

University of Tehran, Tehran, IRAN
Summary of Course Descriptions - B.Sc. in Mechanical Engineering
2012-2016

Subject	Credit	Description
Calculus I (Linear Algebra-Engineering Analysis)	3	Mathematical principals such as limit, integral, derivative. series and etc.
Physics 1 (Mechanic 1)	3	Basic and advanced principles movements and of mechanical physics
Physics Laboratory 1	1	Implementing theoretical principles of Mechanical physics in laboratory.
General Chemistry	3	Organic Chemistry, chemical bonding, simple reactions, chemical equilibria and solution equilibria
Persian Language	3	Advanced Persian language, grammar, poem and literatures from 4th century
Islamic Thought 1 (Beginning and Resurrection)	2	The philosophy of creation humans by God, aims, destination of human beings based on Islamic thoughts
Physical Education I	1	General physical education and exercises.
Statics	3	Newton's laws of motion and gravitation, SI system, Force Vectors, Equilibrium of particles, Force System Resultants, Equilibrium of a Rigid Body, Structural Analysis
Computer programming	3	Computer programming languages. Introduction to programming with MATLAB and C++.
Differential equations	3	1st order and 2nd order differential equations, Fourier Series and Laplace Transform, 1 st order systems
Physics 2	3	The principles of electricity physics, electrical devices and electrical distribution methods.
Islamic Thought 2 (Prophethood and Imammat)	2	-Philosophy of having Imam and prophets- Historical periods of Islamic civilization, implementation of the law in society by prophet and a Imams

Calculus 2	3	Parametric equations and polar coordinates. Vectors, vector functions and space curves. Differential and integral calculus of functions of several variables. Line integrals and surface integrals and classic vector calculus theorems.
Thematic interpretation of the Quran	2	Ethical themes and methods found in the Quran
Dynamics	4	Kinematics, Kinetics of a rigid body. 1 st order 2 nd order system, linear systems Applied vector mechanics of particles and rigid bodies. Kinetics of rigid and nonrigid bodies in space. Moment and product of inertia of masses. Euler and Lagrange equations.
Engineering Mathematics	3	Limits, Continuity, Differentiation, Introduction to linear first order differential equations, partial and total derivatives composite functions, matrices and determinants, Vector algebra, Vector calculus, Directional derivatives
Materials Science	3	Introduction to atomic structures, interatomic bonding mechanisms, crystal and microstructure. Relationship between structure and properties of metals, alloys, ceramics and plastics. Principles of the behavior of materials in common environments. Fabrication processes and applications.
Welding and Metal Forming Workshop	1	Implementing the basic welding and cutting, welding processes, set up welding and oxy-fuel equipment and perform welding, brazing, and soldering processes
Electrical Circuits and Machines	3	Coulomb's law. Gauss's theorem. Capacitors. Ohm's law. Kirchhoff's laws, electrical energy, D.C. bridges and potentiometer. Magnetic effect of current, electromagnetic induction, moving coil and ballistic galvanometers. Multimeters, D.C. and A.C. meters and generators. Hysteresis. Power

		in A.C. circuits, semiconductors, conductivity and mobility. Rectification.
Strength of Materials 1 (Engineering Mechanics 2)	3	Stress and strain; Mohr's circle for transformation of stress and strain; deflection under load; design of beams, shafts, columns and failure theory
Islamic Ethics (Principles and Concepts)	2	Principles and ethics of Islamic civilization
Physical education 2	1	Advanced physical exercises, Swimming, Soccer and fitness
Thermodynamics 1	3	Basic concepts, quantitative relations of zeroth, first, second and third laws of thermodynamics. Behavior of pure substances and perfect gases. Ideal gas cycles. Isothermal isentropic and polytrophic expansion. Carnot cycle. Refrigeration cycle. Steam and gas turbines
Design of Machine Elements 1(Engineering and Design 1)	3	Application of mechanical engineering theories to machine component design. Analysis, synthesis and evaluation procedures in creative design. Use of codes, charts, tables, standards and empirical data.
Strength of Materials 2	2	Determine stresses in the member subjected to torsion, torsion, and bending stresses, un symmetrical bending, analyze and design thin and thick cylinders, analyze columns and struts.
Fluid Mechanics 1	3	Continuity, Bernoulli and Momentum equations. viscous and pressure drag, Boundary layer theory, flow systems analysis and modeling.
English Language	3	Describing English grammar and vocabulary with speaking, reading, and writing

Numerical Computation	2	Basics of numerical solutions in engineering problems, interpolation, approximation of functions, integration, direct and iterative methods in linear algebra.
Islamic Revolution in Iran	2	Iranian Revolution of 1978-79 and the subsequent establishment of the Islamic Republic.
Training 1 (Co-Op)	3	Working as a trainee at Iran Air company. Basic principals of aircrafts and their maintenance. Developing aerodynamics, thermodynamics, and sheet metal knowledges.
Mechanical Vibrations	3	Introduction to the fundamental concepts of vibration, single and multiple degrees of freedom systems, design of vibration suppression and isolation of mechanical systems
Electrical and Electronics laboratory	1	Conducting experiments on generators, transistors, electrical machines
Heat transfer 1	3	conduction, convection and radiation and of mass transfer by molecular diffusion and convection, heat exchangers
Dynamics of Machinery	3	Introduction to planar mechanism , Analyze static and dynamic force, analysis of mechanisms.
Auto mechanics Workshop	1	Introduction to principles of diesel and auto engines, maintenance and operation of auto mobiles
Machine Tool Workshop	1	Implementing the principles of drilling machines, lathe, milling machine, s-haper, and precision grinders.
Fluid mechanics 2	3	Differential Analysis of Fluid Motion, Internal Viscous Flows, External Viscous Flows, Compressible Flows
Design of Machine Elements 2 (Engineering and Design 2 &3)	3	Design of shafts and bearings under different loading, and operation cycles.
Physics laboratory 2	1	Implementing the theory behind the

		circuits, electronic and electromechanical devices, magnetic circuits; induced, electric and magnetic fields (EMF), inductance, transformers magnetic forces
Dynamics and Vibrations Laboratory	1	Implementing the principles of dynamics and vibrations in the laboratory.
Fluid Mechanics laboratory	1	Conducting experiments on turbines, pumps, wind tunnels, viscometer, and monometer
Heat Transfer 2 (Advanced Heat transfer)	2	Forced Convection, Radiation heat transfer, Heat transfer in porous media
Thermodynamics 2 (Applied thermodynamics)	3	Analyzing power cycles, refrigeration cycles, and jet engines. Thermodynamics of pure gases and vapour, non-reactive mixtures and psychometric
Gas Turbine and Jet Propulsion	3	gas turbine applications, cycle calculation, , engine function, Axial and radial compressors, Radial and axial turbine flow
Application of Solar Energy in Iran	3	Thermal Collector design, efficiency and energy calculation of thermal collectors
Industrial Drawing 1	2	Principals of construction and technical drawing. Use of Auto CAD for 2-D drawings
Analytical History of Beginning Islam	2	The challenges and circumstances of beginning Islam by Prophet
Family Schematization and population	2	A brief guide about family life and control of population.
Training II (Co-op)	1	Working as a trainee at a HVAC design company. Learned about heating/ cooling loads calculations for residential buildings. Used Carrier and Revit software
Strength of Materials Laboratory	1	Conducting total of six different experiments on deformation, stress and strain of materials under different loads
Manufacturing Process and Workshop	3	History and evolution of CNC machines, material removal

		processes, mathematical models and several empirical data casting, and forming processes
Fundamental of Electronics 2	3	Principles of transistors, diodes, integrated circuits, and semiconductors
Welding Process	3	Basic welding and cutting, welding processes, set up welding and oxy-fuel equipment and perform welding, brazing, and soldering processes
Heat Transfer Laboratory	1	Conducting experiments on HVAC system, heat pipe, emissivity apparatus, shell and tube heat exchanger, parallel and counter flow heat exchanger
Thermodynamics Laboratory	1	Experiments on calculations of COP of heat pump, bomb calorimeter, diesel engine, steam power cycle
Automatic Control	3	1 st order 2 nd order system, linear systems and CTC and PID controls, Laplace and frequency domains, Routh Locus, Bode plot.
Engineering Economics	3	Emphasizes the systematic evaluation of the costs and benefits associated with proposed technical projects