software, and research-based practices that seek to have a positive impact on teaching and learning in diverse settings and with diverse populations. Specific emphasis will focus on awareness of best-practice technology integration techniques into the design, execution, and assessment of learning. Students will practice using 21st-century technology equipment to leverage necessary skills as a future education professional. will include assessment, program development, use and evaluation of technologies, collaborative problem solving.