

Building Bridges with Industry

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Some years ago, the Faculty of Engineering was re-structured so as to reflect the diversity within this ever-expanding field. Known formerly as the Faculty of Mechanical and Electrical Engineering and comprising solely these two departments, the Faculty today has six departments and offers a four-year undergraduate course leading to a Bachelor of Engineering Honours [B.Eng.(Hons.)] degree. Programmes at Masters and Doctoral level are also available.

In keeping with general University policy to become increasingly more entrepreneurial, the Faculty of Engineering, over the years, has established close connections with industry. There is collaboration in the realisation of various joint projects while industrial companies have been quick to acknowledge the potential of our engineering students who soon acquire positions on graduating.

In the field of Microelectronics, design and construction of production test equipment for ProMinent Fluid Controls Ltd. (a subsidiary of the ProMinent Group of Companies which has its headquarters in Heidelberg, Germany) has been implemented. This necessitated designing and constructing the hardware as well as developing the support software required. Design and fabrication of other (high voltage) test equipment for various industrial clients has also been undertaken. IC design software has been invested in. This can be used to introduce small and medium sized enterprises to the design and use of ASICs in their products. Calibration

equipment for electronic apparatus is available. These facilities can calibrate multimeters, oscilloscopes, power supplies, function generators and other electronic equipment. The calibration can be traced to NAMAS certification and is therefore valid for ISO 9000 purposes. This service is already being provided to local industry. The department has been very active in the research of low power and high frequency IC design suitable for the next generation mobile technology, with a number of papers published in journals. A paper entitled *The Silicon Cochlea and its Adaptation to Spatial Localisation*, (IEE-Proceedings: Circuits, Devices and Systems, vol. 146, pp. 70-76, 1999), by I. Grech, J. Micallef and T. Vladimirova was awarded the 2000 *Ambrose Fleming Premium* by the Institute of Electrical Engineers, UK. due to its innovative content.

ST Microelectronics are sponsoring the development of an electric vehicle for use inside the factory premises. This is being developed through collaboration between the Departments of Communications and Computer Engineering and Electrical Power and Control. Communications software and communications development tools for the design and modelling of communications systems are available. State of the art acoustic measurement equipment is utilised in the evaluation of the noise or acoustic environment within an office enclosure or a factory floorshop among others. Analysis of acoustic material from churches and mosques with the aim of preserving the acoustic heritage associated with large

public buildings is an undertaking made possible through involvement in an EU 5th framework project. Adaptive antenna design that is of importance when implementing wireless communication systems is a focus of current research.

In conjunction with several local companies, the Department of Electrical Power and Control is involved in the exploration of alternative energy sources (such as its research concerning Solar Grid Connected Inverters, partly sponsored by MasterVolt) as well as the use of new signal processing techniques for efficient power control. A new Power Systems Laboratory using protective relays donated by Siemens has been designed. Further collaboration with the public sector has involved research into Water Leakages for Water Services Corporation, a project which is now into its second year. Erasmus agreements have been signed with the University of Nottingham, the University of Valencia and the University of Sheffield which will facilitate student and lecturer mobility.

A wide range of engineering coatings and heat treatment services such as: Vacuum Heat Treatment; Laser cutting, welding and surface hardening; Ion implantation; Physical Vapour Deposition of Titanium and Chromium Nitride coatings and Plasma Nitriding are offered by the Department of Metallurgy and Materials to various sectors of the local industry. To this end, a joint venture company, Surface Engineering Co. Ltd., has been established with Tecvac Ltd. of Cambridge, UK. Coatings and heat treatments are used for a decorative purpose, to reduce wear or friction, or improve corrosion resistance. Other coatings treat surfaces with a covering suitable for humans so that underlying noxious substances or material harmful

to the body cannot be absorbed through the skin. These services help local industry to improve the quality of their product, increase productivity by extending tool life and reduce machine down time thereby increasing the added value of the finished component. Companies such as ST Microelectronics, Merit Malta Ltd., Baxter Ltd., Forsheda, Dowty Tecmold and others make regular use of these facilities.

With the setting up of a centralized, state of the art heat treatment facility, the dependence upon imported goods and services has been minimized. The heat treatment plant has served in many cases to provide services which were otherwise not available on the island and in some cases to replace those which were not environmentally friendly and involved the use of hazardous chemicals such as cyanide salts. The workshop provides industry with the security of having the latest technology available in Malta which eliminates the need to replace or send expensive tooling abroad for treatment.

Research and industrial activities of the Department of Manufacturing Engineering concern various product development technologies and methodologies. Industrial short courses such as those in Computer Aided Engineering Design & Manufacture and PLCs are also conducted regularly. For several years, it has also collaborated with local industry in the design and development of various fabrication, assembly and inspection systems. A typical, recent final year student project was conducted in conjunction with Methode Electronics (Malta Ltd.), a supplier of automotive control technologies to companies like BMW &

Ford. It concerned the re-design of a sliding switch mechanism by using 'DFX methods' in order to improve its life-cycle performance. Similar design and development projects are carried out with other firms such as Toly Products Ltd., and Seifert (Malta) Ltd. Industrial services provided include the calibration of metrology instruments used in support of the ISO9000 certification. From a research perspective, there is regular participation in various international conferences such as those organized by the American Society of Mechanical Engineers, the Society of Manufacturing Engineers (USA), I.F.I.P. and the Institute of Mechanical Engineers (UK). There is ongoing collaboration with CNR (Italy), the University of Strathclyde and the Technical University of Denmark, in product development, lecturing and research activities. Through its role on the Malta Standards Authority and advice given to the Institute for Private and Small Enterprises (IPSE), the department is an active contributor to Malta's industrial restructuring exercise.

Studies on fuel additives, combustion and flame stabilisation have been carried out by the Department of Mechanical Engineering in conjunction with Enemalta Corporation. Research focusses on the development of a Solar heat pump, a wind turbine and Pressure Vessels (this, in collaboration with the University of Strathclyde). Research work on Finite Element Analysis is another departmental project. Collaboration with the public sector has also included conducting acoustic measurements and Planning Surveys on behalf of the Planning Authority.

Agreements have been signed with various American and Australian Universities for the exchange of undergraduate students. As from next

year, they will have access to European Universities under the Erasmus programme. Six students have already benefited from an agreement with Oakland University, Rochester, Michigan, by which outstanding students are awarded research scholarships to pursue Master's and Doctoral degrees at its School of Engineering and Computer Science. Apart from collaboration with local industry and providing consultancy on industrial projects, the Faculty has a host of mutually beneficial ongoing research links with foreign Universities. These include, among others, the University of Lecce in the field of Multimedia Communications; Pavia in the area of Integrated Microsystems; Hong Kong in optoelectronics and the University of Massachusetts in the area of polymers. Research into austempered ductile iron has seen the establishment of links with the Institute of Machinery at the University of Catania in the field of thermal infrared imaging technique to determine the fatigue limit of austempered ductile iron and with Birmingham University, UK and the Technical University of Clausthal, Germany on the Kinetics of the austempering reactions in a ductile iron alloyed with copper and nickel and quantitative metallurgical analysis of cast iron using x-ray diffraction techniques. The Faculty also has links with Pittsburg State University, USA.

(A comprehensive picture of the Faculty of Engineering, research findings and publications may be seen on-line by navigating the website at: <http://www.eng.um.edu.mt>)

Dr. Micallef is Head of the Department of Communications & Computer Engineering and Dean of the Faculty of Engineering. He is also Chairman of the Board of Studies for Information Technology.