



PRESS RELEASE

UKZN's Mechanical Engineering Open Day to Showcase the Best of Innovative Student Engineering

There is feverish activity and an atmosphere of excited anticipation in the corridors of UKZN's discipline of Mechanical Engineering.

Students and staff alike are hard at work preparing for the annual Mechanical Engineering Open Day, scheduled to take place on Friday 20 October 2017 at the Unite School of Engineering building, Howard College Campus.

This highlight of UKZN Mechanical Engineering's academic calendar showcases the best of innovative student engineering, when final year Mechanical Engineering students display their projects for public viewing. With their hearts in their mouths, the fourth year engineering hopefuls are at hand to explain their project designs to evaluators, sponsors, parents and the general public.

This display of projects is part of the degree requirements of the final year Design and Research Project modules. Projects are allocated to project groups, consisting of three or four students, at the beginning of the year.

The final year Mechanical Engineering design projects simulate a professional working environment in which students have to apply the Engineering knowledge gained during their studies, to achieve specified project objectives whilst keeping within predetermined budgets. The technology demonstration prototypes that they produce within the nine month period encompass a wide variety of engineering sub-disciplines; including vehicle design (electric, air, land, water), green energy technologies, renewable energy harvesting systems and industrial machines.

Assessment of the projects is structured in accordance with the Engineering outcomes required by the Engineering Council of South Africa (ECSA).

'The focus of this Open Day is to highlight the hard work and technical achievements of our final-year students,' said Academic Leader for Mechanical Engineering at UKZN, Professor Glen Bright.

Discipline demonstrations and postgraduate research will also be on show. Dynamic interactive displays, available for hands-on testing by the public, include the UKZN pedal bus, electric trikes and the rally car simulator. There will be technology demonstrations throughout the day, including from the rocket display unit, the unmanned aerial vehicle (UAV) and a mobile robotic displays. Standing exhibits will include vehicles that illustrate the evolution of the motor vehicle. These include a Model T Ford, Wildtrak Ranger, UKZN's World solar car entry and a flying hovercraft.

'We want the public to experience and interact with the engineering projects,' said Prof Bright. 'So please come and take part in this interesting and interactive Engineering festival.'

A PICK OF THE 21 FINAL YEAR ENGINEERING DESIGN PROJECTS ON DISPLAY:

- **RECUMBENT COLLAPSIBLE HAND-BICYCLE**

Kelly B, Patchy J, Sampat S, Viriah T

Prof S Adali

The project involves the design of a hand-driven bicycle to be used by paraplegics. The bicycle is designed to be collapsible and to be easily assembled and disassembled. A simple folding mechanism is accomplished in 3 simple steps and can be done in a minute. The purpose is to provide a means of transportation and exercise for people who are unable to or find



it difficult to use conventional bicycles. It is hoped that the hand driven bicycle will contribute to the well-being of the paraplegic person using it.

- **BRICK REHABILITATION**

Dlamini V, Govender D, Ramcharan I, Singh D

Prof G Bright/Mr C Basson

The project objective was to design and develop a semi-autonomous brick rehabilitation system. The brick rehabilitation system features an integrated cleaning mechanism capable of rehabilitating a brick by either refurbishing and/or reshaping it; if broken, such that the brick can be reused in the construction industry. The final conceptual design employs a three-stage fixed distance blade cutting system that aims to match or decrease the manual cleaning rate of one brick per minute. The system can provide potential entrepreneurs with a device to build a business around as the output brick will provide a low-cost alternative to new bricks.



- **VERTICAL AXIS LOW HEAD WATER TURBINE**
Kuzwayo K, Madanlal A, Nkwanyana W, Sookraj N

Prof GDJ Smith

The vertical axis low head turbine/pump set was designed to supply water to the many communities in South Africa that do not have easy access to water, communities that are situated far from power grids and citizens that otherwise have to endure long walks in harsh climates to collect water. The system works on the principle of using the water flow from rivers with low head drops, i.e. 1.5 metres and a flow rate of 50 litres/s, to drive a pump capable of lifting water to a significantly greater height. The use of a pre-swirling volute has obviated the need for nozzle guide vanes and a printed ABS plastic rotor has been produced which, together with other design features, has led to a final design which is both low cost and with little need for maintenance.



- **LOW COST 4D VEHICLE SIMULATOR**
Bahadur S, Chetty J, Jagot M

Prof G Bright/Mr H Gerken

Over 60% of road fatalities in South Africa involve drivers under the age of 25. This statistic highlights a need for a safer method for younger drivers to gain experience. To address this, a Low Cost 4D Vehicle Simulator was designed. The 4D simulator was based on an existing rally car simulator. It was found through testing that the simulator lacked modularity and sufficient 4D effects. Modifications were carried out to improve modularity, aiding in transportation and fabrication of the design, as well as provide a 4D experience for the driver. Kinematic & software systems were explored in the design to synchronise platform movement to improve realism. Safety features were added and modifications were made to improve comfort.



- **VTOL WINGED FLYING CAR**

Cooper R, Crichton J, Gounden N, Mthembu N

Prof G Bright/Mr E Slabbert

The research, design and development of a 1/8th scale Vertical Take-off and Landing (VTOL) winged flying car to model a futuristic approach to land and air transportation. The aim was to redesign the 2014 flying car to allow for digital control switching between flight and drive modes, incorporate retractable wings and aerodynamics to produce lift for increased flight efficiency to maximize the flying car's range. The chassis consists of a rear-driven, three-wheel tadpole layout. The remote control vehicle utilizes bi-rotor open blade propeller technology, weight reduction via a CFRP airframe, aerodynamic modelled wings and body for stable flight and hover.



- **RESEARCH AND DEVELOPMENT OF AN OFF-ROAD RALLY VEHICLE**

Hofer C, Munsamy S, Pillay R, Rampersath V

Prof G Bright/Mr H Gerken

The purpose of this project is to develop a methodology for the conversion of a 1968 VW beetle, into an off-road rally vehicle. The conversion methodology provides a cost effective alternative to the purchase of a new expensive leisure/amateur rally vehicle, while recycling an old vehicle which is in near scrap condition. This enables the formation of a new 'budget' rally league, which caters to these restored vehicles. This also reduces the problem of old vehicles in danger of losing their road worthiness being scrapped, and posing a potential source of environmental pollution. The off-road rally vehicle the project has produced proves the validity of this methodology.



- **PEDAL BUS AND TRIKE TECHNOLOGY PROJECT**

Jairaj D, Pather S, Sunnylall S

Prof G Bright/Ms R Theba

Technology defines the structure upon which the modern age is built. Durban has embarked on a strategy to showcase new and innovative developments in transportation technology. The pedal bus and trike are pre-existing vehicles that transport people in a carbon free and efficient manner. The task required by the final year project students was to design and implement systems on both vehicles that would allow them to perform operations under semi-autonomous conditions. In addition to this, appropriate speed control and a high degree of comfort for passengers needed to be implemented on both vehicles.



- **HYBRID ROCKET MOTOR TEST FACILITY**

Bissessur S, Govender S, Maritz W, Premilall R

Dr MJ Brooks

The project entails the design and construction of a dedicated propulsion facility for the testing of hybrid rocket motors by the Aerospace Systems Research Group. The facility must enable the safe testing of laboratory-scale motors and must facilitate rapid reusability and flexibility while ensuring safety at all times. Finite element analysis and chemical equilibrium simulations were undertaken to predict the mechanical performance of a new laboratory-scale hybrid rocket motor developed for the facility. LabVIEW software was incorporated to control and measure operational parameters while a double layered wall acts as a blast chamber. The facility incorporates a propellant distribution system to transport nitrous oxide from run tanks to the test motor.

- **SERAFF SOLAR FURNACE CAPABILITY ENHANCEMENTS**

Chetty M, Mabele S, Perumal M

A flume in the Mechanical Engineering Building is of a length and width which will allow the installation of a wave generator at one end and an absorber at the other end 15 meters distant. The generator should be adjustable in terms of wave frequency and magnitude and possibly should even be controlled to absorb any waves that may be reflected back from the absorber. The absorber should convert wave motion into the efficient deflection of a hydraulic ram.

Mr JF Pitot



- **SMART HOUSE**

Govender T, Naidoo T, Ngobese S, Naidoo P

Prof FL Inambao

The Smart House is designed to operate entirely off the grid by utilising solar energy. The 'Smart' component of the house incorporates a control system that is applied to several of the components. Energy considerations were made in order to reduce required energy input sufficiently so that solar energy would meet the homes energy requirements. A steady state thermal analysis was carried out, in order to develop on the understanding of heating and cooling loads in the house. Improvements in solar energy absorption have been adopted to increase the energy supplied to the house. The Smart house has been designed to meet the standards of a Smart home, while answering the global call for sustainable development.



UKZN MECHANICAL ENGINEERING OPEN DAY PROGRAMME:

- DATE:** Friday 20 October 2017
- TIME:** 12h00 – 16h00
- VENUE:** Unite School of Engineering Building, University of KwaZulu-Natal, Howard College Campus
- ENTRY:** UKZN Gate 8 off Rick Turner Rd. Thereafter take first right and drive straight to the Unite School of Engineering parking lot.
- ENQUIRIES:** Professor Glen Bright, Academic Leader: Mechanical Engineering, UKZN
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