# List of Senior Engineering Design projects for 2015-2016

**PROJECT 1** **Design and Implementation of a System to Measure Entropy Generation for Multiple Fluid Dynamics Experiments** **(4-5 STUDENTS)**

**FACULTY SPONSOR:** Dr. Evan Lemley (Office - HOH 209, Phone - x5473, elemley@uco.edu)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** This project involves designing, implementing, and testing a complete system that provides liquid flows at specified Reynolds numbers and flow conditions appropriate for multiple flow experiments. This system requires a means of controlling and measuring flow rates and pressures in real time. The project also requires a system - mechanical, electronic, and computational - to make measurements of entropy generation rates at a variety of locations in test geometries for multiple experiments. A successful project will result in a set of systems that allow data to be measured for the specified experiments that are suitable for peer-reviewed publication.

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**PROJECT 2** **MINIMIZING STRESS SHIELDING IN FEMORAL HIP IMPLANTS THROUGH MATHEMATICAL MODELING AND EXPERIMENTAL VERIFICATION.** **(4 STUDENTS)**

**FACULTY SPONSOR:** Dr. Abdellah Ait moussa (Office - HOH 118A4, Phone - 974 5293)
**FACULTY CO-SPONSOR (If any):** Dr. Morshed Khandaker (Office - HOH 221H, Phone - 974-5935)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:**
Between 300,000 and 400,000 hip replacement operations are performed in the United States alone each year and the number is rising. Arthritis and other degenerative joint disorders are the most common health problems requiring total hip replacement. Other reasons relate to the limited life expectancy of the prostheses used.
The design and optimization of prostheses used for total hip replacement is a highly complicated task due to the complex three-dimensional shape and material properties of the stem, ball and cup socket. Small differences in the aforementioned characteristics can lead to significant changes in the

levels of stress in the fixation areas between implant, cement and cortical bone which can lead to cement fracture in short term and fatigue failure in long term. Aseptic loosening caused by stress shielding is also responsible for total hip replacement failure for both cemented and uncemented hip implants. In this respect, prostheses that are extremely stiff induce high levels of stress shielding in the proximal portion of the femur and decrease interface stress. This aspect is more pronounced in uncemented implants since their sizes are larger, hence stiffer and takes away more loads from the bone.
In this project we contrive to reduce stress shielding and interface stress in a total hip replacement by controlling stem stiffness, which is a function of the stem geometry and its material properties. This will be achieved in two phases. In the first, we develop a numerical method that systematically employs Finite element Analysis (FEA), Geometry Parameterization and a novel orthogonal arrays search method to predict the most optimal stem stiffness that simultaneously minimize stress shielding and interface stress on the fixation areas. In the second phase, we use modeling and instrumentation to benchmark and confirm the efficiency and reliability of the proposed designs via experimentation. The specific aims are
- Specific Aim.1: The numerical analysis of the prosthesis: Under this goal we identified four separate objectives: (1) the mathematical modeling and control of the stem geometry using a fixed number of design parameters. (2) The self-regulated solid modeling of the stem, cement, and cortical bone. (3) The Finite element simulation. (4) The setup and numerical optimization of the stem geometry and material properties to reduce stress shielding and interface stress.
- Specific Aim.2: The experimental setup, instrumentation and testing to benchmark and confirm the numerical results. Under this goal, several of the proposed designs following the numerical analysis will be constructed, and tested under static, dynamic and fatigue failure. Static analyses will be conducted under body load, while Dynamic analyses will be performed under average walking conditions. Load cells will be inserted in the proximal portion of the cortical bone to monitor and register the stress there. All specimens will be analyzed by stereomicroscope and dye (black ink) penetrant to check the levels of porosity and micro cracking, respectively.

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**PROJECT 3** **Design and development of microfluidic miniature cell sorting device for biomedical applications** **(4 students)**.

**FACULTY SPONSOR:** Dr. Robi Hossan (Office – HOH 221R, Phone: 974-5295)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** Microfluidic device has emerged as a promising tool for rapid cellular analysis in engineering and biomedical applications. Compared to traditional large instruments, microfluidic based miniature device provide a better platform for cellular analysis since they do not require expensive, specialized instruments, and they perform better, yielding higher efficiencies, reproducibility and affordability. In addition, current cell sorting devices require cell surface specific

marker or antigen which is severely limited or lacking altogether. In this project, students will design and develop label free microfluidic based miniature device for trapping and separating cells based on the electrical properties of individual cells. Students will perform computer simulations for optimum design, develop photolithographic microfabrication process protocols, select device materials such as PDMS, glass or PMMA and finally fabricate an integrated microfluidic miniature device. With the developed device, students will demonstrate and analyze the cell separation and sorting of different types and states of cells using external electric field.

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**PROJECT 4** **FABRICATION AND TESTING OF A PRESSURE SENSOR FOR INTRADISCAL PRESSURE MEASUREMENTS (4 students).**

**FACULTY SPONSOR:** Dr. Morshed Khandaker (Office - HOH 221H, Phone - x5935)
**FACULTY CO-SPONSOR (If any):** Dr. Alaeddin Abuabed (Office - HOH 221S, Phone - x5934), Dr. Mohammed Hossan (Office - HOH 221, Phone - x5295)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering

**PROJECT DESCRIPTION:**
The invasive needle-type pressure transducer is widely used for the in vitro measurement of intradiscal pressure (IDP) of human and animal intravertbra disc pressure. However, the commercially available IDP is expansive and special handling protocol is required for IDP measurements. The deliverable for the research are (1) to fabricate an IDP sensors using liquid crystal, (2) to integrate the IDP sensor with a fatigue test system, (3) to test the measurement effectiveness of the sensor using rabbit tail discs units, and (4) to verify the measurement data using a commercially available pressure sensor.

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**PROJECT 5** **FABRICATION AND TESTING OF AN ELECTROSPUN FIBER BASED 3D TISSUE CULTURE SCAFFOLD (4 STUDENTS)**

**FACULTY SPONSOR:** Dr. Morshed Khandaker (Office - HOH 221H, Phone - x5935)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering

**PROJECT DESCRIPTION:**
Electrospinning is a process by which fibers with sub-micron diameters can be obtained from an electrostatically driven jet of polymer solution. These fibers have a high surface area to volume ratio,

which have numerous engineering applications. The goal of this project is to design and construct Polycaprolecton (PCL) micro/nano fiber based tissue generating scaffold. The deliverables are (1) to design 1.5 mm thick and 9.56 mm diameter cell culture device consists of layers of PCL and PEGDA, (2) to test the cell morphology and viability of the scaffold, and (3) to test the osseointegration strength of the scaffold with a titanium implant.

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**PROJECT 6** **DESIGN AND CONSTRUCTION OF AN AUTOMATED WHITE BOARD ERASER AND SCANNER ( 4 STUDENTS)**

**FACULTY SPONSOR:** Dr. Alaeddin Abuabed (Office - HOH 221S, Phone - x5934)
**FACULTY CO-SPONSOR (If any):** Dr. Abdellah Ait moussa (Office - HOH 118A4, Phone - 974 5293)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The purpose of this project to design and fabricate a whiteboard eraser and scanner using a single motor that runs on two tracks, one at the top and one at the bottom of the white board. The track will hold two trolley style wheels that will hold the mechanism in place. The bottom will be controlled by a DC motor and the top will hold the track in place.

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**PROJECT 7** **AUTOMATION OF SPRINKLER SYSTEMS AND IRRIGATION SYSTEMS (4 STUDENTS)**

**FACULTY SPONSOR:** Dr. Mohamed Bingabr (Office - HOH 221B, Phone - x5718)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** Contemporary sprinkler system can be programmed to turn on the water at specific days of the week, specific hours of the day, and the time interval of watering. One weakness of the current sprinkler system is that it may turn the sprinkler on for watering when it is raining all day. You have to always monitor the weather report to decide to turn off the sprinkler system or not. Sometimes you will be traveling and will not be able to manually control the sprinkler. Another weakness of the current sprinkler system is that the watering interval is fixed.

Some days the yard needs to be watered for 20 minutes another day it may need to be watered for 40 minutes.

The objective of the senior design project is to build an automation system to monitor the moisture of the yard soil and decide when to turn on the sprinkler system to water the soil and for how long. This system will involve the design and use of appropriate sensors to measure soil moisture, send the parameters that represent the moister by wireless communication or through hard wire connections. These data will be received by a microprocessor to compare the data and make a decision to turn on or not the sprinkler system. If the system decided to turn on the sprinkler then for how long does it leave it on to water the soil? This system can be used to control farm irrigation system in country where water is scarce.

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**PROJECT 8** **DESIGN AND CONSTRUCTION OF A MINI INCUBATOR FOR LIVE CELL AND TISSUE IMAGING (4 STUDENTS)**

**FACULTY SPONSOR:** Dr. Gang Xu (Office - HOH 221F, Phone - x5423)
**FACULTY CO-SPONSOR (If any):** Dr. Yuhao Jiang (Office - HOH 221K, Phone - x5472)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Electrical Engineering

**PROJECT DESCRIPTION:** The participating students will design, construct, and test a mini incubator with fully integrated temperature and CO2/O2 control. The mini incubator should fit onto the stage of an upright or inverted research microscope. The incubator will allow the time-lapse imaging of cultured cells, tissue, and chick embryos.

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**PROJECT 9** **Autonomous Collaborative Robots (2-4 students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any): INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** Design a swarm of autonomous robots that are capable of working collaboratively to perform the task of cleaning up a hazardous chemical spill. In particular, the robots must first work autonomous to locate and surround the spill to keep it from spreading and then work together to remove the spilled material.

**PROJECT 10** **Paraconical Pendulum (3-5 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):** Dr. David Martin (Office – HOH 221J, Phone x5482)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** A "paraconical" pendulum is a pendulum that is supported on a ball which rests upon a flat, thus permitting it to rotate about its vertical axis as well as swinging in two perpendicular directions. A paraconical pendulum has three degrees of freedom and is used in high precision experiments to test current theories of gravity. The rolling friction of the ball upon the flat is extremely low, so that a paraconical pendulum has a high Q factor, principally determined by air resistance. Typically a paraconical pendulum is built as a solid body with a stiff rod, rather than with a flexible wire or cord, and its length is usually about one meter. In this project you will build and model a paraconical pendulum and devise a method to monitor is motion electronically for extended periods of time.

**REFERENCES:** http://www.allais.info/pararesearch.htm;
http://www.gravitation.org/Allais-Pendel_omega_E.pdf

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**PROJECT 11** **Marinov Coupled Shutters One-Way Speed of Light Experiment (4-5 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):** Dr. David Martin (Office – HOH 221J, Phone x5482)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** Build/Improve the Marinov coupled shutter one-way speed of light apparatus and use it to measure the speed of light and attempt to reproduce the results of Marinov.

**REFERENCES:**

http://www.ptep-online.com/index_files/2007/PP-08-05.PDF
http://iopscience.iop.org/0305-4470/12/5/006/pdf/jav12i5pL99.pdf
http://www.helical-structures.org/new_evidences/modern-ether-drift-exp/Marinov_Coupled-Shutters.pdf
http://arxiv.org/PS_cache/physics/pdf/0612/0612201v2.pdf

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**PROJECT 12** **Design of a Unipolar Generator (2-3 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):** Dr. David Martin (Office – HOH 221J, Phone x5482)
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The goal of this project is to design and build a unipolar (a.k.a, homopolar) electric generator. Use the generator to light a 100-W light bulb. Measure the power delivered by the generator.

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**PROJECT 13** **Vertical Michelson-Morley Interferometer (3-4 students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The Michelson-Morley experiment has always been performed with apparatus rotating horizontally about a vertical axis. It has not disproved the existence of ether currents flowing vertically in the direction of the earth's gravitational field. If such vertically flowing ether currents exist, then it should be possible to detect them with an interferometer mounted for rotation on a horizontal axis so that either one of the beams can be positioned vertically and the other one horizontally. This project would entail constructing such an interferometer with a CCD camera for fringe detection and computer automation of fringe shift measurement.

**PROJECT 14** **Wireless Energy Transmission (3-4 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** Design, build, and test a miniature wireless energy transmission device (transmitter and receiver) based on Tesla's patent No. 645,576. The system must fit on a desk top, the transmitter and receiver must be built on separate printed circuit boards, and demonstrate energy transmission over a distance of not less than 2 meters. See http://keelynet.com/tesla/00645576.pdf.

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**PROJECT 15** **Rotating Electric Field Apparatus (3-4 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** A spinning electric field can be created by superimposing two mutually orthogonal, shifted in phase ac fields of equal frequency with two orthogonal pairs of conductive plates (quadrupole capacitors) fed by phase shifted voltages. This project will build the apparatus and investigate it's effects and possible effects on matter.

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**PROJECT 16** **Zener Gravitational Wave Detection Apparatus (3-4 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The possibility that electron current fluctuations through Zener diode pn-junctions in reverse bias mode completely driven by space fluctuations, could revolutionize the detection and characterization of gravitational waves,. This project would build, analyze and collect data from a simple and cheap table-top gravitational wave experiment apparatus using Zener diode detectors, and see if they can used to reveal the implications for the nature of space and time.

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**PROJECT 17** **Anti-Ballistic Missile System using Video Motion Detection and a Nerf Gun (3-4 Students)**

**FACULTY SPONSOR:** Dr. Weldon Wilson (Office – HOH 221E, Phone x5470)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The goal of this senior project is to use a video camera and a dart gun to create an antiballistic missile dart launcher. Create a motion detecting and trajectory calculating program with a webcam and link it to a Nerf dart gun to fire Nerf darts at airborne projectiles.

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**PROJECT 18** **Data Collector/ Performance Analyzer for a Solar Collector system (3-4 Students)**

**FACULTY SPONSOR:** Dr. Ron Miller (Office – HOH 221C, Phone x5471)
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The analyzer consists of: 1) sensors to measure Data such as Solar energy, power IN, energy stored, and power OUT as the days go by. 2) Transmitting data to a laptop which is programmed to 3) calculate and display the overall status and performance of the solar site (Radiometer, Solar Panel, Controller, Battery and Load).

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**PROJECT 19** **Smart cars systems with smart functionalities. (3-4 Students)**

**FACULTY SPONSOR:** Dr. Nesreen Alsbou
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The goal of this project is to build systems to make cars smarter and establish communication between cars on the road. The communication can be between cars, called C2C or V2V communication or between cars and infrastructure on the road, called Vehicle to Infrastructure V2I communication. For example, the communication can be established to send messages to other cars on the road to warn them of an accident/collision.

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**PROJECT 20** **Medical devices communication systems for building smarter hospitals and smarter homes. (3-4 Students)**

**FACULTY SPONSOR:** Dr. Nesreen Alsbou
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**
Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The goal of this project is to establish communication between different medical devices to help doctors and patients. The medical devices can vary and the systems can be used in hospitals, homes, and on the road while driving. The project will use different kind of sensors in a smart way to build the systems.

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**PROJECT 21** **Patient respiratory motion tracking system. (3-4 Students)**

**FACULTY SPONSOR:** Dr. Nesreen Alsbou
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The goal of this project is to develop a motion tracking system. The respiratory motion of patients has to be measured and quantified precisely in medical procedures that require accurate localization of the patient in CT imaging, surgical procedure or radiation therapy treatments. In this system, students will develop a motion tracking system by mounting sensors or markers (optical or ultrasonic, radar) on volunteers and developing a software to read the spatial coordinates of these markers and track the motion of the patient within an accuracy of submillimeter. This motion track of the patient can be used by the imaging system or radiation therapy machine in order to compensate for patient position variation from breathing.

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**PROJECT 22** **Medical devices communications, Collision avoidance system in medical procedures** **(3-4 Students)**

**FACULTY SPONSOR:** Dr. Nesreen Alsbou
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECT DESCRIPTION:** The goal of this project is to avoid collision between patient and machine in radiation therapy treatment. In radiation therapy treatment, large and heavy machines move around the patient during treatment while the room is not attended by personnel. Thus, there is potential for harming the patient in case the machine collides with the patient. In this students will develop a collision avoidance system by placing sensors or markers on both the machine and the patient and tracking their positions. An algorithm will be developed to track the position of these sensors in real time and generate action levels, for example it can be as follows: (a) safe region if the machine and patient are far away from each other by > 10 cm, (b) warning region if the machine is close to the patient within 2-10 cm and (c) dangerous region if the machine is < 2 cm from the patient.

**PROJECT 23-28** **Projects from Dr. Charles Hughes (contact Dr. Hughes for details)**

**FACULTY SPONSOR:** Dr. Charles Hughes
**FACULTY CO-SPONSOR (If any):**
**INDUSTRY CO-SPONSOR (If any):**

**ENGINEERING AREAS:**

Biomedical Engineering
Engineering Physics – Electrical Engineering
Engineering Physics – Mechanical Engineering
Engineering Physics – Physics

**PROJECTS DESCRIPTION:**

1. Advanced Cooling Tower: The basic concept would be to design a cooling tower that uses compressed air in a Dyson style configuration instead of a traditional bladed fan. First semester objective would be to build a scale model, and then the second semester would focus on building out the CAD design of a full scale system. On this one I can help get it started, and then provide industry contacts for cooling tower companies that may be able help.
2. 3DPhotoCAD: This would be mounting a set of GoPro style cameras to a robot, and taking pictures at set intervals to calculate angles and build a 3D model of a room based on those photos. Photosynth (photosynth.net) allows you to do something similar, but it is not targeted on creating a 3D model. They are focused on organizing pictures.
3. Down Can Pick Up System: At the brewery, they get down cans throughout the line, which roll off and collect in bins. If someone could design a system to catch the down can, check the orientation, and reinsert that can upstream it would solve a number of product loss problems in the beverage industry.
4. A sensor to measure abdominal contractions in patients undergoing therapy.
5. A device that will assist patients in getting on and off a therapy table on their own. Currently the therapists have to help them, but the patients often want to try and do it on their own. Similar to this, would be a device that helps patients get up from a couch or chair in their home. Therapists want them to learn to use their legs as much as possible, but they often need support in early stages. Elderly folks have similar issues.
6. Compression icing sleeves having to be reset several times on a patient because there is no way to tell whether it is contacting the skin the right way before the icing chemical is triggered. When they reset it, they often have to break the frozen material up to refit it on the patient. The question is whether some kind of pressure sensor (that could run in spite of the cold) could be developed that would ensure the sleeve is properly placed the first time out.