



كتيب برنامج هندسة القوى

كلية الهندسة

2022

قسم الهندسة الميكانيكية والصناعية

Mechanical & Industrial Engineering Department



أولاً:- قوائم مسميات المقررات الدراسية للمرحلة العامة

1st: List of General Courses

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Humanities Courses

العلوم الإنسانية

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
GH141	English I	Nil	3	اللغة الإنجليزية 1	ع 141
GH142	English II	GH141	3	اللغة الإنجليزية 2	ع 142
GH150	Arabic I	Nil	2	اللغة العربية 1	ع 150
GH151	Arabic II	GH150	1	اللغة العربية 2	ع 151
GH152	Technical Writing in Arabic	GH151	1	كتابة التقارير الفنية	ع 152
Total Credits			10	إجمالي عدد الوحدات	

General Science Course

العلوم الأساسية العامة

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
GS101	Mathematics I	Nil	3	الرياضيات 1	ع 101
GS102	Mathematics II	GS101	4	الرياضيات 2	ع 102
GS111	Physics I	Nil	3	الفيزياء 1	ع 111
GS112	Physics II	GS111	3	الفيزياء 2	ع 112
GS112L	Physics Lab	GS111	1	فيزياء معمل	ع 112 م
GS115	Chemistry	Nil	3	الكيمياء العامة	ع 115
GS115L	Chemistry Lab	Nil	1	الكيمياء معمل	ع 115 م
GS200	Computer Programming	Nil	3	برمجة حاسوب	ع 200
GS203	Mathematics III	GS102	3	الرياضيات 3	ع 203
GS204	Mathematics IV	GS102	3	الرياضيات 4	ع 204
GS206	Probability & Statistics	Nil	3	الإحصاء والاحتمالات	ع 206
Total Credits			30	إجمالي عدد الوحدات	



General Engineering Courses

العلوم الهندسية العامة

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
GE121	Engineering Mechanics I	Nil	3	ميكانيكا هندسية 1	هـ ع 121
GE125	Engineering Graphics	Nil	2	الهندسة الوصفية	هـ ع 125
GE127	Engineering Drawing	Nil	2	الرسم الهندسي	هـ ع 127
GE129	Workshop Technology	Nil	2	تقنية الورش	هـ ع 129
GE129 L	Workshop Technology Lab	GE 129	1	معمل تقنية الورش	هـ ع 129 م
GE133	Properties of Materials	GS101 GS111 GS115	3	خواص المواد	هـ ع 133
GE222	Engineering Mechanics II	GE121	3	ميكانيكا هندسية 2	هـ ع 222
Total Credits			16	إجمالي عدد الوحدات	

ثانيا :- قائمة مسميات المقررات الدراسية الملزمة لجميع طلبة القسم

2nd . List of Departmental Compulsory Courses.

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
EE280	Electrical Eng. Fundamentals	GS101,S112L	3	أساسيات الهندسة الكهربائية	هـ كه 280
ME 201	Mechanical Drawing	GE127	2	الرسم الميكانيكي	هـ مك 201
ME202	Workshop Practice	GE129 GE129L	2	تدريبات الورش	هـ مك 202
ME204	Strength of materials	GE121 GE133	3	مقاومة المواد	هـ مك 204
ME205	Stress Analysis I	ME204 CE203	3	تحليل الإجهادات 1	هـ مك 205
ME206	Metallurgy	GE129 GE133	3	علم المعادن	هـ مك 206
ME210	Thermodynamics I	GS102 GS111	3	ديناميكا حرارية 1	هـ مك 210
ME215	Production Engineering I	ME206	3	هندسة الإنتاج 1	هـ مك 215



ME261	Industrial Management	Nil	3	الإدارة الصناعية	هـ مك 261
ME301	Design Of Mechanical ElementsI	ME201 ME205	3	تصميم العناصر الميكانيكية	هـ مك 301
ME302	Heat Transfer I	GS102 ME210	3	انتقال الحرارة I	هـ مك 302
ME306	Mechanics Of Machines I	GE222	3	ميكانيكا الآلات I	هـ مك 306
ME309	Numerical Analysis	GS200 GS203 GS204	3	التحليل العددي	هـ مك 309
ME 312	Fluid Mechanics I	GE222 GS203 ME210	3	ميكانيكا الموائع I	هـ مك 312
ME315	Production Engineering II	ME206	3	هندسة الإنتاج 2	هـ مك 315
ME317	Energy Conversion sys.	ME302	3	منظومات تحويل الطاقة	هـ مك 317
ME318	Measur. & Instrumentations	ME306 ME312 GH152	3	معمل المقاييس وأجهزة القياس	هـ مك 318
ME 322	Principles of Air Con. & Ref.	ME302	3	اساسيات التبريد والتكييف	هـ مك 322
ME325	Mechanical Vibrations	GS204 ME306	3	الاهتزازات الميكانيكية	هـ مك 325
ME330	Automatic Control I	GS204 GE222 EE280	3	التحكم الآلي الصناعي	هـ مك 330
ME365	Eng. Economics & feasibility	ME261	3	الاقتصاد الهندسي ودراسة الجدوى	هـ مك 365
ME599	B.Sc. Project	Min 130 credit	3	المشروع	هـ مك 599
Total Credits			64	إجمالي عدد الوحدات	



ثالثًا :- قوائم مسميات المقررات الدراسية الملزمة والاختيارية لشعبة هندسة القوى

3rd . List for each Branch Compulsory and Elective Courses

A. Mechanical Power Branch

• قائمة مسميات المقررات الملزمة والخاصة بطالبة شعبة القوى فقط

• List of Courses

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
ME 310	Thermodynamics II	ME210	3	ديناميكا حرارية 2	همك 310
ME 313	Fluid Mechanics II	ME312	3	ميكانيكا الموائع 2	همك 313
ME 402	Heat Transfer II	ME302,GS204 ME313	3	انتقال الحرارة 2	همك 402
ME443	Power Plants Engineering	ME310, ME302	3	هندسة واقتصاديات محطات القوى	همك 443
ME490	Mechanical Engineering Lab.	ME318 & NOT LESS THAN 100 Credit	2	معامل الهندسة الميكانيكية	همك 490
Total Credits			14	إجمالي عدد الوحدات	

• قائمة مسميات المقررات الإختيارية الخاصة بشعبة القوى. List of Elective Courses
على الطالب إختيار عدد 5 مقررات إختيارية بإجمالي عدد وحدات 15 وحدة

Course No.	Course name	Pre request	Credits	اسم المقرر	رقم المقرر
		المتطلبات	الوحدات		
EE422	Electric Power & Machines		3	القوى الكهربائية و الآلات	همك 422
ME411	Internal Combustion Engines I	ME310 - ME302	3	محركات الاحتراق الداخلي 1	همك 411
ME414	Incompressible Flow Machines	ME313	3	المضخات	همك 414
ME422	Air Conditioning	ME302- ME310&ME313	3	التكييف	همك 422
ME423	Refrigeration	ME322 &ME310	3	التبريد	همك 423
ME437	Automotive Maintenance	EE280-ME411	3	ميكانيكا السيارات	همك 437
ME501	Engineering Analysis	ME309	3	التحليل الهندسي	همك 501
ME512	Internal Combustion Engines II	ME411	3	محركات الاحتراق الداخلي 2	همك 512



ME 514	Blowers & Compressors	ME313	3	النوافخ والضواغط	هـ مك 514
ME523	Cryogenics	ME423	3	علم إنتاج درجات الحرارة المنخفضة جداً	هـ مك 523
ME527	Gas Dynamics	ME313	3	ديناميكا الغازات	هـ مك 527
ME535	Maintenance Planning	ME461	3	تخطيط الصيانة	هـ مك 535
ME542	Gas & Steam Turbines	ME310 & ME312	3	التوربينات الغازية والبخارية	هـ مك 542
ME545	Water Desalination	ME310&ME302	3	تحلية المياه	هـ مك 545
ME547	Solar Energy Thermal Conversion	ME302	3	التحويل الحراري للطاقة الشمسية	هـ مك 547
ME548	Wind Energy Conversion	ME313	3	تحويل طاقة الرياح	هـ مك 548
ME550	Automatic Control II	ME450/330	3	التحكم الآلي 2	هـ مك 550
ME551	Conversion Of Energy	ME310&ME313	3	تحويل الطاقة	هـ مك 551
ME591	Special Topics		3	مواضيع خاصة	هـ مك 591

الجدول التالي الذي يوضح تفاصيل متطلبات عدد الوحدات التخرج لكل شعبة بالقسم :

القسم	الشعبة أو البرنامج	العلوم الإنسانية		العلوم الأساسية العامة		العلوم الهندسية العامة		المقررات التخصصية الملائمة لجميع طلبية القسم		المقررات التخصصية الملائمة لطلبة الشعبة فقط		العلوم التخصصية الاختيارية	
		عدد	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد	النسبة المئوية من إجمالي عدد الوحدات الكلية	عدد	النسبة المئوية من إجمالي عدد الوحدات الكلية
الهندسة الميكانيكية والصناعية	قوى	10	6.7%	30	20.1%	16	10.7%	64	43.0%	14	9.4%	15	10.1%
	صناعية	10	6.7%	30	20.0%	16	10.7%	64	42.7%	15	10.0%	15	10.0%
	تطبيقية	10	6.7%	30	20.1%	16	10.7%	64	43.0%	17	11.4%	12	8.1%



المحتوى العلمي للمقررات الدراسية

Syllabus of General Courses

GH141 and GH142	English (I,II)	& 3 respectively 3Credits	NIL
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GH141 and GH142 are complimentary courses designed to introduce the student to the basic patterns of scientific English at the introductory stage and thereafter deals with inure advanced materials. Each covers:

- Intensive reading of passage containing material to student needs with comprehension question, contextual references, vocabulary exercises and affixation.
- The study of scientific vocabulary which includes use of dictionary, spelling rules and affixation.
- Revision and studs of Basic English verb tenses, active and passive.
- Description of the laboratory experiment.
- Study arid use of the passive voice in scientific technical English.
- Ing form;
- Compound nouns. The English noun phrases, relative clauses, deletion of relative, relation in active and passive voice.
- Summary writing.

GH150 and GH151	ARABIC (I , II)	respectively 1 & 2Credits	NIL
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Review to Arabic courses taken in high school including construction of Arabic sentence, spilling and punctuation.

GH152	ARABIC TECHNICAL WRITING	Credits 1	NIL
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Writing technical reports, Report preparation and presentation. preparation of minutes of meetings. Translation of technical document.

GS-101	MATH I	Credits 3	NILL
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Limits, continuity, derivatives, chain rule, higher derivatives implied differentiation, trigonometric functions, maxima, minima, point of inflection. Curve sketching, role's theorem, mean value theorem. Definite, and indefinite integrals: Definition,

GS102	MATH. II	Credits 4	GS101
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Methods of integration: By partial fractions, by successive reduction formulaic, transcendental functions; differentiation & integration of transcendental function. Complex numbers, partial differentiation, applications on relative maxima and minima, the method of Lagrange multiplier. Multiple integration with application.

GS-111	Physics I	Credits 3	NIL
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Waves: Wave equations, traveling waves and stationary waves; principles of superposition, Doppler effect.

Sound; Definitions, velocity of sound in air and material media and its variation, velocity of transverse & longitudinal vibration in wires and rods. Echoes briefly.

Optics: properties of light, the electromagnetic character of light; sources of light and their spectra, absorption & scattering, dispersion, polarization of light.

GS-112	Physics II	Credits 3	GS111
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Electrostatics: changes and fields, the electric potential; electric current; the magnetic field, electric fields in matter. Photoelectric effect, Einstein's explanation and quantum theory of the hydrogen atom. Radioactive decay law derivation.

GS-112L	Physics Lab	Credits 1	NIL
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Experiments about sound, light, electricity, magnetism, heat and electro-chemical conversion.

GS-115	Chemistry	Credits 3	NIL
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Measurements and SI units; chemical equations and stoichiometry; structures of atoms and periodic relationships, chemical compounds:

The gaseous state; solutions-electrolytes and non-electrolytes; acids and bases; thermochemistry; chemical equilibrium; ionic equilibrium I and II; organic chemistry.

GS-115L	Chemistry Lab	Credits 1	NIL
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Some experiments related to GS115 course.



GS-200	Computer Programming	Credits 3	NIL
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Introduction to computer science; basic principles of computer structure; basic components of programming languages; problem solving steps; Algorithms; introduction to Programming Language; Tokens; Values & variables; Input & Output statements; Statements, Expressions and Operators; Flow of Controls (if, if..elseif, switch statements, ternary operator); Iteration and loops (while, do-while and for loop statements); Continue and Break statements; Built-in functions, User defined functions; Scope of variables (global, local and static variables); Arrays (one dimensional array, 2 dimensional array, multi-dimensional arrays); some arithmetic operations on arrays; Arrays and functions; File I/O, files and streams, opening and closing files, reading & writing text files; other data types (i.e. structures, pointers)

GS-203	Mathematics III	Credits 3	GS-102
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Vector analysis, div, grad, curl, Green's, Gauss's and Stokes theorems and their applications, Linear algebra, matrices and their applications. N-Euclidean space, vector spaces. Matrices, algebra of matrices, rank of a matrix, linear transformation, system of linear equation, equivalent and similar matrices, eigen values and eigenvectors.

GS-204	Mathematics IV	Credits 3	GS-203
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Ordinary differential equations, differential equations of first order and first degree, different forms, non-linear differential equations of first order, linear differential equations constant coefficients; homogeneous case, method of variation of parameters, method of undetermined coefficient; method of laplace transforms, simultaneous differential equations in series; gamma, beta functions, Bessel function, modified bessel function, Legendre polynomials; spherical harmonics, hyper-geometric function.



GS-206	Probability and Statistics	Credits 3	NIL
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Probability: concept of a random experiment and sample space; addition and multiplication laws of probability; conditional probability and independence, Bay's theorem and its application. Random variables and their probability distribution; Binomial, poisson, Normal, Gamma, Exponential, Uniform and cauchy distributions and their properties.

Basic statistical concepts: Statistical data, measures of central simple linear regression, regression coefficient and correlation coefficient, non-linear regression. Fitting of linear and non-linear regression to data. Multiple linear regression and multiple correlation coefficient.

GE-121	Engineering Mechanics I (Statics)	Credits 3	NIL
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Statics of particles; forces in plane and space; statics of rigid bodies : Equivalent system of forces; equilibrium in two and three dimensions, work and energy, analysis of trusses, frames, and machines, free body diagram; kinematic; stability friction, centroids and center of gravity-lines, area and volumes. Moment of inertia of areas and masses.

GE-125	ENGINEERING GRAPHICS or “ DESCRIPTIVE GEOMETRY “	2Credits	Nil
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Introduction, the purpose of Descriptive Geometry, different types of projection. Representation of point, line and plane. Position problems. Metric problems. Projection on auxiliary views. Polyhedrons, development and intersections. Circle and sphere. Cone and cylinder. Curved surfaces, development and Intersection.

GE-127	ENGINEERING DRAWING	Credits 2	Nil
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Introduction; definitions, conventions. Instrument, dimensioning, some geometrical constructions; e.g., drawing of some polygons, parallel lines, line and arc tangents.



Projection; theory, types of projection, one view projection, multi-view projection, first and third angle projection, applications, including missing line views. Sectional views; complete section, half section, part section, removed sections, revolved section, and applications.

GE-129 & GE129I	WORKSHOP TECHNOLOGY and	Credits 2+1	Nil
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Industrial safety; engineering materials and their mechanical and physical properties; classifications, ferrous and nonferrous metals, natural and synthetic materials; introduction to manufacturing processes: casting, welding, forging, rolling, extrusion; sheet metal working methods, metal machining.

GE-133	PROPERTIES OF MATERIALS	Credits 3	Nil
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Elastic and plastic behavior of metals, plastic deformation of metals; atomic structure of materials, crystal geometry of; electrical, magnetic and optical properties of materials; materials at high temperature; recovery, recrystallization, grain growth; fatigue of metals; corrosion of metals and alloys; oxidation of metals and alloys.

GE-222	ENGINEERING MECHANICS II	Credits 3	GE-121
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Introduction to dynamics. Kinematics of particles; Kinematics of rigid bodies. Three-dimensional motion of a particle relative to a rotating frame (Coriolis acceleration). D'Alembert's principle. Kinetic energy of a rigid body in plane motion. Kinetics of rigid bodies in three dimensions; motion of a gyroscope. Introduction to mechanical vibrations.



محتويات المقررات الملزمة لجميع البرامج (الشعب)

Syllabus of Departmental Compulsory Courses

for Mechanical & Industrial Engineering

EE280	Electrical Engineering Fundamentals	3 Credits
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Pre-requisite: GS101,S112L

Kirchoff laws and applications, network theorems, applied electromagnetism and magnetic circuits, self and mutual inductance, rise and fall of current in an inductive circuit, capacitance, charging and discharging of capacitors, stored energy, alternating voltages and currents, average and R.M.S. values pastors, complex notation, R-L-C circuits resonance, quality factor. Power calculations.

ME201	Mechanical Drawing	2 Credits
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Pre-requisite: GE127

Introduction: Revision to engineering drawing. Types of mechanical drawings: Symbols, abbreviation and conventions. Fasting elements: Screw, key, pin, welding. Surface texture and surface finish symbols: Dimensional fits, tolerances. General purpose constructional machine elements: Gears, coupling, bearing, pipe thread, pipe joints, cams, springs, rivets.

ME202	Workshop Practice	2 Credits
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Pre-requisite: GE129 & GE129L

Bench .work operation-drilling, countersinking, drilling blind holes, tapping; operation of lathe, drill press, shaper and milling machine-turning operation, thread cutting; plane surface and V-surface on shaper; side and face milling, T-slot milling. Welding straight and vertical. Foundry pattern making, sand testing hardness, permeability and strength.

ME204	Strength of Materials	3 Credits
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Pre-requisite GE121

Structural loading analysis: Types of structural loading, Classification of frames and beams, Statically determinate and indeterminate structures, Calculation of structure reactions.

Loading diagrams (beams): The method of sections, Shear in beams, axial force in beams, bending moment in beams; Shear, axial-force and moment diagrams; Step by



step procedure, Shear diagram by summation; Moment diagram by summation; Shear force and bending moment relations.

Deflection of beams: Differential equation of deflection curve; Deflection by integration of the bending equation; Moment-area method; Temperature effects; Continuous beams.

Torsion: Circular and non-circular solid shafts; Hollow circular shafts; Thin-walled tubes; Shear center and shear flow.

Introduction to stress and strain analyses: Normal and shear stresses and strains; volumetric strains; Poisson's ratio; Hook's law; Engineering strains; True strains; Uniform deformation; Tensile tests; True stress-true strain curves; Point of instability.

ME205	Stress Analysis I	3 Credits
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Pre-requisite: ME204

Introduction to stress and strain analysis: Engineering and true stresses and strains, Stress-strain relationship, Stress equilibrium equation, Simple torsion theory, Normal and shear stresses, Stresses of combined loading.

Stresses in bodies of revolution: Thin-walled pressure vessels (cylinders and spherical).

Stresses on oblique surfaces: Graphical representation of stress and strain, Principle stresses and strains, Mohr's circle for stress and strain, Plain stress and strain conditions.

Introduction to Failure theories: Static failure theories for ductile and brittle materials; Maximum shear stress theory, Maximum distortion energy theory, Maximum principle stress theory, Mohr-coulomb theory.

ME206	Metallurgy	3 Credits
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Pre-requisite: GS111-GS102

Elementary theory of structure of metals, atoms, space lattice, crystal systems, arrangement of atoms; plastic deformation of metals, hot and cold working, recovery, recrystallization; grain growth; phase diagram, solidification of pure metals and alloys, equilibrium diagram; heat treatment of steel, TTT curves, heat treating processes, corrosion of metals; cast irons, carbon steels, alloy steels, nickel and its alloys, bearing metals, fusible alloys; introduction to powder metallurgy.

ME210	Thermodynamics I	3 Credits
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Pre-requisite: GS111-GS102

Introduction; historical background, units, definitions, concepts of heat, temperature, force and work. Closed system and control volume; equation of state for ideal gas; properties of pure substances. The first law of thermodynamics, reversible and irreversible processes. The second law of thermodynamics and Its corollaries,



temperature scale, entropy, closed system processes, steady and unsteady flow processes, thermodynamic cycles.

ME215	Production Engineering I	3 Credits
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Pre-requisite: ME202 - ME206

Mechanical working of metals, hot and cold working. Analysis of forging, rolling, drawing extrusion. Press working processes, equipment's and tools. Rubber and plastic forming methods. Introduction and classification of machine tools, cutting tools and their materials. Cat Ling fluids.

ME261	Industrial Management	3 Credits
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Pre-requisite: NIL

Concept of management, scientific management, functions and types of management, span of control; forecasting, factory planning, production planning and control, material management, work study, decision making, capital budgeting, personal management, industrial safety, maintenance planning.

ME301	Design Of Mechanical Elements I	3 Credits
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Pre-requisite: ME201, ME204 & ME205

Introduction to design and design processes; Calculations of bolted and riveted joints, Power screws and welded joints. Keys and splines: types and stress calculations. Design of spur gears and springs, Selection of rolling elements bearings.

ME302	Heat Transfer I	3 Credits
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Pre-requisite: GS203 & ME210

Introduction: conduction, convection, radiation, electrical analogy. Overall heat transfer coefficient. Conduction: steady state one dimensional heat flow in slabs, cylinders and spheres; critical insulation, internal heat generation, variable conductivity, extended surfaces; Steady state two dimensional conduction (Cartesian coordinates). Transient Heat Conduction. Radiation, absorption, reflection and transmission. Kirchoff's law, Stefan Boltzmann lap. Radiation intensity, emissive power, radiation between black and grey bodies. Heat exchangers.

ME306	Mechanics Of Machines I	3 Credits
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Pre-requisite: GE222

Kinematics: Mechanisms, Classification, Velocity and acceleration by analytical and graphical methods, Force analysis. Introduction to the theory of cams. Gears: Terminology, Classification, Gear trains.



Crank-effort diagrams: Flywheel effect on speed and energy fluctuations in engines.

ME309	Numerical Analysis	3 Credits
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Pre-requisite: GS200 GS203 & GS204

Basic concepts and analysis of errors, the Taylor series and numerical differentiation, roots of equations, optimization, simultaneous linear algebraic and nonlinear set of equations, curve fitting and interpolation, numerical integration, ordinary differential equations (initial value problems, boundary value problems and Eigen value problems), and using computer for solving these numerical methods.

ME312	Fluid Mechanics I	3 Credits
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Pre-requisite: GE222, GS203 & ME210

Introduction: continuum concepts and fluid properties; static pressure and its variation with height; pressure and force on submerged surfaces, buoyancy, fluid motion under linear acceleration and rotation of the container; stream line, vortices and circulation; concept of control volume, integral form of continuity and momentum equations; Euler's equation, Bernoulli's equation; Navier—Stoke's equation and stress field, viscous effects and energy dissipation; application of Bernoulli's equation, momentum equations; energy equation in integral form; static, dynamic and stagnation pressures; Pitot and static tube.

ME315	Production Engineering II	3 Credits
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Pre-requisite: GE129

Metal casting; molding materials, pattern, core making. Various casting processes; melting practices, felling, finishing, and casting defects. Welding processes and equipment. Types of welds, welding rods and electrodes, defects, inspection of welding joints.

ME317	Energy Conversion sys	3 Credits
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Pre-requisite: ME302

Fuels and Combustion: Types of fuels, Combustion equation, Stoichiometry, theoretical air required for complete combustion, Excess air, Calculation of combustion products.

Heat engines: definition, classification, basic components, Standard cycles, Terminology and Working principle and power conversion mechanism. Environmental impacts.

Renewable energies: definition of renewable energy, Classification, Applications. Working principle and energy conversion mechanism and environmental impacts.



ME318	Measur. & Instrumentations	3 Credits
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Pre-requisite: ME306, ME312 & GH152

Introduction to measurement systems, experiment planning, report writing, analysis of experimental data, error analysis, uncertainty analysis, statistical and probability analysis, normal distribution; correlation and regression analysis method of least square; mechanical and electrical devices for measuring displacement, velocity, pressure, temperature, flow rate, thermal and transport properties, force, torque and strain. Mechanical sensors, input-output devices, amplifications and instrumentation.

ME322	Principles of Air Con. & Ref	3 Credits
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Pre-requisite: ME302

Principle, concept and methods of air conditioning; Properties of moist air; Air conditioning processes; Summer and winter air conditioning cycles; human comfort and air conditioning; Ventilation and infiltration of air for buildings and the equipment of ventilation; Air conditioning systems types and selections; Principle of refrigeration systems and applications; Refrigerants properties and how to selections; Refrigeration cycles and performance.

ME325	Mechanical Vibrations	3 Credits
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Pre-requisite: GS204 & ME306

Free vibration: equation of motion, natural frequency, viscous damping; forced vibration: Harmonically excited vibration, rotating unbalance. Multi-degrees of freedom system: Normal mode vibration, co-ordinate coupling, vibration absorber, vibration isolation.

ME330	Automatic Control I	3 Credits
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Pre-requisite: GS204, EE280 & GE222

Introduction to automatic control, review of Laplace transformation, mathematical models of dynamic system: system modeling, electrical and electronic circuits, block diagrams and signal flow graphs, mechanical system, electromechanical systems, sensors, temperature control system, robotic control system, analogous systems and linearization; State variable models, Characteristics of closed loop control system, performance of feedback control system in time domain; Basic modes of control, pneumatic controllers; Poles, zeros and stability; Root locus analysis; introduction to frequency response analysis; Introduction to discrete processes control.

ME365	Eng. Economics & feasibility	3 Credits
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Pre-requisite: ME261

Elements of engineering economics: measures of financial effective- ness, economical studies and accounting, costing, break even analysis. Value analysis. Interest and money time relationship, depreciation, capital financing and budgeting.



Selection between alternatives. Replacement theory. Economic studies of public projects. Case studies.

ME599	B.Sc. Project	3 Credits
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Pre-requisite: Min.130 credits and completion of 100, 200 & 300 level courses

Projects is an in-depth theoretical and/or an experimental investigation of specific problem in different fields of mechanical and industrial engineering.

محتويات المقررات الملزمة لبرنامج هندسة القوى

Mechanical Power Branch only (Compulsory courses)

ME310	Thermodynamics II	3 Credits
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Pre-requisite: GS115 & ME210

Vapour and gas power cycles, efficiency, and work ratio, specific. Steam consumption. Refrigeration cycles, coefficient of performance. Availability and irreversibility. General thermodynamic property relationships, Vander Walls equation, generalized property charts, properties of mixture of gases, ideal gas mixture, and adiabatic saturation. Air psychrometry, combustion- stoichiometry. Energy free energy of chemical reaction, chemical equilibrium, Gibb' s function for simple chemical systems.

ME313	Fluid Mechanics II	3 Credits
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Pre-requisite: ME312

Dimensional analysis, Buckingham pi- theorem, similitude and limitations; fully developed laminar flow in pipes, annuli and between plates, shear stress distribution, and laminar flow over bluff bodies, transition and turbulence, turbulent. flow in smooth and rough pipes, velocity profile and moody diagram; application of energy equation, calculation of friction losses and minor losses in bends and pipe fittings, concept of boundary layer; Blasius solution over flat. plate, momentum integral equation; turbulent boundary layer over flat plate, pressure and skin friction drag, wake and separation; stream lining a body, lift and drag coefficient; flow measurements by bends, orifice, nozzle, venture; basic equations for isentropic one dimensional compressible flow stagnation properties; flow through nozzles and diffusers, Fanno and Rayleigh lines in constant area ducts. Normal shocks.

ME402	Heat Transfer II	3 Credits
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Pre-requisite: GS204, ME302 & ME313

Two and three dimensional steady state conduction, extended surface with variable areas, internal heat generating systems. Transient and periodic heat flow;



forced convection for turbulent flows over bluff bodies and bank of tubes; convection at high speeds; natural convection over vertical and inclined surfaces; gas, flame and solar radiation; heat transfer with phase change, boiling, condensation; parallel and contour flow heat. Exchangers and design criteria; introduction to mass transfer.

ME443	Power Plant Engineering and Economy	3 Credits
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Pre-requisite: ME302 & ME310

Sources of energy, types of power plants, elements of electrical energy unit cost, analysis of variation of loads on the system, basis of economical distribution, Economical planning for extension of power plant system, evaluation of construction and operational costs bases on economical basis, evaluation of economic system reserve. Theoretical and actual power plant cycles; cycles for multi-purpose plants. Steam generators: furnaces, super heaters and reheaters, economizer and air preheater, condensers, water preheaters, draft systems. Introduction to nuclear energy, nuclear reaction, nuclear fuel, reactor control, some nuclear power reactors (PWR, BWP, OCR).

ME490	Mechanical Engineering Lab.	2 Credits
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Pre-requisite ME318

A number of experiments in the fields of :forced vibration, Automatic control Whirling of shafts Gyroscope Ram pump , friction in pipes, solar energy, X-flow H.E., Air compressor. Student should performs each of the above experiments and to submit a FULL report Which include; Introduction . and theoretical background of the experiment, discussion of results, error analysis on measured data , and conclusions.



محتويات المقررات الاختيارية لبرنامج هندسة القوى Syllabus of Elective courses for Mechanical Power Branch

ME411	Internal Combustion Engines I	3 Credits
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Pre-requisite: ME302 & ME310

Introduction; theoretical and actual cycles of two-stroke and four-stroke engines, factors affecting the actual processes, performance characteristic variables of working cycles and stable operation, supercharging engines and performance, heat balance, mixture fuel injection in SI engines, Octane and Cetane numbers, IC engines, injectors and fuel pumps, ignition system, flame propagation, normal and abnormal combustion, peregination, spark advancing, detonation and knock, scavenging in two-stroke engines, types of combustion chambers.

ME414	Incompressible Flow Machinery I	3 Credits
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Pre-requisite: ME313

Introduction, classification of pumps, displacement pumps; reciprocating and rotary types, performance characteristics and applications; rotodynamic pumps: head generation theory, centrifugal, mixed flow and propeller pumps, characteristic curves, similarity rules, cavitation, water hammering and suction limitation; axial thrust and its balancing, selection of pumps; introduction to water turbines.

ME422	Air Conditioning	3 Credits
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Pre-requisite: ME302 ME310 & ME313

Introduction: moist air properties and conditioning, processes, comfort and health, heat transmission in building structures, space heating load, space cooling load (the method of LTD), types of air- conditioning systems, air distribution system, duct sizing, fluid distribution system and pipe sizing, selection of air conditioning equipment.

ME423	Refrigeration	3 Credits
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Pre-requisite: ME302 & ME310

Mechanical vapor compression refrigeration cycles; carnet refrigeration cycle, single stage cycle, compressors, evaporators, condensers _and cooling towers; properties mixtures, steady flow process with binary mixture; rectification, absorption refrigeration systems; aqua ammonia absorption systems; Li- Br absorption system; refrigerants; cooling load calculations, wall gain load, air change load, product load; refrigeration; equipment and their selection and arrangements.



ME437	Automotive Maintenance	3 Credits
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Pre-requisite: EE280&ME411

Starting system fundamentals: Electric motor principles, starter parts, operation of solenoid, starter electrical circuit. Charging system: Electrical generation principles, alternator parts, operation of a voltage regulator. Braking system: basic principles of braking (including friction, pressure, heat dissipation), hydraulic system operation, operation of power braking, basic operation of anti-lock brake systems. Tire and wheel theory. Suspension system : parts of typical suspension systems, function of each suspension system component. Steering system : parts of steering systems, principles of steering systems, operation of steering systems. Clutch fundamentals: basic clutch, operation of the clutch. Manual transmission fundamentals: relation between gears and torque, basic types of gears, Gear ratio, trace of power true transmissions.

ME501	Engineering Analysis	3 Credits
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Pre-requisite: ME309

Methods for formulating mathematical models for engineering problems; examples may be drawn from the field of dynamics, elasticity, fluid mechanics, heat transfer and electro-mechanics. Three classes of engineering problems could be considered, namely, equilibrium, Eigen value, and propagation problems; techniques for obtaining approximate solutions; methods for casting models into forms appropriate for solution on digital computer.

Equilibrium Problems: steady state problems, e.g. steady temperature distribution, equilibrium displacements, voltages, etc.

Eigenvalue Problems: like equilibrium problems, but critical values of certain system parameters are to be determined, e.g. natural frequencies, buckling loads, principal stresses, etc.

Propagation Problems: initial value problems, predict the state of a system at some future time from the knowledge of its present condition, e.g., heat propagation, transition motion of a structure, etc.

Each of these types of problems can be modeled in two ways:

(I) Lumped-parameter mode (results in a set of algebraic equations);

(II) Continuum Model (results in a governing differential equation).

Numerical Techniques: several techniques could be adapted to solve the models specified above. However, some or all of the following methods could be implemented.

(I) Algebraic Equations: Creamer's Rule; Gaussian Elimination; Matrix Inversion, Iterative Techniques.

(II) Differential Equations: Weighted-Residual Methods; Finite Difference Methods; Finite Element Methods; Numerical Differentiation and Integration Techniques.



ME512	Internal Combustion Engines II	3 Credits
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Pre-requisite: ME411

Engine fuels: characteristics of gasoline and diesel fuel. Intake and exhaust systems turbochargers and superchargers. Electronic control on main engine systems: electronic control system, components of electronic control system. Air flow system: air flow sensors. Injection fuel system: calcifications of fuel injection systems, components of fuel injection systems. Ignition system fundamentals: calcifications of ignition systems, components of fuel ignition systems. Sensors Emission control system fundamentals: components of emission system, operation and control of emission systems.

ME 514	Blowers & Compressors	3 Credits
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Pre-requisite: ME313

Introduction; types and elements of compressors, fans and blowers, diff users; theory of reciprocating, centrifugal and axial flow compressors and fans; cascade theory, degree of reaction and staging; performance characteristics, pressure coefficient and surging; design of axial and radial flow fans, dynamic similarity, system resistance for fans in series and in parallel, performance characteristics. Torque converters, their operational characteristics and construction features.

ME523	Cryogenics	3 Credits
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Pre-requisite: ME423

Introduction: cryogenic systems, low temperature properties of engineering materials. Liquefaction of gases: liquefaction of gases other than neon hydrogen and helium; liquefaction system for neon, hydrogen and helium; critical components of liquefaction systems. Gas separation and gas purification systems: principles of gas separation and rectification; air separable-. Systems. Cryogenic refrigeration systems. Cryogenic fluid storage transfer syste

ME527	Gas Dynamics	3 Credits
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Pre-requisite: ME313

Brief review, mass, momentum and energy equations for one dimensional compressible flow; isentropic flow through nozzles and diffusers; design of supersonic nozzles and diffusers; normal shock, two-dimensional expansion shock, oblique shock; transonic, supersonic and hypersonic flow analysis; Prandtl- Mayer 2- D expansion; linearized theory for 2-D flow with small perturbation; method of characteristics for 2-D supersonic flow; unsteady one dimensional compressible flow.



ME535	Maintenance Planning	3 Credits
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Pre-requisite ME261

Maintenance and need for planning of maintenance. Maintenance practices: breakdown maintenance, preventive maintenance. Elements of preventive maintenance system. Categorizations of equipment, design of an inspection system and methods of lubrication. Planning and scheduling of maintenance work. Spare parts management. Maintenance records and their analysis. organization of maintenance.

ME542	Gas & Steam Turbines	3 Credits
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Pre-requisite: ME310 & ME313

Introduction, Classification of turbines, analysis of ideal, basic and modified gas turbine cycles; reheat, inter-cooling and regeneration, multi-stage systems; design of nozzles, performance; combustion system and heat losses, performance characteristics; matching of gas turbine components; working principle of axial flow steam turbines, compounding, velocity diagrams, thrust, staging and degree of reaction. Impulse and reaction design of multi-stage turbines, efficiencies, governing systems.

ME545	Water Desalination	3 Credits
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Pre-requisite: ME302 & ME310

Water sources, demand, quality and desalting processes; fundainentals of main desalting processes; multi effect evaporators, multi stage parting, solar stills, reverse osmosis, electro-dialysis; general systems engineering: single and dual purpose plants, agro--industrial complexes.

ME547	Solar Energy Thermal Conversion	3 Credits
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Pre-requisite: ME302

Introduction to solar energy and its conversion for use on earth, world wide energy demand, world wide solar energy availability, overview of solar energy conversion methods, solar energy applications, Fundamentals of solar radiation, the physics of the sun and its energy transport, solar position in relation to earth, reckoning of time, sun path diagram, shadow determination, thermal radiation, radioactive properties of real surfaces, measurements of surface radiation properties, radiation exchange between surfaces, solar radiation, extraterrestrial irradiation, atmospheric attenuation, instantaneous values of terrestrial irradiation, long-term values of terrestrial irradiation, insulation on tilted surface, absorbed solar radiation, solar radiation measurement, Methods of solar collection and thermal conversion, flat-plate solar energy collectors, general description, selective absorber surfaces, transparent plates, energy balance of flat-plate collectors, collector energy losses, thermal analysis of collectors, collector performance, instantaneous collector performance, long-term collector performance, collector performance testing, concentrating collectors, high temperature collectors, general concept and different geometries, thermal analysis of



concentrating collectors, performance of compound parabolic concentrators, Thermal energy storage, storage of solar energy, water storage, stratification in water storage, packed-bed storage, phase-change storage, Controls and economics of a solar system, controls for solar thermal system, mathematical models of solar systems, introduction to solar energy process economics, time value of money, life cycle saving analysis, payback time, cost benefit analysis and optimization, Solar heating systems, service water heating systems, space heating systems, mathematical modeling of a liquid-based solar heating system, performance of a liquid system, liquid system design : the f-chart method, Solar cooling systems, vapor-compression refrigeration cycle, absorption-refrigeration cycle, aqua-ammonia absorption systems, lithium bromide-water absorption system, solar-operated absorption systems, solar Rankine-cycle cooling system, miscellaneous cooling methods, evaporative cooling, adsorption process, radiative cooling, Notes on solar ponds, solar power, and solar distillation, solar ponds, solar thermal power, solar distillation.

ME548	Wind Energy Conversion	3 Credits
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Pre-requisite: ME313

Introduction, history of wind turbines, types of vertical and horizontal axes turbines, wind power climatology, wind characteristic measurement, wind speed and power at various heights, wind power available, flow analysis over blades, momentum theory, vortex theory, drag and lift, blade velocity diagram, forces and moments for vertical wind gradient, optimum rotor determination Glauert method, blade design and methods of construction, size of turbines and control, brakes, tower installation, concept of system design and cost viability for pumping, power generation and storage, performance of wind turbine systems.

ME550	Automatic Control II	3 Credits
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Pre-requisite: ME330 & ME450

Design of control system by root locus method, design of control system using frequency response, PID controllers and a brief description of robust control, state space method for design of control systems, design of discrete data control system.

ME551	Conversion Of Energy	3 Credits
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Pre-requisite: ME310&ME313

Introduction; sources of energy and conversion methods, merits and demerits, energy based systems relevant to Libya, house heating and cooling, Thermal insulation analysis, cost analysis and optimization between insulation cost and saved energy, air conditioning, process industries, utilizing of passive systems in heating and cooling of buildings, process industries, furnaces, burners and boilers, recycling and storing of energy, system, energy consumptions and cost analysis of processes, equipment, waste



heat recoveries, energy from waste and biomass, wind and solar power to appropriate technology, thermo-siphon-loop, economic optimization of systems, energy conservation policy; case study.

ME591	Special Topics	3 Credits
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نموذج قائمة المقررات الدراسية للبرنامج الدراسي لهندسة القوى
لدرجة البكالوريوس - الخطة الدراسية
(توزيع المواد على 10 فصول دراسية)

قسم الهندسة الميكانيكية و الصناعية

كلية الهندسة

البرنامج الدراسي لشعبة القوى الميكانيكية

الشعبة: قوى

تاريخ تأسيس القسم: 1961 م

عدد الوحدات التعليمية المعتمدة: 149 وحدة

مدة الدراسة: عشرة فصول دراسية

مجموع الوحدات	المتطلبات السابقة	نوع المقرر	توزيع الساعات			عدد الساعات	عدد الوحدات	اسم المقرر	رمز المقرر	الفصل الدراسي
			العلمي	التدريب	المحاضرات					
16	-	د		1	3	4	3	Mathematics I	GS101	الفصل الأول
	-	د		1	3	4	3	Physics I	GS111	
	-	د		1	3	4	3	Engineering Mechanics I	GE121	
	-	د			2	2	2	Workshop Technology	GE129	
	-	ج			3	3	3	English I	GH141	
	-	ج			2	2	2	Arabic I	GH150	
15	GS101	د		1	4	5	4	Mathematics II	GS102	الفصل الثاني
	GS111	د		1	3	4	3	Physics II	GS112	
	GS111	د	3			3	1	Physics Lab	GS112L	
	GH141	د			3	3	3	English II	GH142	
	GH150	ج			1	1	1	Arabic II	GH151	
	-	د	3		1	2	2	Engineering Drawing	GE127	
	-	د	3			3	1	Workshop Technology Lab	GE129L	
15	-	د		1	3	4	3	Chemistry	GS115	الفصل الثالث
	GS102	د		1	3	4	3	Mathematics III	GS203	
	-	د	3		1	2	2	Engineering Graphics	GE125	
	GS101 GS111 GS115	د		1	3	4	3	Properties of Materials	GE133	
	GE121	د		1	3	4	3	Engineering Mechanics II	GE222	
	-	د	3			3	1	Chemistry Lab	GS115L	
17	GS102	د		1	3	4	3	Mathematics IV	GS204	الفصل الرابع
	-	د	2		2	4	3	Computer Programming	GS200	
	GS101 GH112L	د		1	3	4	3	Electrical Eng. Fundamentals	EE280	
	-	د		1	3	4	3	Probability & Statistics	GS206	
	GE127	ت	2	3	1	5	2	Mechanical Drawing	ME201	
	GS111 - GS102	ت		1	3	4	3	Thermodynamics I	ME210	



مجموع الوحدات	المتطلبات السابقة	نوع المقرر	توزيع الساعات			عدد الساعات	عدد الوحدات	اسم المقرر	رمز المقرر	لفصل الدراسي
			العملية	التدريب	المحاضرات					
15	GE129 GE129L	تخصصي	3			3	2	Workshop Practice	ME202	الفصل الخامس
	GE129 GE133	تخصصي		1	3	4	3	Metallurgy	ME206	
	GH151	جامعي			1	1	1	Technical Writing	GH152	
	GE121 GE133	داعم		1	3	4	3	Strength of materials	ME204	
	GE222	تخصصي		1	3	4	3	Mechanics Of Machines I	ME306	
15	GS203 GS204 GS200	تخصصي		1	3	4	3	Numerical Analysis	ME309	الفصل السادس
	ME206	تخصصي		1	3	4	3	Production Engineering I	ME215	
	ME210	تخصصي		1	3	4	3	Heat Transfer I	ME302	
	ME204	تخصصي		1	2	3	3	Stress Analysis I	ME205	
	ME206	تخصصي		1	3	4	3	Production Engineering II	ME315	
GS204 GE222	تخصصي		1	3	4	3	Mechanical Vibrations	ME325		
15	GS203 GE222 ME210	تخصصي		1	3	4	3	Fluid Mechanics I	ME312	الفصل السابع
	ME302	تخصصي		1	3	4	3	Principles of Air Con. & Ref.	ME322	
	ME302	تخصصي		1	3	4	3	Energy Conversion sys.	ME317	
	ME201 ME205	تخصصي		1	3	4	3	Design Of Mechanical Elements I	ME301	
		تخصصي		1	3	4	3	Industrial Management	ME261	
15	ME306 ME312 GH152	تخصصي		1	3	4	3	Measur. & Instrumentations	ME318	الفصل الثامن
	GS204 EE280 GE222	تخصصي		1	3	4	3	Automatic Control I	ME330	
	GS200	تخصصي		1	3	4	3	Eng. Economics & feasibility	ME365	
	ME210	تخصصي		1	3	4	3	Thermodynamics II	ME310	
	ME312	تخصصي		1	3	4	3	Fluid Mechanics II	ME313	
14	GS204 ME302 ME313	تخصصي		1	3	4	3	Heat Transfer II	ME402	الفصل التاسع
	ME302 ME310	تخصصي		1	3	4	3	Power Plants Engineering	ME443	
	ME318 & min 100 credit	تخصصي	3				2	Mechanical Engineering Lab.	ME490	
	Choose From Table of Elective Power Courses	تخصصي		1	3	4	3	Elective Power Course # 1	ME***	
		تخصصي		1	3	4	3	Elective Power Course # 2	ME***	
12	Choose From Table of Elective Power Courses	تخصصي		1	3	4	3	Elective Power Course # 3	ME***	الفصل العاشر
		تخصصي		1	3	4	3	Elective Power Course # 4	ME***	
		تخصصي		1	3	4	3	Elective Power Course # 5	ME***	
	Min 130 credit	تخصصي		1	3	4	3	مشروع التخرج B.Sc project	ME599	