

ME-411 and ME415, List of Senior Design Project Proposals 032

Ser	Project Advisor	Project Title & Brief Description	Pre-Requisites	No. Students
1	Dr. Faleh Al-Sulaiman	<p><u>Design and Construction of an Environmental Test Chamber</u> <u>Brief Description:</u></p> <p>This is a multidisciplinary project that aims at a detailed design and construction of a 2 × 2 × 3 m environmental test chamber. This requires:</p> <ol style="list-style-type: none"> 1. Design and construction of the chamber structure, the required thermal loads, and the rating of the heating elements. 2. Design and construction of the air supply system. This will include the mechanical parts of the humidity control system. 3. Design and construction of the controllers (temperature and humidity). This entails a complete design and selection of the electronic controllers and electrical components required for the operation of chamber. <p>This project can be offered as common project between the Mechanical Engineering Dept. with the Systems Engineering Dept. and/or the Electrical Engineering Dept.</p>	Senior Standing	Four Mechanical Engineering Students Two Electrical / Systems / Computer Engineering Students (Control Option) One Electrical Engineering Student (Power option)
		<u>Experimental and Numerical Performance Evaluation of</u>		

2	Dr. R. Ben-mansour Dr. Faleh Al-Sulaiman Dr. Esmail Mokheimer	<u>Three Different A/C Units</u> <u>Brief Description:</u> This project aims at experimental and numerical evaluation of the performance of three different A/C units donated by Zamil A/C. This requires the installation of the three units which are namely, window type, split system and fan-coil type, at one of the campus houses. The experimental part would result in the measurements of air flow distribution, temperature and humidity distribution within the air conditioned space using the three different units separately. The performance of the three units in terms of the comfort level measured experimentally would be compared. The numerical part aims at the use of CFD simulation to predict the above mentioned parameters. The developed CFD model would be evaluated by the experimental results. Moreover, the validated CFD model is to be used to find the optimum position of the A/C unit that would give the optimum performance within the air conditioned space.	Senior Standing	3
3	Dr. Faleh A. Sulaiman Dr. A. Shuaib Dr. E. Mokheimer	<u>Evaluation of the Effectiveness of Evaporative Cooling of Large Spaces in Dhahran</u> Evaporative cooling of large spaces (e.g. green houses) will be investigated. A set of experiments, measuring tools, data loggers and analyzer would be either designed or utilized to assess this cooling method.	Senior Standing	4
5	Dr. Faleh Al-Sulaiman & Dr. Yehia Khulief	<u>Vibration analysis of the human body</u> <u>Description:</u> The human body can be modeled by an interconnected elastic multi-body system, with different joints and force elements. Such force elements are basically spring-damper elements. The determination of the damping and stiffness characteristics is essential to setting vibration tolerances during work involving vibrating equipment; e.g. jack hammer operation. In this project a test setup will be designed. Several volunteers will be tested. The input and output vibration will be reduced, analyzed and used to produce estimates of	Consent of instructor	2-3

		the model parameters.		
6	Dr. Yehia Khulief	<p><u>Design of a lifting horizontal platform</u></p> <p>Description: The objective of this design project is to design a lifting platform that remains horizontal at all phases of its motion. The platform will be fitted to the bed of a truck, and the combination is expected to be used for transporting lifting objects, while maintaining horizontal orientation of the load. Examples of such application are many; e.g. trucks used for catering services at airports, between-terminal passenger transport busses, fluid-handling lifting trucks; etc. The project includes kinematic design of the lifting mechanism, design of the drive and control system, machine component design, material selection, design safety consideration, operational safety, and cost estimation.</p>	Consent of instructor / ME-309	2
7	Drs. Habib Abualhamayel and P. Gandhidasan	<p><u>Testing of a water recovery system using calcium chloride solution</u></p> <p><u>Main Objectives of the Project</u></p> <p>This project proposes to use calcium chloride solution to extract fresh water from the atmosphere. The nighttime moisture absorption and daytime moisture desorption take place in the same unit. The unit consists of a flat, blackened, tilted surface and is covered with a single glazing. A suitable system is ready for operation and it will be tested both in the night as well as in the daytime.</p>	ME 315	2

8	Dr. Zuhair Gasem	<p><u>Designing and Building an Impingement Test Rig</u></p> <p>Impingement test is a useful testing approach to evaluate the combined erosion-corrosion resistance of metals and alloys. It consists basically of a variable speed pump, a controlled temperature liquid bath and a close-loop piping. Additional accessories may include a load cell to monitor the impingement load and a reference electrode to monitor the specimen potential. The students have to design and select the proper parts and build the rig as well as performing initial testing for few materials at different jet speeds and temperatures.</p>	Senior Standing	2
8	Dr. S. A. M. Said Dr. Esmail Mokheimer and Eng. Alaa Khider	<p><u>Plate & Frame Heat Exchanger Chilled Water System Analysis (PFHXCWSA)</u></p> <p>This project aims at developing a prototype for a residential application (2- 3 TR) and comparing it to its equivalent DX unit (Mini-Split). The analysis is to include(1)Outsourcing and sizing of components (HX, pumps, piping conduits,...) (<u>DONE</u>), (2)Development of the prototypes (<u>DONE</u>),(3) Operation and measurement of consumption comparatively to DX system (including noise, installation, operation, servicing,..),(4)Economics and life-cycle cost analysis Assessment of making the product commercially competitive.</p>	Senior Standing	2 –3
9	Dr. Khaled Mezghani	<p><u>Small Extruder Assembly</u></p> <p><u>Brief Description:</u></p> <p>Several parts of a small extruder for polymer processing have been designed and manufactured. For this project, the students are asked to achieve the followings:</p> <ul style="list-style-type: none"> • Review the previous design; • Follow up the manufacturing of previous designs; • Design an appropriate assembly for the extruder; • Assemble the different parts; • Design and manufacture of a screen filter and an external die. • Test the assembled extruder with the die. 	ME-307	3

		Note: All drawings have to be made using AutoCAD.		
10	Dr. Khaled Mezghani	<p><u>Polymer Melt Index Instrument</u> <u>Brief Description:</u> A melt indexer for polymers is to be designed and manufactured. The students are asked to achieve the followings:</p> <ul style="list-style-type: none"> • Review the existing designs; • Design, drawing, material selection, stress analysis of the melt indexer. • Follow up the manufacturing of the design; • Select an appropriate assembly for the melt indexer; • Assemble the different parts; • Test the assembled melt indexer. <p>Note: All drawings have to be made using AutoCAD.</p>	ME 307	2
11	Dr. Luai Al -Hadhrami, Dr. M. A. Antar	<p><u>Natural Gas as a an alternative fuel in KSA</u> <u>Brief Description:</u> A single cylinder engine was procured and received. This engine works with either Gasoline or natural gas through special modifications. Two students are to work in this project experimentally to prepare the setup, run the engine in both systems and compare the performance using the two different systems of fuel. Suitable components needed to fix the engine in the right place and ensure safety in operation will be taken into account.</p>	ME 204	2

12	Dr. Khalid Aldheydan And Dr. y. Al-Nassar	<u>The low-velocity impact strength of E-glass/polyester composites: the effects of fiber length and content on impact strength using Ansys computer code.</u> <u>Brief Description:</u> Polymer composites are very sensitive to low speed impact loadings, such as dropped tools or miss handling. By changing the fiber fraction or length, we may increase the strength of these composites and widen their applications. It is required that the analysis is carried out using a suitable computer code like ANSYS.	strong background in the area of material science (M.E 215) or equivalent and some stress analysis (C.E 203).	2
13	Dr. Iyad Al-Zaharnah and Dr. Bekir Yilbas	<u>Design of an air compression system for a plant (workshop) in Aramco</u> The objective of the project: is to design an air compression system for an industrial plant in Aramco and it should provide compressed air to the following units: Air starters, grinding wheels, paint sprays, plug drills, pneumatic valves and purging air. Each of the above units needs a different amount of compressed air flow at different pressure from the other units. Each of the units works at different load factor. The working compression system has to supply enough amounts of airflow and pressure for each of the units at any time. The design should be based on the maximum air pressure and on the maximum required air flowrate. Basically, the design should include the following:	ME 311	2

		<ul style="list-style-type: none"> - Determining the head losses in the piping system. - Compression stage design [deciding the type of compression system, the number of stages of compression and the size of the air receiver (air storage tank)]. The design should be optimized in order to minimize the number of on/off compression cycles. - Piping system design. - Flow diagrams and detailed engineering students. 		
14	Dr. Saif A. Al-Kaabi	<p><u>Design of a Flexible Testing device for Pipes</u></p> <p>A flexible mechanism (device) is needed to test tubes and pipes using vibration or/and ultrasonic sensors. The device must be able to position the sensors around the pipe outer surface for both exciters and receivers. The device consists of two identical ring-like platforms that carry the sensors. Those platforms are separated apart -along the tube- by adjustable bars which are connecting the two platforms. The distance between the two platforms can be varied precisely by manual means. The distances separating each sensor from the adjacent one -mounted along the circumference of each platform- can be easily adjusted manually. All sensors must be able to be in contact with the surface of the tube.</p>	ME 308	2 -3
15	Drs. B.S. Yilbas, Arif and A. Gondal(CAPS, RI)	<p><u>Laser treatment of HVOF Coated Inconel 625 alloy</u></p> <p>HVOF coating of metallic surfaces provides considerable surface resistance to corrosion, erosion, and high temperature situations. However, HVOF coating is formed through mechanical locking of the powder with the surface subjected to the coating; therefore, the coating is resulted due to mechanical bonding. The bond properties can be improved through thermal treatment of the surfaces in such away that mechanical bonding will be accompanied with the thermal bonding. The objective of the project is to carry out the experimental work to examine the properties of the thermal bonding of the HVOF</p>	ME 205	4

		coated surfaces. To achieve this, HVOF coated surfaces will be scanned by a laser beam. The scanned surfaces will be examined metallurgically through EDS and SEM. Hardness tests will also be conducted.		
16	Dr. Meyassar Al-Haddad and Dr. Abdel-Salam Eleiche	<u>Design, construction, and testing of a pneumatic "Rabbit" system</u> Pneumatic " <i>Rabbit</i> " system is used to send samples from one place to another in a very short period of time using air pressure as driving force. The student will investigate an existing pneumatic system, design and build a simplified version using local resources, then test his design.	Senior Standing	3
17	Dr. Mohammad Al-Qahtani	<u>Loss coefficient measurement for various pipe fittings</u> <ul style="list-style-type: none"> - Design of experimental set up to measure Loss coefficient of different pipe fittings available in the market. - Use manometers, pressure gauge and/or pressure transducer to measure the pressure drop a cross pipe fitting. - Determine the flow rate using pitot tube. 	ME311	3
18	Dr. Mohamed Antar	<u>Air Conditioning of a Shopping Mall</u> The project involves styding the building layout and construction, calculating the cooling loads, using different software packages, selection of A/C units, designing the piping system and finally designing the duct system for comfort conditions	ME315 and ME204	2