ANNEXURE – 1

A brief note on all Thrust Areas of the University

- **Department of Civil Engineering**

The thrust areas of research are in Structural and infrastructure, transportation, Hydraulic and Survey engineering. The department is quite strong in terms of research activity in the Structural engineering. Departments also conduct a Masters Program in Structural Engineering. The department's faculty is active in these research thrust areas. These thrust areas are briefly mentioned below.

Steel Structures
Experimental, analytical, numerical and design-oriented research is performed on steel structures - for entire buildings, subassemblies, connections/joints and fasteners (bolts, welds and nails). The behavior and properties of structural steel and cast iron materials are also studied. The loading conditions that are considered include quasi-static, fatigue, impact and seismic. Current research emphasis is placed on Structural Stability, Welded and Bolted Connections,

Concrete Structures
The Department of Civil Engineering has had a strong focus on the behavior of reinforced concrete structures. Unlike many institutions that either focus on experimental work or focus on analytical modelling of behavior. Thus the two main structural laboratories at the University contain a great deal of large-scale equipment and are often used for special-purpose, unique tests. In addition, there has been a long term initiative to truly understand the behavior that is being observed. This has led to the development of many useful theories on the behavior of concrete structures that have been the subject of extensive research here and elsewhere.

Transportation Systems Management
The goal of the thrust area is the Development of Advanced Technology, Improved Processes, and Enhanced Organizational Structures for the Integrated Management and Operation of Transportation Facilities and Corridors

Bridge Engineering
The department is planning to develop bridge related technology and provide a mechanism through bridge related projects, including laboratory and on-site testing.

Water Resources Research
The purpose of the departments is to develop new technology and more efficient methods for resolving local, state and national water resources problems. In addition to supporting research, its mission includes training water scientists and engineers and disseminating information to the public. St. Peters University has started an Open University course in Water Resources

- **Department of Mechanical Engineering**

1. Renewable Fuel
2. Renewable Energy
3. Emission Control
4. Engineering Design Using Nanotechnology

- **Department of Electronics and Instrumentation Engineering:**

1. Virtual Instrumentation system
2. VLSI Embedded control system
3. Bio medical systems.
4. Advanced process control
5. Smart structure and control

- **Department of Information Technology**

1. Grid Computing,
2. Adhoc and Wireless Networking,
3. Data Mining and Warehousing

- **Department of Production Engineering**

1. Machining of Composites by Wire Cut Electrical Discharge Machining.
2. Grinding of Metal Matrix Composites.
3. Friction Stir Welding of Metal Matrix Composites.
4. Hybrid Bike
5. Special Purpose Machine for Bending of Pipes.
6. Technological Business Incubator.

- **Computer Science and Engineering**

1. Grid Computing,
2. Adhoc and Wireless Networking,
3. Data Mining and Warehousing

- **Production Engineering**

1. Machining of Composites by Wire Cut Electrical Discharge Machining.
2. Grinding of Metal Matrix Composites. Friction Stir Welding of Metal Matrix
3. Composites.
4. Hybrid Bike
5. Special Purpose Machine for Bending of Pipes.
6. Technological Business Incubator.

- **Department of Chemical Engineering:**

1. Effect of hydro topes on solubility and mass transfer coefficient

This study deals with the effect of hydro tropes on the solubility and mass transfer coefficient of salicylic acid. The solubility and mass transfer studies were performed using the hydro tropes, i.e., sodium acetate, sodium salicylate, citric acid, and urea at concentrations of 0~3.0 mol/L and system temperatures of 303~333 K. It was found that the solubility and mass transfer coefficient of salicylic acid increases with increase in hydrotrope concentration and also with system temperature. All hydrotropes used in this work showed an enhancement in solubility and mass transfer coefficient to different degrees. The maximum enhancement factor values were determined for all hydrotropes used in this study. The highest value was 28.08 for solubility studies and 10.42 for mass transfer studies. The performance of hydrotropes was measured in terms of the Setschenow constant (*K*s). The highest value observed was 0.696.

2. Aerobic Treatment of industrial effluents

Aerobic Treatment of industrial effluent is one the majore thrust area in environmental engineering. In this treatment isolation of microorganisms is also carried out and modeling is done to find out which model suits best for treatment.

- **Department of Automobile Engineering**

AUTOMOBILE AND SURFACE TECHNOLOGY. APPLICATION AND DEVELOPMENT OF THE FUNCTIONAL SURFACE. DEVELOPMENT OF TITANIUM OXIDE PHOTOCATALYST TO THE AUTOMOBILE FIELD.

Recent application development concerning automobiles of titanium dioxide photo catalyst was examined and summarized.

Application to air cleaning in an automobile: the structure of cleaning filter using the photo catalyst and a case of the acetaldehyde removal effect are presented.
The use of ultra hydrophilic surface: examples of water drop proof mirror and window are described.
Removal of NOx in the environment: spray paving with cement mixed with titanium dioxide photo catalyst onto road surface is introduced.

THE SIX STROKE ENGINE IS A TYPE OF INTERNAL COMBUSTION ENGINE BASED ON THE FOUR-STROKE ENGINE, BUT WITH ADDITIONAL COMPLEXITY TO MAKE IT MORE EFFICIENT AND REDUCE EMISSIONS

In this approach, the engine captures the heat lost from the four-stroke Otto cycle or Diesel cycle and uses it to power an additional power and exhaust stroke of the piston in the same cylinder. Designs use either steam or air as the working fluid for the additional power stroke. As well as extracting power, the additional stroke cools the engine and removes the need for a cooling system, making the engine lighter and giving an estimated efficiency of 40%.[1] The pistons in this type of six-stroke engine go up and down six

times for each injection of fuel. There are two power strokes: one with fuel, the other with steam or air. The currently notable designs in this class are the Crower six stroke engine, invented by Bruce Crower of the U.S. ; the Bajulaz engine by the Bajulaz S.A. company of Switzerland; and the Velozeta Six-stroke engine built by the College of Engineering, at Trivandrum in India.

- **Department of Aeronautical Engineering**

NEW ENGINE TECHNOLOGIES

The Pratt & Whitney Geared Turbofan which will allow the Fan and LP Turbine to each operates at optimum speed providing increased fuel efficiency and reduced noise.

Electric airplanes are being developed and tested under projects as the E-flight initiative. Range is still limited with these airplanes though.

Solar and human powered propulsion-aircraft are being worked on for long duration flight. Aircraft like the Solar Impulse, Helios, Pathfinder and others prove that zero emission fixed wing aircraft are possible, yet translating the concept to larger aircraft is very hard

Alternative fuels for aircraft have received limited attention. Hydrogen is perhaps the most obvious alternative to existing kerosene/gasoline-type fuels, but the technical and infrastructural challenges inherent in developing a commercially usable hydrogen-powered aircraft are huge. The Russian manufacturer Tupolev built a prototype hydrogen-powered version of the Tu-154 airliner, named the Tu-155, which made its first flight in 1989. In addition, Boeing too has been experimenting with hydrogen (primarily to power auxilliary systems), yet has plans to build a hydrogen-powered jet. Also Boeing's Research & Technology Europe (BR&TE) has made a civilian aircraft made from a 2-seat Dimona motor glider running on a fuel cell. (called Theator Airplane)". [10] [11] Lange Aviation also made a hydrogen-powered airplane with its Antares DLR-H2 airplane.

RADICAL AIRCRAFT DESIGNS

Blended wing body designs date from the early postwar era. Research on updated designs is under way at Boeing and Cranfield University

In addition to blended wing body designs, Flying wing-designs also offer similar benefits and have had interesting new technologies as counter acting airbrakes (folding open both above and under the wing) .

Lifting body designs are similar to flying wing designs with the difference that is a wing without a conventional fuselage. Some airplanes such as Smartfish are equipped with this design, hereby no longer needing flaps, slats or spoilers.

Airplanes can also be foreseen with lighter-than-air gases such as helium or hydrogen. These gases may be placed in extra wings, such as with the Bauhaus luftfahrt boxed wing aircraft.

The AeroVironment SkyTote fixed wing, VTOL aircraft is another type of radical rethinking on aircraft construction. It focuses on building an aircraft that has moderately good VTOL properties as well as the flight advantages of a regular fixed wing aircraft.

The Peebles Fanwing is a new approach to lift, and is benefiting from investment by the UK and Italian Governments.

Another radical new aircraft design that is being relooked for the environmental advantage it can bring are flettner airplanes