School	School of Engineering
Major	Masters of Science in Mechanical Engineering

Major Requirements			
Code	**Title**	**Credits**	**Description**
MENG695A	Master Thesis(Part I)	3	The Master's Project course is a six credits practical and research course. The master project is spread over two semesters. Students are requested to conduct a research relevant to the field of specialty; ending up with a thesis describing methodology; applications and results. The course also includes the realization of a prototype of the research subject (numerical model, physical application).
MENG610	Machine Design II	3	The principles of machine design and the design of machine elements. Major emphasis is placed on reliability, fatigue and fracture design using a case study approach. Design topics are selected from bearing lubrication, springs; fasteners, flexible machine elements and power transfer systems (shafts, keys, couplings, and gears).
MENG555L	Introduction To Finite Element Analysis Lab	1	This course teaches students how to effectively construct mechanical model, analyze it, and interpret the results using ANSYS Program. ANSYS is commercial finite-element analysis software with the capability to analyze a wide range of different problems.
MENG555	Introduction To Finite Element Analysis	3	This course covers the fundamentals of the Finite Element Analysis (FEA) with emphasis on solid mechanics and stress analysis. The subject of finite elements is treated using variational principles such as the principle of virtual work and total potential energy. The course deals with a variety of structural components such as springs, axially loaded bars, beams under bending, two-dimensional/axially symmetric/three-dimensional continuum elements and their formulation in static and dynamic analysis.
MENG560	Machine Design I	3	Philosophy of machine Design factor/reliability relationships. Contemporary fatigue design analysis, including low-high cycle fatigue (S-N diagrams and fracture mechanics), triaxial state of non-reversed stress and fatigue damage, surface failure, with applications on design case studies of relatively simple machines.
MENG550	Mechanical Systems II	3	This is the second course which deals with kinematics and dynamics of machinery such as Engine Dynamics, Cams, and Gears. The purpose of this course is to study the kinematics of gear tooth theory, and design gear sets and gear trains for desired motions tasks. Explore the kinematics and dynamics of cams and followers. Integrate all the dynamic considerations into the design of the slider-crank linkage as used in the single cylinder internal combustion engine piston and pumps. Extend the design to a multi-cylinder engines. It is hoped that this course will help in developing the students' ability to design viable solutions to real, unstructured engineering problems by using a design process.
MENG580	Advanced Heat Transfer	3	Advanced Heat Transfer
MENG530	Mechanical Vibrations II	3	This is a second part of a mechanical vibrations course in which continuous systems are considered rather than discrete systems. Also, the course introduces the various techniques used in vibration control and elimination. Furthermore, the course presents methodologies of vibration testing and experimental modal analysis. Numerical means are employed to discriminate the difference between implicit and explicit techniques used in engineering vibrations. Finally, General forced response is examined for single degree of freedom systems.
MENG525	Engineering Thermodynamics II	3	This is a second part of an engineering thermodynamics course in which properties of gas mixtures, air-vapour mixtures, and applications are considered. Thermodynamics of combustion processes and equilibrium are also studied. Furthermore, Energy conversion, power, and refrigeration are also covered.

MENG520	Fluid Mechanics II	3	This is the second part of a Fluid Mechanics course in which concepts of laminar and turbulent flows around bodies immersed in a fluid stream, boundary layer, lift and drag, and flow separation are considered. Also the course introduces the use of computational fluid dynamics to solve fluid flow problems and its applications to aerodynamics. Derivation of the equations of motion for a compressible viscous fluid flow (Navier -Stokes equation) is also covered in which flow in pipes and ducts, normal shock waves are considered. Furthermore, the course presents elementary engineering estimates of the performance of turbo machines.
MENG510	Stress Analysis	3	Plane stress and plane strain problems, Inelastic axial deformation, inelastic torsion, introduction to membranes, composite beams, curved beams, inelastic bending, shear center, absolute maximum shear stress and strain, theories of failure, fully stressed beams, the secant formula, inelastic bulking, stresses in cylinders, energy methods, Castiglinano□s theorem, and introduction to plates and shells are covered.
MENG601	Hydraulic and Pneumatic Systems	3	Fundamentals of fluid power technology: hydraulic fluids, hydraulic pipes, pumps, hydraulic cylinders and cushioning devices, motors, valves. Hydraulic circuit design and analysis. Hydraulic conductors and fittings. Ancillary hydraulic devices. Pneumatics: Air preparation, components, circuits and applications. Basic and advanced electrical controls for fluid power circuits. Fluid logic control systems.
MENG695B	Master Thesis(Part II)	3	The Master□s Project course is a six credits practical and research course. The master project is spread over two semesters. Students are requested to conduct a research relevant to the field of specialty; ending up with a thesis describing methodology; applications and results. The course also includes the realization of a prototype of the research subject (numerical model, physical application).