High School Research Program 2018 Project List		
Project Name	**Project Mentor**	**Project Description**
Systems Engineering		
Battery-Buffered Smart Load Control	Dr. Jing Zhang	Smart loads are referred to those which can automatically adjust the power consumption based on the operating state of an electrical power grid. They are helpful to improve the system stability and power quality of electrical power grids as well as to reduce the peak load. Equipped with a rechargeable battery, a smart load should be able to control the power flow from power grid optimally with substantially improved power quality and security. For the proposed project, a test platform will be provided in the power systems laboratory. Students will use the test platform to study the characteristics and control strategies of a smart load. They will investigate the model, efficiency and life time of rechargeable battery operating in a smart load.
Internet of Things for Creating Smart Appliances/Smart Homes	Dr. Seshadri Mohan	Internet of Things (IoT) refers to sensors, devices, appliances, homes, vehicles, and various other entities connected together to the Internet so as to impart intelligence to these systems for performing useful applications that could facilitate improved quality of life. The field of IoT has huge potential in creating smart homes, smart appliances, intelligent transportation, smart cities, and smart infrastructure. In this project, the high school student researcher will learn about various sensors (temperature, humidity, pressure, etc) and about a micro-controller (Raspberry PI) and will learn to interconnect the sensors to Raspberry PI. The student will also learn to program Raspberry PI to implement various control functions and will learn to write applications to realize a smart appliance or a smart home.
Engineering Technology		
Engineering Properties of Paper Wastes	Dr. Ashokkumar Sharma	Solid waste such as paper, card board, and plastic can be converted to gas and/or liquid through thermochemical conversion processes for the production of heat, power, fuels, and value-added products. However, these waste materials need preprocessing such as size-reduction to achieve desired feedstock properties suitable for the downstream conversion process. Flow-ability of preprocessed feedstock is an important consideration for the consistent and effective performance of the thermochemical conversion system. The preprocessing steps influence physical properties and thus the flow-ability of the material. The objective of the present study is to perform characterization of dry solid waste frequently produced at the university campus. The physical properties (such as size, density, and angle of repose) of these materials and their blends will be measured and analyzed. The data will be further compared with the biomass and fossil materials.
Computer Science		
Model of Facial Parameter Extraction and Animation	Dr. Mariofanna Milanova	Recent advances in multimedia-related technologies and new applications such as virtual agents, video conferencing, visual effects in movies, and virtual players in computer games are motivating much research in digital character and face animation. In this project we will develop a system for the implementation of photo realistic avatar using video captured from the user. This is achieved by constructing a dynamic video map of facial expressions and mapping them to a 2D model. The dynamic video map reflects user &rsquo's facial expressions with constant updates directly from the input video. The goal of this project is to provide a vivid representation of participants with the use of dynamic video map in perceptually important facial regions, notably eyes and mouth as compared to all of the facial parameters defined by MPEG4. We implemented an automated system that performs face detection, face tracking and facial feature extraction.
Step by Step introducing Scratch Programming	Dr. Mariofanna Milanova	The students will create interactive stories, games and animations with Scratch. The student will have experience implementing Scratch for: Interactive games, Storytelling, Interactive projects, Music projects, and Animations. While learning programming concepts and gaining a basic introduction to Electronics and Techniques.
Center for Nanotechnology Sciences		
Development of nanotechnology-based coatings for anti-icing applications	Dr. Ganesh Kannarpady	Nanotechnology is the study and application of extremely small things; it spans all science disciplines, including chemistry, biology, physics, materials science, and engineering. In the Advanced Deposition Lab at UALR's Center for Integrative Nanotechnology Sciences, researchers are working to develop coatings composed of tungsten nanorods that do not allow water droplets to form on a surface. As a result, the surface does not ice. These coatings can be applied in different industries like the aerospace industry and HVAC industry.

High School Research Program 2018		
Project List		
Project Name	**Project Mentor**	**Project Description**
Mechanical testing of biomaterial scaffolds	Dr. Shawn Bourdo	In the nanomaterials synthesis lab, growth, purification, and functionalization of nanomaterials, including carbon nanotubes and graphene, is performed. These nanostructures are the "building blocks" for other projects, and are later incorporated into various materials, such as polymers, in order to evaluate mechanical and/or electrical properties among others. In addition to carbon nanomaterials, several other nanoparticles are utilized in projects related to bioengineered scaffolds. Students interested in materials science, engineering, or chemistry and how they can be applied to biological systems will be challenged by this project. The student will learn basic polymer nanoparticle formulation techniques, process them into films or rods, and learn about and test the mechanical properties of the final product. The student will not perform any work directly with biological components.
Chemistry		
Developing Novel Carbonaceous Materials for Fuel Cell and Biomolecule Detection	Dr. Anindya Ghosh	Students will develop novel homogenous and heterogenous catalysts which can be used to detect various biomolecules and analytes such as hydrogen peroxide, oxygen, antibiotics, etc. Students will also be developing novel non-precious metal based catalysts which can replace expensive catalysts in fuel cells, convert of carbon dioxide to value-added products, etc.