Project Descriptions for ME463 Spring 2015

1. Team Name: The Appliance Alliance
Project Name: Project DWARF (Dishwasher and Refrigeration)
Brief Project description:
   The problem we will investigate is the overall inefficiency of heat being expelled from a refrigerator to the atmosphere and using a home’s water heater for the operation of a dishwasher. This household standard raises energy costs and fails to utilize a significant amount of heat for other uses around the house. The exact heat lost from the refrigerator and that needed for a dishwasher cycle is unknown, but reusing waste heat for other operations is an expected improvement from the systems in place. Existing technologies include a system described in the article Cooling, Heating, Generating Power, and Recovering Waste Heat with Thermoelectric Systems, by Bell. In this approach, thermoelectric materials can be used to convert waste heat into electricity. There is also an existing patent (US 5220807 A by Bourne, et. al) for a combined refrigerator water heater. Our product is unique, however, because it specifically integrates a dishwasher. Therefore, we will perform a thorough thermodynamic analysis of refrigerator and dishwasher operations to specify the heat needs and capacities of each device. We will design and construct a storage tank for the waste heat from the refrigerator and a pump to use that heat for the water in a dishwasher cycle.

2. Team Name: REACH
Project Name: Reclaiming Energy from A/C Heat
Brief Project description:
   While a residential air conditioning system cools a home, it rejects wasted heat outside to the atmosphere. This heat can be reclaimed using heat exchangers and used to heat water for showers, dishwashers, clothes washers, and possibly other household uses. Similar systems have been created in the past, but are predominantly used in large-scale industrial cooling applications. The goal is to create a heat exchanger or heat pump system that can be added to residential air conditioning systems to reduce the costs of heating water while the air conditioning system is in use. A device like this could decrease the energy use in a home and make the residence more environmentally friendly.

3. Team Name: TWO
Project Name: Single Element LDI Burner
Brief Project description:
Redesign parts like burner confinement fuel injector, swirler, and venture to increase the fuel efficiency, flame stability, and decrease the NOx production.
Spokes-person: Liang Yuchi lyuchi@purdue.edu

4. Team Name: The Combustion Engineers
Project Name: Lean Mean Combustion Machine
Brief Project description:
Our project is the design and implementation of an air-swirling and fuel injection system that feeds into a combustion chamber. The fuel injector is linearly actuated to aid in the investigation of a variable area Venturi throat. In addition, the combustion chamber features variable exit geometry, allowing us
to investigate the impact of exit area on acoustic phenomena. The project as a whole is aimed to aid in research in lean combustion being done by Dustin Cruise.

5. Team Name: Combustamove
Project Name: N+4 Combustion Engineer Research
Brief Project description:
Investigate a 6” long and 1.2” square combustor interaction with fluid flow from 3 different swirlers at 60 degree vane angle. The 3 swirlers are a single set of vanes, a co-rotating pair of vane zones, and a counter-rotating pair of vane zones.

6. Team Name: Burnouts
Project Name: LDI Design
Brief Project description:
Design improvement of and LDI with given dimensions of 8.5’ x 1.7’ with a vane angle of 50 degrees.

7. Team Name: Flame Fantasy
Project Name: Aviation Fuel-Mixing Combustion Analysis
Brief Project description:
A design, analysis, construction, and testing of a fuel injection unit consisting of a fuel injector, swirler, and venture, and of a combustion chamber for the research and improvement of efficiency in airplane engines.

8. Team Name: Team Bacon
Project Name: FeedControl System for Livestock
Brief Project description: A system to control the distribution of feed to livestock that is adjustable and quantifiable. This should be useful for large agricultural operations.

9. Team Name: Stay at Home Dads
Project Name: Ferris Wheel
Brief Project description:
Design a vertically rotating cabinet that removes the challenge of reaching higher shelves. We hope to maximize storage space, ensure safety, and increase retrieval time.

10. Team Name: Lift Squad
Project Name: Attic Aid (moving stuff into the attic)
Brief Project description:
Homeowners need a system to assist in moving items in our out of attic space because current methods are impractical, unsafe, and expensive.

11. Team Name: MotoSafe
Project Name: Visihelmet
Brief Project description:
Motorcycle helmet with turn indicators and brake light indicator for better visibility to other traffic.
12. Team Name: Aesthetech
Project Name: Speakualizer
Brief Project description:
A sound equalizer with speakers for the adjustment sliders.

13. Team Name: HYDROPOWER FOR CAMEROON – “H 4 C”
Project Name: PILOT HYDROPOWER TURBINE PROJECT (PHTP)
Brief Project description:
The goal of this project is to develop a mini hydropower turbine that could generate around 10 to 20 kW power of electricity with approximately 60% efficiency. This turbine will be used during the 3-month dry season in Bangang, Cameroon. This project mainly focuses on machining and assembly alignment of the turbine components in order to improve the sustainability of the overall system.

14. Team Name: STEAAM Engineering
Project Name: Automotive Cabin Pre-heater
Brief Project description:
Decrease the time required to heat up the cabin of a car in the winter, increasing operator comfort, leading to less fuel consumption.

15. Team Name: Wheel to the Future
Project Name: Chainless Challenge
Brief Project description:
Flywheel energy storage system for bicycles.

16. Team Name: Power Tower
Project Name: Power Tower
Brief Project description:
Device to measure a swimmers performance and provide resistance training.

17. Team Name: Assistech
Project Name: Dressing Assistant
Brief Project description:
Design a dressing assistant for either elderly or people disabled to wear clothing such as shirt and pants everyday.

18. Team Name: Net Results
Project Name: Volleyball Setting Machine
Brief Project description:
Coach Shondell requested an automated machine that would not only set a volleyball in different locations and at varying heights and speeds, but would also serve a volleyball using different spins and speeds. This machine also needs to be more cost effective than current options on the market.

19. Team Name: Sports Performance Tech
Project Name: **Basketball Shooting Form Analyzer**

Brief Project description:
We are working on a device that will be used to help improve the free throw shooting form of basketball players. This device will analyze the acceleration, velocity, of the wrist, forearm, and bicep, and compare them to ideal values. The prototype will then signal through a series of tones the quality of the shooting form.

20. Team Name: **Spin Doctors**
Project Name: **Balls of Fury**
Brief Project description:
Ping-Pong ball server.

21. Team Name: **Shady Engineers**
Project Name: **Automatic Window Blinds**
Brief Project description:
Window blinds that automatically adjust to modify the light entering a room in order to control light or temperature.

22. Team Name: **Fantastic Folds**
Project Name: **Automatic Shirt Folder**
Brief Project description:
Design and create a device that folds a shirt automatically.

23. Team Name: **AeroX**
Project Name: **VTOL Fixed-Wing Drone**
Brief Project description:
Design and build a fixed-wing aerial drone capable of vertical take-off and landing (VTOL) and adaptable to multiple mission profiles.

24. Team Name: **Tuggiteers**
Project Name: **Aircraft Tug**
Brief Project description:
Powered general aviation aircraft mover.

25. Team Name: **HauRuck**
Project Name: **Cargo Loader**
Brief Project description:
Design and build an aesthetically pleasing cargo loader which can assist consumers with limited ability in loading cargo into the trunk of an SUV.

26. Team Name: **ASME**
Project Name: **Robots for Relief**
Brief Project description:
ASME Design Competition

27. Team Name: SafeDrop
Project Name: Safe, accurate Package Drop System
Brief Project description:
A specially designed package, with steering capabilities, able to safely and accurately carry supplies to civilians or military personnel. These drops may include food, water, supplies, weapons, etc. The aesthetically pleasing design must have the ability to land safely within a tight radius of a specified location. These strict requirements will be accomplished autonomously using an onboard control system.

28. Team Name: O-Drone
Project Name: Safe Reliable Drone
Brief Project description:
Drone that is safe, more reliable, more efficient, still aesthetically pleasing.

29. Team Name: Fiffi
Project Name: Tennis Ball Retriever
Brief Project description:
A device that collects tennis balls on its own on a tennis court.

30. Team Name: Purdue BraillerMakers
Project Name: Manufacturing Process for Braille eReader
Brief Project description:
Currently, for the Braille eReader EPICS team, St. Vincent Advancement Team (SVAT), there are approximately 8,200 pins that are actuated to create the Braille characters on a reading surface. The current method of production for these pins is by hand which is a very time consuming process and cannot be replicated at the desired scale of production. Constructing these actuators by hand also poses problems with achieving consistent quality. These pins require a high order of quality because all 8,200 pins will need to be placed into a specific array within a 10 inch by 10 inch matrix. High quality must be maintained so that all of the pins will actuate accurately over their lifetime.

31. Team Name: Ping Pong Petes
Project Name: Automatic Ping Pong Game
Brief Project description:
The design is to build an arcade style ping pong game that allows the user to hit the ball back and then receive a score depending on which target it hit. The shooter will be able to shoot the ball at various speeds and spins, making the game like a real ping pong game. The design is also to create a ping pong game system that shoots a ball either from one moving location or from multiple shooters with different speeds and spins, and the ball return system and remote control system would be considered into the design.

32. Team Name: FTP Engineering
Project Name: Pass Master
Brief Project description:
Our aim is to create a football projectile machine that will track its receiver and function autonomously. Possible concepts to consider include user-triggered throws, automatic catch-and-reload, and left-handed and right-handed spin throws.

33. Team Name: **SAR (Some Assembly Required)**
Project Name: **Snapflare – Flying Drone**
Brief Project description:
Portable Flying drone that rises up in the air, takes aerial photos, and returns to the user.

34. Team Name: **Team A.I.R**
Project Name: **Automatic Item Retriever**
Brief Project description:
Automated retrieval robot used to collect various items and store them.

35. Team Name: **Wipe Out**
Project Name: **Semi Truck Snow Cleaner**
Brief Project description:
This device would automatically remove snow/ice from the roof of a semi-trailer. A sensor would detect when there is buildup of snow and a brush/shovel device would run along tracks and clear the roof.

36. Team Name: **MOTUS**
Project Name: **Assistive Movement Device for Impaired Lower Extremities**
Brief Project description:
This innovative assistive movement device will allow those affected with lower limb impairments to move freely in their everyday activities without being held back by the limitations of normal crutches by freeing up the hands and addressing the inhibitive nature of current designs.

37. Team Name: **Team A Plus**
Project Name: **Refreshable Braille Plot**
Brief Project description:
There are about 659,700 of people ages between 4 and 20 in the USA, there is no calculus book that is written with braille text has any plot of mathematic equations, and there is no such digital device that display braille mathematic plot in the market either. Therefore the refreshable braille plot project is to design and build a device that can display various mathematical plots for vision impaired student to learn Calculus.

38. Team Name: **Roughnecks**
Project Name: **Chemical Enhanced Oil Recovery Lab – Core Holder Mover**
Brief Project description:
A new Chemical Enhanced Oil Recovery research lab is being commissioned at the Bindley Bioscience Center at Purdue’s Discovery Park. The process of inserting pieces of reservoir rock into the special holder and then placing the holder inside the oven can be quite tedious and dangerous. Our group will
build an apparatus to assist with this task.

39. Team Name:  **Spoilermakers**  
**Project Name:**  **Retractable Air Dam**  
**Brief Project description:**  
An air dam is a plastic part located under a vehicle front fascia. This component helps to achieve better fuel economy, engine cooling capabilities and driving stability from decreased lift. However, with air dams comes decreased ground clearance for vehicles increasing the risk of scraping the tops of concrete parking curbs, raised sidewalks or possible off-road obstacles causing loss of functionality for the air dam. Prior attempts at solving this issue have utilized manual removal or deployment, or a complex segmented panel assembly. A more simple and automatic approach is necessary for integrating this concept into the new passenger vehicles of today.

40. Team Name:  **Intelligent Innovations**  
**Project Name:**  **Linear Impulsive Regenerative Energy Project**  
**Brief Project description:**  
Convert the linear impulsive energy of the bolt carrier of a firearm into usable and storable electrical energy that could be used by an electronic optic on the weapon.

41. Team Name:  **TEC (Transatlantic Engineering Corporation)**  
**Project Name:**  **BlitzWash**  
**Brief Project description:**  
A washer-dryer combination to address sweaty gym clothes for quick cycles and immediate usage.

42. Team Name:  **Newbility**  
**Project Name:**  **High pressure high temperature cell**  
**Brief Project description:**  
The high pressure high temperature cell (HPHT cell) is designed for optical experiments which is able to maintain a high temperature (up to 1000K) and high pressure (10 atm) inside. The HPHT cell has windows on both sides that allow laser beams to pass through.

43. Team Name:  **JDC Tech**  
**Project Name:**  **X-Charge, Motorcycle Waste Heat Phone Charger**  
**Brief Project description:**  
To build a phone charging system to be mounted on a motorcycle that uses waste heat from exhaust gas to provide electricity via Thermal Electric Generation.

44. Team Name:  **Fret Stars**  
**Project Name:**  **Guitar Assistant for People with Lack of Fine Motor Skills**  
**Brief Project description:**  
Create an apparatus to attach to the neck of a guitar which will allow for the playing of various chords and individual frets. The apparatus will consist of a different control mechanism, such as buttons, which will alleviate the need for the player to arrange their fingers and press the strings themselves. The apparatus will likely be programmed and electronically operate pistons to press the appropriate
strings. In addition, the apparatus will have the ability to slide up and down the neck of the guitar to allow maximum range of notes and chords to be played.

45. Team Name: **Team Mobility**  
**Project Name:** **Rolling Rehab**  
**Brief Project description:** Patients that are wheelchair bound are frequently left in a state that leaves them lacking in strength and mobility. Our goal is to create a solution that will be an extension of their wheelchair that can help these patients rehabilitate in their everyday lives.

46. Team Name: **Four Seasons Solutions**  
**Project Name:** **Snow Plow Robot**  
**Brief Project description:** An autonomous snow plower and salter that can be applied to use on sidewalks and driveways, and in the summer and spring can be used to spread fertilizer and seed.

47. Team Name: **Rapid Elements**  
**Project Name:** **Interface for Rapid Prototyping and Design**  
**Brief Project description:** Product customization will allow people to embed their preferences and individual needs at the front of the design process. However, an accessible interface does not exist to allow to the lay person to interact with the product design process. Therefore, we have developed an interface that requires little or no CAD knowledge and will allow a user to modify a 3D model using an intuitive physical controller.

48. Team Name: **The Softies**  
**Project Name:** **Soft Robot**  
**Brief Project description:** Traditional robots lack the necessary robustness to survive exploration of unstructured environments, such as extraterrestrial terrains. Such environments may lead to an exploratory robot falling or flipping on unforgiving surfaces. We have designed a robust robot that can survive repeated impacts, disorientation, and obstacles obstructing its path.

49. Team Name: **Levram/SoftServ**  
**Project Name:** **Soft Material 3D Printer**  
**Brief Project description:** There is currently no commercially available 3D printer that can print commonly used elastomers. These materials are widely used, but parts made from these materials are typically manufactured one-at-a-time using non-scalable molding processes. We present a soft material 3D printer that can accept common and highly viscous uncured elastomers with built in curing functions to optimize the printer resolution.

50. Team Name: **AMMMT**  
**Project Name:** **Low Cost Micromanipulator**  
**Brief Project description:** Micro-manipulators are typically prohibitively expensive and spatially inefficient. In order to reduce
costs and manage space more conveniently, we have designed a low-cost micro-manipulator that moves objects with micrometer precision using alternative hardware such as hobby motors, microcontrollers, and 3D-printed mounting assemblies.

51. Team Name: **MEn**  
**Project Name:** **Motorcycle Assistive Lifting Device (MALD)**  
**Brief Project description:**  
There are currently no devices on the market that efficiently assist a user in lifting a fallen motorcycle of any make or model to its upright position. Therefore, we have designed a prototype that can lift a bike weighing up to 600 kg using pneumatic inflation and that also deflates for convenient storage on the motorcycle.

52. Team Name: **Zero G**  
**Project Name:** **Interactive Model Roller Coaster**  
**Brief Project description:**  
This project is intended to garner interest in engineering, science and math for current and future Purdue students. Many students find roller coasters interesting and attention-grabbing. By teaching basic physics and dynamics through roller coaster demonstrations, student learning can be optimized. Our prototype employs a model roller coaster to collect, process, and display acceleration data for learning purposes.

53. Team Name: **SAE Mini Baja**  
**Project Name:** **2015 Mini Baja Competition**  
**Brief Project description:**  
Design and build the 2015 mini Baja competition vehicle

54. Team Name: **SAE Formula**  
**Project Name:** **2015 Formula SAE Competition**  
**Brief Project description:**  
Design and build the 2015 SAE Formula vehicle

55. Team Name: **SAE E-Formula**  
**Project Name:** **2015 Electric Formula SAE Competition**  
**Brief Project description:**  
Design and build the 2015 Electric SAE Formula vehicle