Ser.#	Faculty Name	email	Research Title	Research Description	Area of research
1	Dr. Abduljabar Alsayoud	sayoudaq@kfupm.edu.sa	Blue hydrogen (Design of metallic membrane for hydrogen separation using machine learning)	The student will work on the development of machine leaning model. The work will be mainly on optimization the selection of the alloying composition and synthesis condition. The goal is to enhance the durability of the membrane and reduce grain growth and pinholes formation.	materials and manufacturing
2	Dr. Abduljabar Alsayoud	sayoudaq@kfupm.edu.sa	Blue hydrogen (Design of metallic membrane for hydrogen separation using DFT)	The student will work on designing Pd alloy for hydrogen separation using density functional theory. They will test several alloying compositions for the best hydrogen diffusion coefficient and hydrogen dissociation on the alloy surface	materials and manufacturing
3	Dr. Awad Alquaity	awad.alquaity@kfupm.edu.sa	Efficiency improvement of Air-Conditioning Systems in Saudi Arabia	Residential sector in Saudi Arabia consumes more than 50% of the total electricity generated with the room air conditioners contributing significantly towards the peak load. With a growing population and addition of more than 2 million new homes in the last five years, it is essential to explore the cost-benefit tradeoff of various strategies to improve efficiency of air conditioners in the country. This work will utilize Low Emissions Analysis Platform (LEAP) software to predict the energy savings and emission reductions possible under various scenarios for energy efficiency standards in Saudi Arabia.	thermofluids
4	Dr. Hussain Alqahtani	qahtanih@kfupm.edu.sa	Bifurcation of delayed systems	The purpose is to develop numerical model to solve mechanical systems that involve delayed status. The model will be compared to analytical solutions if available. Student should know basic knowledge on how to use Matlab. All documents and relevant supporting materials will be provide.	Dynamics and control

5	Dr. Nesar Merah	nesar@kfupm.edu.sa	Load and speed effects on wear of drilling tubing	With the development of petroleum exploration and drilling technology, more directional wells have been drilled in complex geological environments. Due to the structural complexity and trajectory of directional wells, the deviation angle and azimuth angle complicate the stress field around the wellbore. These complexities imply an increasing potential of damage resulting from downhole casing wear. The main objective of the proposed research work is to use the existing testing facility to develop casing wear factors for drillpipes and casings and use them to predict wear of tubings. Different drillpipe speeds and radial loads will be considered along with drilling fluids. Their effects on the wear depth, shape and volume will be studied and used to estimate casing wear factors.	materials and manufacturing
6	Dr. Atia Khalifa	akhalifa@kfupm.edu.sa	Cavitated Membrane Distillation- A novel process for water desalination	Water desalination using membrane distillation (MD) process is receiving a great attention as one of the emerging desalination techniques. In MD, water vapor is being separated from the seawater using a hydrophobic membrane. The research idea includes the creation of cavitation in the feed stream and investigate its effects on the distillation process and the system design.	thermofluids
7	Dr. Atia Khalifa	akhalifa@kfupm.edu.sa	Thermoelectric Membrane Distillation Desalination System	The goal of this research idea is to produce freshwater at low energy consumption using the thermoelectric effect. We target a new design of a small membrane distillation (MD) unit power by thermoelectric elements for water desalination. the performance and limitations of the unit will be evaluated experimentally.	thermofluids
8	Dr. Fadi Al-Badour	fbadour@kfupm.edu.sa	Friction stir welding of hybrid structures	In this research work, the student will work on developing a joining process to weld non-metal (thermoplastic) to light alloy (aluminum) using friction stir welding technology. The work will involve performing the welding process and testing the integrity of produced joints using different mechanical and microstructural tests.	materials and manufacturing

9	Dr. S Fida Hassan	sfhassan@kfupm.edu.sa	Developing Compositionally Complex Alloy	Compositionally complex alloy are new and displays high potential for engineering application. Lightweight compositionally complex alloy will be was designed, synthesize and characterize to study it's potential application.	materials and manufacturing
10	Dr. S Fida Hassan	sfhassan@kfupm.edu.sa	Developing highly dissolvable structural magnesium	Magnesium alloy has high potential for wide range of engineering application. Magnesium alloy will be will be was designed, synthesize from powder and characterize to study it's structural and degradation behavior.	materials and manufacturing
11	S Fida Hassan	sfhassan@kfupm.edu.sa	Ti-Mg alloy	Lightweight bio-compatible alloy. titanium-magnesium alloy will be designed, synthesize from powder and characterize to study it's structural and degradation behavior.	materials and manufacturing
12	Dr. IHSAN UL HAQ TOOR	ihsan@kfupm.edu.sa	Corrosion measurement and prediction using corrosion sensors	In this proposed work, student will conduct a detailed literature review of the recent developments in corrosion sensors for different industries and the future prospects. He will also conduct experimental studies and use different types of corrosion sensors to predict the corrosion behavior of metals in different environments.	Materials & manufacturing
13	Dr. Ihsan ulhaq Toor	ihsan@kfupm.edu.sa	Corrosion behavior of additively manufactured metal alloys	During this work, student will be involved to examine the corrosion performance of additively manufactured alloys. He will first conduct a detailed literature review of the subject and will identify the current challenges related to the topic. It is expected that student will present his work in a reputed conference and will publish a journal paper.	Materials & Manufacturing
14	Dr. Ihsan ulhaq Toor	ihsan@kfupm.edu.sa	Microbial Induced Corrosion (MIC) of metal alloys	The increased water wetting in oil and gas transportation because of increased use of water flooding for enhanced oil recovery, is causing many MIC failures of the infrastructure. In this work, the student will 1st review the existing MIC challenges in Oil& gas industries and later conduct experimental investigations.	Materials & manufacturing

15	Dr. Ammar Alzaydi	ammar.alzaydi@kfupm.edu.sa	Innovative Drone Frame Design, Modelling and Analysis (Minimum Weight with Maximum Strength)	A completely new and innovative drone frame is to be developed for this project. For an example, the usual cross section of a drone frame arm is a circle, but we consider a partly elliptic shape of the cross section tapered along the length to withstand flexural movements and to allow a better stability against vibration, made of plastic or composite lightweight materials. Also, investigate different types of composite materials and shapes of drone frames with motor arms that produce a high strength and stable structure with minimum weight. Materials selection and manufacturing cost will be considered. The goal is to lower the total drone body weight by an expected 15-40% over traditionally used carbon fiber drone frame designs. It is also aimed that the drone frame will be cheaper to manufacture and can be made in house (with readily available additive manufacturing techniques, such as 3D printing).	materials and manufacturing
16	Dr. Ammar Alzaydi	ammar.alzaydi@kfupm.edu.sa	UAV Light Weight Robotic Arm Design	Attaching a traditional robotic arm with motorized joint will require to constantly monitor the balancing of the combined structure via the centre of mass. Instead, a “snake” like flexible robotic arm can be used on the drone instead, which means that the robotic arm heavy mechanism is at a single point attached to the drone. This will reduce the centre of mass shift control and reduce the overall robotic arm weight as it does not need counter weights to be balance (Ex. At different points of the robot arm), but rather, the thrust from the drone motors should be enough to handle such centre of mass weight shift. An ME 495 student will be required to design and analyse the outer/inner structure and working mechatronic mechanism of this flexible robotic arm (snake robot like mechanism). The flexible mechanism dynamically changing centre of mass needs to be defined as well, and the robotic arm having the advantage to configure instantly to achieve a stable and balanced position allowed by the snake configuration.	Mechatronics / Robotics

17	Dr. Ahmed Sarhan	ahsarhan@kfupm.edu.sa	Develop (CNT) nano Lubrication for Higher Quality and Productivity in CNC Machining	In this research work, Carbon Nano Tube (CNT) nano-lubrication system will be developed for machining process (CNC milling) for high production rate and product quality. The experimentation will be carried out using a thin-pulsed jet nozzle and controlled by a variable speed control drive. In case of using nanoparticle suspended lubrication system, the nozzle has to be equipped with additional air nozzle to accelerate the lubricant into the cutting zone and to reduce the oil consumption. The effects of using CNT nano-lubricant on machining performance (cutting temperature, surface roughness, cutting force and chip thickness ratio) will be investigated and the optimum CNT nano-lubricant parameters under different concentrations of nanoparticles, nozzle orientation and air pressure will be introduced to achieve correct lubrication conditions for the lowest cutting force, cutting temperature and surface roughness. Taguchi optimization method will be used. Furthermore, analyses on surface roughness and cutting force have to be conducted using signal-to-noise (S/N) response analysis and the analysis of variance (Pareto ANOVA) to determine which process parameters are significant. Finally, the quality of CNT nano-lubricant in term of kinematic viscosity and colloidal stability will be investigated	materials and manufacturing
18	Dr. Ahmed Sarhan	ahsarhan@kfupm.edu.sa	Effect of substrate surface conditions on hard PVD coating of on cast iron for higher wear resistant long-lasting coating	Thin film coating is one of the modern techniques to enhance mechanical properties of engine components and reducing their frictional force. Depositing thin film coating on engine components by using PVD technology has been paid attention in the recent decade. However, coating materials that used are still very limited. For further enhancement and investigation of the coating, we will use three methods which are sandpaper and sand blasting in order to change the roughness of the substrate before it got coated. Second objective is to test some important coating mechanical and tribological properties	materials and manufacturing
19	Dr. Salem Bashmal	bashmal@kfupm.edu.sa	Numerical model for electrical characterization of CNT fiber piezoresistivity	The purpose is to develop a numerical model to investigate the physical phenomena that govern the electromechanical response of a single carbon nanotube fiber filament. A finite element model should be developed to simulate the fiber response under uniaxial stretching with different strain rates. The dependence of fiber piezoresistivity on material and mechanical properties of the fiber should be addressed. The student should have basic knowledge on finite element and the ability to familiarize himself with ANSYS or COMSOL. The accuracy of the model is evaluated by comparison with experimental work or published data.	materials and manufacturing

20	Dr. Bandar AlMangour	bandar.almangour@kfupm.edu.sa	Design for Additive Manufacturing with Lattice Structures	Design for additive manufacturing (DfAM) provides numerous benefits to product development and production with the creation of complex parts with intricate geometries. These benefits are only expounded upon through the formation and use of lattice structures in additive manufacturing, resulting in improved structural optimization and functional design. Driven by the ability of 3D printing to produce extremely complex geometry, the objective of this project is to incorporate optimization-based techniques in designing lattice structures.	materials and manufacturing
21	Dr. Numan Abu Dheir	abudheir@kfupm.edu.sa	Online-IR Imaging Analysis Towards Real Time Monitoring of Manual Arc Welding Processes	One of the main strategies lead by Saudi Arabia government is to digitalize its manufacturing sector, where many of the day-to-day manufacturing activity will be performed with minimum human intervention if any. Manual welding processes propose a great challenge to digitalization due to its labor-intensive nature and due to its complex dynamics. This project aims at providing a well-known thermal imaging technique to be used as a tool for real time control over a manual welding process, where thermal images taken by IR camera will be timely analyzed to identified erroneous welds. The main tasks to be carried by students are: 1) train on IR camera 2) use camera to take multiple images of welding process. 3) Analyze the images captured to create a map for weld quality 4) propose an optimization technique to alert the welder when less than optimum welds are expected.	materials and manufacturing
22	Dr. Ali Alshehri	alshehri@kfupm.edu.sa	The Performance of Jet Impingement Dehumidification in a Membrane Distillation System	Membrane Distillation is an emerging technology in water purification research. Water vapor is separated using a hydrophobic membrane and is being carried by a gas for condensation and collection by dehumidification. However, condensation rate of water vapor in the presence of non-condensable gas carriers (typically air) is low. In this project two dehumidification methods will be compared at the same conditions; 1- Bubble column dehumidification and 2- Jet impingement dehumidification. The student should have a good understanding of heat transfer, thermodynamics. and fluid mechanics. All required documents/training will be provided. Lab is ready for testing the two methods experimentally.	thermofluids

23	Dr. M. Abdul Samad	samad@kfupm.edu.sa	Wear behavior of polymer nanocomposite coatings	The student will be responsible to conduct an extensive literature review on the topic and conduct some experiments to fabricate and evaluate the tribological performance of epoxy nanocomposite coatings in terms of friction and wear. The student will be exposed to different coating fabricating techniques, wear testing techniques and characterization techniques such as SEM, profilometry etc. The outcome of this project may be a Journal paper or a conference paper, which shall help the students in getting good scholarships in reputed universities for their higher studies.	materials and manufacturing
24	Dr. Usman Ali	usman.ali@kfupm.edu.sa	Mechanical properties of additively manufactured materials	In this work, we will manufacture and work on additively manufactured parts. We will look at their mechanical properties and identify the relationships between parts of various designs.	materials and manufacturing
25	Dr. Bekir Yilbas	bsyilbas@kfupm.edu.sa	Analysis and Removal of Environmental Dust	Analysis of environmental dust characteristics; outdoor testing of hydrophobic surfaces pertinent to dust fouling; oil impregnation of surfaces; outdoor performance of oil impregnated surfaces; water droplet dynamics on oil impregnated surfaces; droplet dynamics on low temperature phase change materials.	thermofluids /materials
26	Dr. Syed Sohail Akhtar	ssakhtar@kfupm.edu.sa	Functionally-graded ceramic-matrix composites: Synthesis, characterization, and testing	The purpose of the proposed project is to develop novel functionally-graded hybrid SiAlON-based composites. The proposed composite will have a tailored structural and tribological property for cutting tools. Various combinations of SiAlON-matrices and hybrid inclusions will be identified wherein compositions will be varied from the core to the surface to achieve the desired thermo-mechanical response.	materials and manufacturing
27	Dr. Syed Sohail Akhtar	ssakhtar@kfupm.edu.sa	Simulation-based Optimization of Mold Design for High Quality Metal Castings	It is important to predict and thus minimize these defects during casting and mold design to make the process fast and economical at the same time. The proposed project is focused on the use of modern metal casting technologies using advanced simulation tools which provide solution to such problems by shifting from a physical trial-and-error approach to a proof-of-concept approach, where the mold design, casting process and the casting defects can be analyzed simultaneously in a virtual domain prior to actual casting run in a foundry. A holistic approach in this proposed project will be used where autonomous optimization of mold design for more than one objectives such as porosity minimization, soundness, yield maximization, and residual stress minimization will be carried out. High-end software such as MAGMASOFT are available with such modules and will be used for multi-criteria optimization of mold designs to produce sound and high quality castings for better in-service performance.	materials and manufacturing

28	Dr. Syed Sohail Akhtar	ssakhtar@kfupm.edu.sa	The effect of processes parameters and insert geometry on the performance of cutting tools through machining simulations.	A fully coupled thermal and structural analysis of the cutting tool insert during cutting of hard-to-cut material will be performed using finite element method (preferably using AdvnatEdge Software). The performance characteristics and the effects of the new ceramic composite tool with improved properties will be evaluated. Stress distribution and temperature profile will be observed as a function of time during cutting process and will be studied in terms of resistance to thermal shock which can be associated with better flow of temperature through the insert. The stresses generated due to the combined effect of the heat flux and mechanical loading on the cutting edge will also be analysed	materials and manufacturing
29	Dr. Syed Sohail Akhtar	ssakhtar@kfupm.edu.sa	Design and fabrication of Cermet composites for cutting tool inserts	The proposed project is aimed to develop a protocol for the material design and production of SPSed cermet-based cutting inserts in standard near-net geometries with improved mechanical, thermal, and tribological performance. Based on designed matrix-inclusion(s) combinations with optimum predicted properties, some representative inserts in various geometries will be developed using Spark Plasma Sintering followed by characterization and properties measurement. The performance evaluation of the developed inserts will be carried out using lab tests.	materials and manufacturing
30	Dr. Syed Sohail Akhtar	ssakhtar@kfupm.edu.sa	Development of Predictive Models for Porosity and Tensile strength for the Quality Optimization of Spin Castings	The main motive of proposed project is to develop predictive models for the porosity and tensile strength of a spin cast product by applying the DOE approach through parametric analysis of three core process parameters (mold rotational speed, spinning time and pouring temperature) for the product quality optimization.	materials and manufacturing
31	Dr. Zuhair Gasem	zuhair@kfupm.edu.sa	The effect of water absorption on interlaminar shear stress on glass-fiber reinforced plastic (GFRP) pipes.	Water absorption in GFRP pipes results in degradation of interlaminar shear strength and consequently leads to drop in flexural properties of buried pipes. A testing program will be carried out to measure the interlaminar shear strength (ISS) of samples of GFRP pipes after exposure in water at different temperature and exposure times.	materials and manufacturing
32	Dr. Samir Mekid	smekid@kfupm.edu.sa	An exploration of opportunities for research and practices of drones in manufacturing	The objective of the work is dedicated towards the assessment of usability of drones in manufacturing in its various configurations since there is scarcity of applications. The purpose is to examine participation in manufacturing process, quality inspection, decision-making through monitoring…etc. Each of sub topics needs elaboration, concepts generation and analysis. This will offer a guide for research on drones in manufacturing to include research opportunities in industrial engineering, technology development, and behavioral operations. It is expected that the student(s) come up with a model to discuss all related engineering aspects and societal impacts of drones' applications in Saudi Arabia for example.	Intelligent Manufacturing and Robotics

33	Dr. Samir Mekid	smekid@kfupm.edu.sa	AI and Automation in Advanced Manufacturing: Proposed solutions and models	Manufacturing systems are driven towards complexity, dynamic and fast connectivity. Recent development have shown that ML and AI have shown high potential to transform and improve drastically manufacturing. The work is aimed at assessing the usability and practical solutions for manufacturing processes, analytical tools for assessment of data, intelligent automation in production lines and other robotics area.In spite of the positive factors behind automation, such as high efficiency, productivity, growth, safety, reliability, low cost, and a better standard of living, the examination of the consequences of vast automation must also consider negative factors, such as changing skill needs and affecting inequality. It is expected that the student(s) build a model of an application chosen from the various concepts he proposed in consultation with his supervisors to discuss all related engineering aspects and societal impacts of automation applications including AI in Saudi Arabia for example.	Intelligent Manufacturing and Robotics