



**Ministry of Higher Education & Scientific Research
University of Mosul
College of Engineering**



Mechanical Engineering Department

B.SC. CURRICULUM COURSES 2019/2020

General Mechanical Engineering

First Year

Course No.	Subject	First term			Second term			Unit no.
		Theo.	App.	Prac.	Theo.	App.	Prac.	
ME 101	Mathematics I	3	-	1	3	-	1	6
ME 102	Computer Programming I	2	2	-	2	2	-	6
ME 104	Elect. Eng. I	2	1	-	2	1	-	5
ME 111	Eng. Mech. I	2	-	1	2	-	1	4
ME 112	Eng. Drawing & Descriptive geometry	1	4	-	1	4	-	5
ME 113	Principles of manufacturing processes	2	2	-	2	2	-	6
ME 114	Eng. Metallurgy	2	1	-	2	1	-	5
ME 121	Freedom and human rights	2	-	-	2	-	-	4
ME 122	Arabic Language	1	-	-	1	-	-	2
Total		17	10	2	17	10	2	43

Second Year

Course No.	Subject	First term			Second term			Unit no.
		Theo.	App.	Prac.	Theo.	App.	Prac.	
ME 201	Mathematics II	3	-	1	3	-	1	6
ME 202	Computer programming II	2	2	-	2	2	-	6
ME 211	Fluid Mechanics I	2	-	1	2	-	1	4
ME 212	PThermodynamics	2	-	1	2	-	1	4
ME 213	Strength of material	2	-	2	2	-	2	4
ME 214	Mechanical Drawing	-	3	-	-	3	-	2
ME 215	Engineering Mechanics II	2	-	1	2	-	1	4
ME 216	Mech. Lab.	-	3	-	-	3	-	2
ME 221	English Language	2	-	-	2	-	-	4
Total		15	8	6	15	8	6	36

Third Year

Course No.	Subject	First term			Second term			Unit no.
		Theo.	App.	Prac.	Theo.	App.	Prac.	
ME 301	Engineering & Numerical Analyses	3	1	1	3	1	1	7
ME 311	Heat Transfer	2	-	1	2	-	1	4
ME 312	Internal Combustion Engine	2	-	1	2	-	1	4
ME 313	Mechanics of Machines	2	-	1	2	-	1	4
ME 314	Machine Element Design	2	-	1	2	-	1	4
ME 315	Fluid Mechanics II	2	-	2	2	-	2	4
ME 316	Manufacturing Processes	2	2	-	2	2	-	6
ME 321	Mech. Lab	-	3	-	-	3	-	2
ME 324	Industrial Management	2	-	-	2	-	-	4
Total		17	6	7	17	6	7	39

Forth Year

Course No.	Subject	First term			Second term			Unit no.
		Theo.	App.	Prac.	Theo.	App.	Prac.	
ME 401	Electrical Engineering II	2	1	-	2	1	-	5
ME 402	Industrial Engineering	2	-	-	2	-	-	4
ME 411	Design of Machines System	2	1	1	2	1	1	5
ME 412	Control & measurement	2	-	1	2	-	1	4
ME 413	Refrigeration & Air-conditioning	3	-	1	3	-	1	6
ME 414	Vibration	2	-	-	2	-	-	4
ME 415	Power Plant	2	-	-	2	-	-	4
ME 417	Engineering Materials	2	-	-	2	-	-	4
ME 419	Engineering Project	1	3	-	1	3	-	4
ME 420	Mech. Lab.	-	3	-	-	3	-	2
Total		18	8	3	18	8	3	42

FIRST YEAR SYLABUS

ME 101:Mathematics-I: (3 / - / 1)

Algebraic, Non – Algebraic functions and its inverse, limits, Continuity, Derivation, Application of derivation, Integration, Indefinite integral, Method of integration, Defiant integral and its application, Vectors, Vectors product, Line and plane equation, Curvature, Tangent and normal vectors, Matrix and determinate, Simultaneous linear algebraic equations, Cramer method, Matrix – inversion method, Gauss – elimination method, Numerical methods to solve non linear Algebraic equations, Interval – halving method, False position method, Newton's method, Numerical integration, Trapezoidal rule, Simpson's rule.

ME 102:Computer Programming: (2 / 2 / -)

Computer units Definition and functioning, Files: Definitions and types, MS-DOS, Windows, Microsoft word, Microsoft Excel, Microsoft power point, Internet, Algorithms: Definition conversion of problems to algorithms, Flowcharting: Symbols conversion of algorithms to flowcharts, branching.

Q. Basic language programming. Input and out put commands, loops, conditional and non conditional branching. Arrays-subprograms, external functions, Graphics in Q. Basic, applications.

ME 102: Computer programming (2 / 2 / 0)

Introduction to comuters and its preipheral devices - Operating systems/DOS operating system - Programming principles ,variables storage in computer memory - Algorithms and flow charts - Data input basic language - Results output - Arithmetic statement , arithmetic operations writing algebraic expression,the rules of precedence and mathematical functions - Control statements – Applications - Control statements ,continued - Loops and their statements - One dimentional Arrays - Two dimensional Arrays - Results output in tabulated form - User Defined Functions-one statement functions and multiline functions – Subroutines - Applications problems

ME 104 : Electrical Engineering – I: (2 / 1 / -)

Resistance calculation, Connection of resistance, Ohms law, Krichhoff's laws, DC network theorems, AC fundamental wave from equations average and PMS values from reactors/peek factor, Vector representation of AC sine, Application of network theorems in AC circuits, Resonance (series and parallel), three phase AC calculations, Magnetic circuits, Transformers single phase transformers, Three phase transformers.

ME 111: Engineering Mechanics (Static): (2 / - / 1)

Introduction and basic concept, Resolution of forces, Resultant of force system, Moment & couples, Equilibrium, Moment of Inertia (mass), Friction, Virtual work..

ME 112:Engineering Drawing and Geometrical Descriptive: (1/4/-)

Subject, Introduction, Graphic instruments and their use lettering, Graphic geometry, multi view orthographic projection in first – and third – angle projection, third view, Isometric drawing and sketching, Oblique drawing, section of isometric drawing, sectional view.

Projection theories, represent of point, represent of line, represent of in (8) angle, represent of two line, determine of true length of oblique line, represent of plane, auxiliary plane (9 position), position of parallel intersection of perpendicular, cutting plane, determine of intersection curve, development, plane, development of body , introduction to using Auto Cade programming in engineering drawing and there application.

ME 113 : Principles of Manufacturing Processes: (2 / 2 / -)

Engineering materials , Physical properties , Mechanical testing , Industrial safety measuring tools , Clearance and tolerance , Production of metals (ferrous and non-ferrous) , Primary manufacturing processes-casting , hot working and cold working , Secondary manufacturing processes-welding , joining , powder metallurgy and machine tools .

ME 114 :Engineering Metallurgy : (2 / - / 1)

Introduction to engineering materials (metallic and non-metallic). Structures for metals and alloys. Crystallization, solidification and cooling curves. Construction of basic thermal equilibrium diagrams using cooling curves. Basic thermal equilibrium diagrams. Selected special binary alloy systems. Iron-carbon equilibrium diagram. Steel portion. Composition/ Microstructures/ Mechanical properties/ Applications. Basic heat-treatments of steels. T.T.T. curves. Heat treatment based on T. T. T. curves. Alloy steels/ Types/ Applications. Heat-treatment of non-ferrous alloys (precipitation hardening). Principles of bearing materials. Corrosion principles.

ME 121 :Human Rights and General Freedom: (2 / - / -)

Human rights; its evolution, different schools of thoughts about it, personal and public freedoms, national and international organizations to assure its implementation. Human rights between theories and practice.

ME 122 : Arabic Language: (1 / - / -)

Glossary of a Course in General Arabic

1. Grammar

a- Parts of Speech; Types of Verbs; The Imperfective Verb Groups (Kana,..etc); The Particle Groups (Inna,..etc.) ; Subject & Subject of the Predicate; Adverbs; - Numbers and their Masculine, Feminine , Accusative, Definite and Indefinite states and forms.; Rules of the Glottal Stop (hamza).

b- Spelling : Numeral Signs, Distinction of Al-Dhaa' and Al-Thaad; Writing the Glottal Stop (hamza)

c- Composition

2. Texts

a- The Holy Quran : Two stories from the chapters (suras) "Al-Kahf" and "Mariyum" explaining the artistic, aesthetic, and linguistic values of both stories.

b- Prose Text: Study of a prose text, such as "The Farewell Sermon", explaining its artistic, aesthetic, and linguistic values.

c- Selection of Arabic Poetry:

d- Modern Arabic Poetry:

e- Prose

Note : Numbers between brackets are the number of (theoretical/ application/ practical) hours.

SECOND YEAR SYLABUS

ME 201:Mathematics-II: (3 / - / 1)

Double and triple integrals Areas, volumes, surface integrals, green theorem, Divergence theorem, Stock's theorem, Complex numbers, De-Moivre theorem, Infinite series, Series test, Power series, Taylor and Mcluaren series, First Order ODE, Second Order ODE, Higher Order ODE, Power series solutions, Solution of system of ODE Eigen value problems.

ME 202 : Computer Programming-II: (2 / 2 / -)

Fortran language (constant) variable, I-O statement control statement, application, selective topic (according to advance in computer science).

ME 202 :Computer Programming - II (2 / 2 / -)

Visual basic project - Visual basic tools - Designing the form - Property setting - Visual basic events – Programming - Variables and constants - Data types, declaring of variables - Arithmetic operators - Types of operators - Data input, data output - Relational, logical operators - Control statements - Arrays and its types - Massage and input box - External Subroutines - External Functions - Plotting with visual basic - Root of equation - Timer - Check box and option button - List and combo box - Mechanical Engineering Applications with VB6.0 .

ME 211:Fluid Mechanics-I: (2 / - / 1)

General introduction to fluid mechanics, Fluid static and pressure application, Forces on immersed bodies and surfaces, Accelerated fluid and relative motion, Equilibrium of floating bodies, Introduction to fluid motion, Continuity equation, Equations of motions and their applications, Dimensional analysis and similarity, Motion of viscous fluids in conduits / and definition of boundary layer, Friction losses in pipes, Measurements of fluid flow. Analysis of piping system.

ME 212 : Thermodynamics: (2 / - / 1)

Introduction, Heat & work, power, Internal energy, enthalpy, zero law, Temperature and its measurement, First law of thermodynamics, Boyle's law & Charle's law, Equation of state, closed system processes, Constant volume & pressure , Adiabatic and polytropic processes, Open system processes/ steady flow energy equation, Application of steady flow energy equation, Reversible and irreversible processes, Heat engine/ Reversed heat engine, Heat pump, Second low of thermodynamics, Cycle / Carnot cycle, Reversed Carnot cycle, Entropy/ Clausius inequality, Entropy in reversed processes, Entropy in irreversible processes, Entropy in irreversible processes with heat transfer, Gas mixtures/ Dalton's law, Avogadro's law/ Adiabatic mixing of gases.

ME 212: Thermodynamics (2/ - / 1)

Introduction - Concept and definitions Pressure, temperature and its measurement Properties of pure substance (water and ideal gases – air). Work and heat : work for different process . The First Law of Thermodynamics –[closed system (control mass) and open system (control volume)] - The classical second law of thermodynamics (heat engine , Carnot cycle) . Entropy , Clausius inequality, Entropy in reversible and irreversible processes , Entropy in irreversible processes with heat transfer. Power cycle: Vapor power cycle (Rankine cycle ,modified Rankine cycle- reheat cycle and regenerative cycle) Air standard power cycle: Gas turbine cycle- Brayton cycle- reciprocating engine cycle (Otto cycle , Diesel cycle , Dual cycle) .

ME 213 : Strength of Materials: (2 / - / 2)

Stresses, Thin – walled cylinders, Simple strain, Axial deformation, Statically indeterminate members, Thermal stresses, Torsion formulas, Flanged bolt couplings, Shear and bending moment diagram, Stresses in beams, Unsymmetrical beams, Shearing stresses in beams, Deflection and slop in beams, Double integration method, Moment – area method, Casigliuno's theorem, Statically indeterminate beams, Three – moment equation, Combined stresses, Eccentrically loaded members, Mohr's circle for stresses, Application of Mohr's circle to combined loadings, Mohr's circle for strains, columns, Euler's formula for long columns.

ME 214 : Mechanical Drawing: (- / 3 / -)

Review, Welding representation, Gears, Cams, Construction drawing, Tolerance & Fits, Machining symbols, Assembly drawing, using Auto Cade programming in mechanical drawing and there application in two and three dimension axis.

ME 215 : Engineering Mechanics-II (Dynamic): (1 / - / 2)

Introduction – Kinematics of particles (rectilinear motion, plane curvilinear motion , constrained motion of connected particle , relative motion) – Kinetics of particles (direct application of Newton's law , work and energy , impulse and momentum , special applications" impact") – Kinematics of rigid body motion (introduction , absolute motion, relative velocity, instantaneous center of zero velocity, relative acceleration) – Kinetics of rigid body (translation , fixed axis rotation, general plan motion) – Mass moment of inertia.

ME 216: Engineering lab. (-/ 3 /-)

Experimental laboratory in subjects of this year.

Course 1:		Course 2:	
1	center of pressure.	١	Hardness test.
2	flow measurements.	٢	flow models.
3	impact of water jet.	٣	pope-Belt friction.
4	strut loading.	٤	universal beam.
5	fly wheel.	٥	heat pump.
6	Adiabatic index.	٦	slipping friction.
7	Engine mosels.	7	Air-compressor.
8	Tensile test.	8	Impact test.

ME 221 : English Language: (2 / - / -)

The parts of speech, types of sentence, tenses, active voice and passive voice, direct and indirect speech, using prepositions, features of scientific English, features of scientific translation, forming of English letter, writing letters.

Note : Numbers between brackets are the number of (theoretical/ application/ practical) hours.

THIRD YEAR SYLABUS

ME 301 : Engineering & Numerical Analysis: (3 / 1 / 1)

complex variables ,Special function (Gamma, beta, Error function), Laplace transforms, Inverse transforms, Applied Laplace transforms to ODE, Initial – value problems, Solution of linear system of ODE, Fourier series, Euler relations, Odd and even functions, Half – range series, Complex – Fourier series, Fourier – Integral, Partial differential equations, Formation of PDE, Solution of simple problems, Solution one and two dimensional problem, Solution of PDE using Laplace transforms, Numerical methods, Finite – Differences, Numerical derivation and integration, Difference equations, Numerical solution of PDE, Numerical couple integral.

ME 311: Heat Transfer: (2 / - / 1)

Introduction, Conduction heat transfer, Heat transfer from fins, Thermal contact resistance, Unsteady state conduction. Thermal boundary layer, Heat transfer for fluids flowing in pipes, laminar and turbulent flow. Natural convection, natural convection from vertical flat surfaces. Radiation heat transfer, shape factor, radiation heat transfer between surfaces, effect of radiation on temperature measurements. Heat exchangers, logarithmic mean temperature difference, NTU method, fouling factor.

ME 312 : Internal Combustion Engine: (2 / - / 1)

First law applied to combustion, Dissociation, Enthalpy of formation, Performance of ICE, Engine cycle analysis, Stander cycle, Air – fuel cycle, Actual cycle, Spark ignition engines, Diesel engine, Gas turbine cycle and modification, Jet- Propulsion, Turbo – Propeller, Turbo – jet, Ram – jet, Engines emission.

ME 313 : Mechanics of Machines: (2 / - / 1)

Introduction, Basic Definitions and Concepts and Fast Review on Engineering Dynamics. Velocity Analysis in Mechanisms Acceleration Analysis in Mechanisms Kinematics Analysis and Simple Mechanisms Design Balancing of Rotating masses Balancing of Reciprocating parts - Clutches - Belts, Ropes and Chain Drives - Gears and Gear Trains - Gyroscopic and Processional Motion - Flywheel and Turning Moment Diagrams -Governors - Cams - Universal Joints.

ME 314 : Design of Machine Elements: (2 / - / 1)

Introduction, Design of shafts, Design of keys and couplings, Design of belts, Design of chains, Design and selection of bearings, Welding, riveting, bolts, & nuts, Power screw, Design of springs, Design of pressure vessels.

ME 315 : Fluid Mechanics-II: (2 / - / 2)

Gas dynamics, compressible fluid flow, Isentropic flow with variable area, Stationary normal shock wave, Nozzles and diffusers, Constant area adiabatic flow (Fanno flow), Constant area flow with heat transfer (Raleigh flow), compressible flow under constant temperature ,Oblique shock wave, Prandtl – Mager wave, Turbo machines, Introduction to rotating fluid machinery and similarity, Definition of efficiency (Pumps and Turbines), Water turbines, Pumps, Compressors, Gas turbine, wind tunnel .

ME 316 : Manufacturing Processes: (2 / 2 / -)

Smelting and foundry techniques , Casting process-sand mould casting , metal mould casting , non-metallic mould casting , Mechanism and industrial applications of each process , Forming process-hot working ,cold working , Mechanism and industrial application of each process , Welding process – gas welding , arc welding , TIG and MIG welding , resistance welding , thermit welding , laser welding , plasma welding , solid phase welding , Powder metallurgy techniques .

Machine cutting process (Machine tools) – Theory of cutting , conventional processes (Lathes , Milling machine , shapers , drilling machines , grinding). Non-conventional processes (Discharge cutting machines , solid particles penetration , wire cutting , electro-chemical machine) . Numerical control machines . CNC machines .

ME 316: Manufacturing Processes (2 / 2 / 0)

Machining Processes, introduction, types of cutting operations Theory of chip formation in metal machining process. Forces in metal cutting Power and energy relations in cutting operations Turning and related operations, Milling operations Drilling operation ,Grinding Operation Material of cutting tools, Tool Geometry Tool failure and Wear, Tool Life, Economics of Metal Cutting, Nontraditional Machining Processes, Electric Discharge Machining(EDM), Wire Cut Electrochemical Machining Processes, Ultrasonic Machining Casting processes :Introduction, Melting and Pouring of Metal, Design of Riser Sand casting Shell moulding Investment casting, Permanent mould Casting Permanent mould Casting,Centifugal Casting Furnaces ,Casting defects Welding Processes: Introduction Fusion Welding, Arc Welding TIG-Welding, MIG-Welding Submerged Arc Welding ,Plasma Arc Welding, Thermit welding Flash Welding, Electric Resistance Welding :Spot, seam ,Projection Oxy- acetylene Welding, Solid phase welding: Friction welding Metal Forming: Introduction, Material behavior, Flow stress Cold, Warm, and Hot Forming Rolling Operation ,Analysis of Flat Rolling Forging, Open –Die Forging, Extrusion Process, Analysis of Extrusion Numerical Control(NC): Analysis of NC Positioning Systems, NC Part Programming .Application of NC) Powder Metallurgy Techniques .

ME 321: Engineering lab. (-/ 3 /-)

Experimental laboratory in subjects of this year.

ME 324 : Industrial Management: (2 / - / -)

Industrial safety, Industrial management & effect of Mech. Engineering on it, Type of maintenance, Cost of maintenance & economical effect, Production & production efficiency of industrial project, Quality control – Quality – Quality systems comprehensive quality system, Introduction to ISO system, Working system and evaluation of work of industrial project, Project engineering, Orders & specifications, Total quality management programming.

Note : Numbers between brackets are the number of (theoretical/ application/ practical) hours.

FORTH YEAR SYLABUS

ME 401: Electrical Engineering-II: (2 / 1 / -)

Motors (D.C. & A.C.), transformers, resistance, power transmission, circuit barkers, amplifiers, measurement devices, lab. Work.

ME 402 : Industrial Engineering: (2 / - / -)

Plant layout ,material handling , project management and control (CPM & PERT), work & time study , production control , inventory control , automation & robotics (principles , applications) , material and machine selection .

ME 411 : Machine Parts Design: (2 / 1 / 1)

Introduction, Design consideration for mechanical elements, Design of gears, Design of brake, Design of clutch, assembly Design of simple mechanical system, hydraulic systems, Mechanical drawing aided drafting, Computer aided design.

ME 412 : Control :

Introduction and definitions, representation of control system components, feed back control system (complete), representation of control systems. With mechanical engineering applications, block diagram algebra, steady state analysis, PID control modes, laplaces, transforms and transient response, roots of characteristic equation and s-plane, routh's stability criterion, Basics of root locus and frequency response, Nyquist, criterion for stability.

Measurements:

Introduction and definitions, Measurements for control systems, measuring system elements, error in measurements, different measuring systems and sensors, (temperature, pressure, flow, angular position, speed, acceleration, force etc.)

Notice:

Some of the measurement material is general within the control material.

ME 413 : Refrigeration & Air-conditioning: (3 / - / 1)

Air and humidity, humidification and dehumidification, Air mixing, Heat transfer and transfer coefficient, Heating load components, Heat loss through structure, space heating, Cooling load / Heat sources, ventilation, cooling load calculation, Comfort air conditioning, Fluid flow through ducts and air distribution, duct design, Pressure drop method, Fans, Principle of Ref./ Pressure, Enthalpy diagram / carnot cycle, Volumetric efficiency of reciprocating compressors, Refrigerant systems and equipment, Low-temp multistage systems.

ME 414 : Vibration: (2 / - / -)

Fast Review on Engineering Dynamics. General information about vibratory systems (components and physical effects). Dynamic behaviors of vibratory system (Periodic and random motions). Degrees of freedom and generalized coordinates. Un-damped free vibration of single degree of freedom systems (derives general equation of motion and calculates the natural frequency based different methods, newton's law method, energy method and equivalent method). Calculate the

fundamental frequency of vibratory and continues systems based Rayleigh's method. Damped free vibration of single degree of freedom systems, viscous damping, friction damping, and structural damping, (derives equation of motion and observe the dynamic behavior of the damped vibratory system based initial conditions). Stability of systems. Forced vibration of single degree of freedom systems, exciting force, base excitation, Rotating unbalance, Vibration isolation. Vibration measuring instruments. Free and forced Vibration of two-degree of freedom systems (Dynamic modeling based free body diagram method and LaGrange's Method). Vibration of continues systems, General approach for analyzing vibrations of continuous systems.

ME 415 : Power Plants: (2 / - / -)

Steam Power Plant Cycles (Rankin , Reheat , Binary). Types of power plants , Thermal , Gas turbine plant , Hydro electric power plant , P.P. Thermal Power plant : Boiler (steam generators) ; super heating process , economizer , reheater , furnace , burners , air heater .Water pumps .Steam turbines (high pressure steam turbines, intermediate & low pressure steam turbines) , Condenser , Type of condensers , Water treatment plant , cooling towers . Gas Turbine Generating plant: Air filter , Axial compressors , combustion chamber , turbines , exhaust , performance . Hydro electric power plant : Dams , penstock , water turbines , performance . Nuclear Power Plants : Piping and valves used in power plant , type of pipes , classes of pipes , types of valves , classes of valves , design , pipe supports ...etc.

ME 417 : Engineering Materials (2 / - /-)

Metallic section :

Alloy systems (binary and ternary) of both ferrous and non-ferrous alloys. Correlation between composition , microstructures , properties and applications of selected industrial and engineering alloy. Alloy steels: alloying elements, classification, Heat- treatments and engineering applications. Correlation between heat treatments, mechanical properties and material selection. Powder metallurgy (P/M) materials. Bearing materials , Low melting temperature alloy (fusible alloys) of both binary and ternary metallic materials. Material standards and specifications.

Non-metallic sections :

Polymers , ceramics and composite materials , Their processing , structures , characteristics , specification and applications , Rubbers , Insulators , Conductors and semi-conductors .

ME 420: Engineering lab. (-/ 3 /-)

Experimental laboratory in subjects of this year.

Note : Numbers between brackets are the number of (theoretical/ application/ practical) hours.