ME 495 proposals for term 221

Ser.#	Advisor Name	email	Research Title	Research Description	Area of research
1	Awad Alquaity	awad.alquaity@kfupm.edu.sa	Spatter transport in an Additive Manufacturing Build Chamber	Spatter particles ejected from the melt pool during selective laser melting processes can get redeposited on the build plate region and impact final part quality. Although an inert gas flow is used to purge the spattered particles away from the build plate region, some of the spatter particles get redeposited on the plate region leading to increased porosity and surface roughness. In this regard, the current study focuses on the numerical modeling of the interactions between the inert gas flow and spatter particles by using the discrete phase model in ANSYS Fluent.	thermofluids
2	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 and investigate its effects on the distillation process and the system design.	thermofluids
3	Atia Khalifa	akhalifa@kfupm.edu.sa	Multistage bubble column dehumidification for desalination using membrane distillation	In this experimental research, water vapor is being seprated from seawater using a membrane. Water vapoer is then carried by an air stream. We are looking for air dehumidifcation using multistage bubble column dehumidifier to extract the freshwater and also to cool the air in order to co-generate freshwater and space cooling. the student is expected to help in the design, fabrication and testing of the system to evaluate its performance	thermofluids
4	S Fida Hassan	sfhassan@kfupm.edu.sa	Compositionally Complex High Entropy Alloy	Compositionally complex alloy are new and displays high potential for engineering application. Compositionally complex alloy will be was designed, synthesize and characterize to study it's potential application	materials and manufacturing
5	S Fida Hassan	sfhassan@kfupm.edu.sa	High Strength Rapid Degradable Environment Friendly Alloy	Magnesium alloy has high potential for wide range of engineering application. High strength magnesium alloy with rapid degradability in the oil well be designed, synthesize from powder and characterize to study it's structural and degradation behavior.	materials and manufacturing

6	S Fida Hassan	sfhassan@kfupm.edu.sa	Bio-implant alloy	Lightweight bio-compatible titanium-magnesium alloy will be designed, synthesize from powder and characterize to study it's structural and degradation behavior.	materials and manufacturing
7	S Fida Hassan	sfhassan@kfupm.edu.sa	Tungsten Heavy Refractory Alloy	Tungsten Heavy Refractory Alloy has application in high temperature environment including nuclear reactor. Tungsten Heavy Refractory Alloy will be synthesize by powder metallurgy and characterize for its properties.	materials and manufacturing
8	Nesar Merah	nesar@kfupm.edu.sa	Wear of oil and gas drilling casings	The main objective of the proposed research work is to modify the existing casing wear testing facility to simulate both drilling pipe (DP) rotation and translation during drilling. The student is expected to design the system that will simulate the translation of DP and use it with the existing system to develop casing wear factors at different loads and speeds. The student will be involved in wear characterization using tribometers, SEM and EDS. He is expected to use the results of his work to write a conference or a journal paper.	materials and manufacturing, Design
9	Bandar AlMangour	bandar.almangour@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, and observe the microstructure by SEM.	materials and manufacturing
10	Hafiz Ali	Hafiz.ali@kfupm.edu.sa	Thermal regulation of electronics	Thermal management plays a vital role in many thermal systems for the optimum working. This work will focus on solution that may be used for better thermal regulation of electronic components which are recently used. Candidate is expected to have good command on heat transfer and fluid mechanics. It is expected to perform literature review, simulations and modeling.	thermofluids

11	Ammar Alzaydi	ammar.alzaydi@kfup m.edu.sa	UAV Light Weight Mechanism Design Investigation	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.	Robotics
12	Ammar Alzaydi	ammar.alzaydi@kfup m.edu.sa	1. Innovative Drone Frame Design: Modelling and Analysis	A completely new and innovative drone frame is to be developed for this project. The new platform will be common to various projects and fundamentally different from previous ones. The drone structure is planned to be reconfigurable with a strong stable shape having minimum weight and resisting deflections, torsions, withstand flexural movements and to allow a better stability against vibration. Also, investigate different types of composite materials 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 and other additive techniques).	materials and manufacturing , UAV and Robotics
13	Ihsan ulhaq Toor	ihsan@kfupm.edu.sa	Advances in corrosion sensing technologies	Student will conduct a detailed literature review of the recent developments in corrosion measurement sensors for different industrial applications. He will also conduct experimental studies and use different types of corrosion sensors to predict the corrosion behavior of metals in different environments.	materials and manufacturing
14	Ihsan ulhaq Toor	ihsan@kfupm.edu.sa	Corrosion behavior of additively manufactured metal alloys	During this work, student will 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.	materials and manufacturing

15	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 and manufacturing
16	Abba Abubakar	abba.abubakar@kfupm.edu.sa	A Physics-Based Modeling Approach for Microstructure Evolution during Metallic Additive Manufacturing	In recent times, additive manufacturing (AM) is widely used to fabricate complex three-dimensional (3D) parts by the successive deposition of thin material layers using sets of digital information contained in a CAD files. Some of the advantages of AM over the conventional manufacturing processes include: high production rate, less material waste, lower energy and manpower requirements, reduced manufacturing costs and inventory size, and flexibility in customizing parts' design. The present study aims to provide in-depth insights on the influence of AM process parameters (such as laser thermal energy density, powder particles characteristics, and their distributions) on the evolution of microstructure during the fabrication of metallic 3D part. The process and material microstructure will be simulated using coupled sets of multi-scale & multi-physics equations involving heat transfer, powder melt flow, and grain growth. Several metallic samples will be fabricated via laser powder bed fusion (PBF) technique and essential characterization studies (such as SEM, optical microscopy, density & hardness measurements, etc.). The computational results on part's topology, powder melt pool geometry and grain size will be compared to that of the experiments. The study aims to establish a procedure for designing and developing reliable parts via the PBF.	materials and manufacturing
17	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

18	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
19	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
20	Obaidallah Munteshari	obaidallah@kfupm.edu.sa	Thermal management for Batteries	Lithium ion batteries typical operating temperature ranging from 20°C to 40°C. Out of this range, batteries' performance and lifespan can be affected significantly. Thus, a thermal management system is usually used to mitigate the batteries' temperature within the abovementioned range. In this project, a new design of a thermal management system will be investigated numerically and experimentally. The student will work on Ansys (Fluent) to conduct the simulations. NO prior knowledge about battery or chemistry is required.	thermofluids

21	Zuhair Gasem	zuhair@kfupm.edu.sa	Producing Green Hydrogen using Solar based Electrolyzers	Electrolysis is a the main option for carbon-free hydrogen production from renewable solar energy. Electrolysis uses electrochemical driving force to split water into hydrogen and oxygen using a unit called an electrolyzer. The main goal of this project is to build a lab scale electrolyzer powered by solar energy. Various approaches will be tested to enhance hydrogen production using different modification of the electrolytes, increased temperature, and electrodes maximize the amount of Hydrogen produced. The student is expected to design a simple setup and produce hydrogen and try few potential approaches to increase hydrogen output.	materials and manufacturing