M.Sc. in Integrated Product Development

The Department of Industrial and Manufacturing Engineering in collaboration with the Faculty of Economics, Accounts and Management (FEAM) is offering for the fifth time the M.Sc. in Integrated Product Development (IPD). The M.Sc. IPD is aimed for engineers or scientists, who have recently graduated in either mechanical or electrical engineering or who have already achieved extensive experience in industry. This postgraduate programme is intended to fortify skills and to maximize performance and success in the industry by integrating all the aspects of product development including product function and design, product materials and manufacturing, product use and environmental impact, product marketing and costing, entrepreneurship and business management.

Further information on the M.Sc. IPD course can be found on the website: http://www.eng.um.edu.mt/~dmeu/msc/. Application details for the M.Sc. IPD course beginning in October 2011 can be obtained from the Office of the University Registrar on Tel: 2340 2848 or by email: info.registrar@um.edu.mt. For any information regarding the M.Sc. IPD course kindly contact the course co-ordinator, Dr Ing. Philip J. Farrugia on Tel: 2340 2045 or by email: pjfarr@eng.um.edu.mt

Testimonials from M.Sc. IPD students:

Laura Pace: "The M.Sc.- IPD Program enables me to pursue further my career within the manufacturing industry whilst at the same time, enhancing my theoretical knowledge both in the engineering and managerial world".

Kenny Muscat: "An advantage of the M.Sc.- IPD is that apart from engineering itself, it focuses on areas such as management and marketing. The content of the degree has helped me to work more effectively at my workplace. It has also helped to understand and appreciate more that really lies behind the development of a product, no matter how simple it might appear".

Bachelor of Engineering (Hons.) in Mechanical Engineering with Industrial and Materials Engineering

The Department of Industrial and Manufacturing Engineering (DIME) together with the Department of Metallurgy and Materials Engineering (DMME) are offering the Bachelor of Engineering (Hons), in Mechanical Engineering with Industrial and Materials Engineering, degree. This Industrial Engineering Degree (IED) is a four-year interdisciplinary program created to meet the requirements of today's industry. By spreading the course over a period of 4 years, the technical and management skills imparted allow the graduates to be able to also take up management-, entrepreneurial- or technically-oriented jobs. B.Eng.(Hons.) graduates will be able to deal with the conceptual, methodological and technological tools used by industrial and service companies in the design, processing and implementation of products and processes. Due to their interdisciplinary training, they will be in an excellent position to engage in a range of Industrial R&D activities, to take up technical managerial posts and will also be eligible to embark on postgraduate degrees offered by the Faculty including the M.Sc. in Integrated Product Development

Prospective students and employers can learn more about this new exciting career by visiting http://www.eng.um.edu.mt/~dmeu/endmg. Those interested in learning more about this career are asked to contact either Prof Ing. Jonathan C. Borg (Head DIME) or Dr Ing. John C. Betts (Head DMME) by phoning 2340 2061 or 2340 2056 respectively.

Testimonials from 3rd Year B.Eng. students:

Bonnie Attard: "I chose this course, since it offers an interesting and in deep view of the industry, its processes, systems and methods. Apart from that the course is also based on material science which is a very interesting and useful field in itself. Site visits given during the course have also been of great value in further understanding the subject".

Mark-A. Bonniz: "Being enrolled in the Industrial Engineering Course, helps me to get a further perspective regarding specific subjects, such as a deeper insight on Material Science, Manufacturing and also on graphical software programs, which I’m sure that a good Engineer will require in today’s Industry".

Message from the Head of Department

I am indeed pleased to once again see the array of academic activities carried by our Department and its contributions at the national scale to amplify competitiveness in Manufacturing. In this respect, as reflected in the content of this newsletter, DIME has been slowly upgrading its infrastructure through the acquisition of state-of-the-art equipment funded by ERDF. Our staff have also been exposed to relevant training overseas whilst our academics have been busy presenting their research results at international conferences.

Nevertheless, as engineers we are driven by the mentality of ‘continuous improvement’ and for this reason, we are looking towards expanding not only our equipment and facilities but also towards increasing our human resources. This will help us prepare our future engineering workforce with respect to Government’s vision 2015 has still not been catered for. We are hopeful that this will be addressed before the start of the next academic year as our aim as a Department is to improve not simply the quantity but more importantly the quality of training and research services we offer to our students.

I believe that the content of this newsletter is proof of the overall work carried out by our very small department and that thus an investment in DIME will reap much more benefits for both the University and Malta’s economy.

Prof Ing. Jonathan C. Borg
Externally Funded Projects

**ERDF 083 Research Tender: Amplifying Innovation in Manufacturing**

The ERDF 083 Project – Research Services for Amplifying Innovation in Manufacturing is composed of three manufacturing research projects, all of which contribute towards Europe’s Strategic Vision for Manufacturing for 2020. The projects are:

- Energy Efficiency in Manufacturing
- ICT in Manufacturing
- Innovation in Manufacturing

The Department of Industrial and Manufacturing Engineering is responsible for the third project – Innovation in Manufacturing. This project started in April 2010 for a duration of 2 years and has as its main aim the amplification of innovation in product design and manufacturing. This research project is composed of two initiatives:

1st Initiative: Development of “An Industrial Collaboration Framework” for Amplifying Innovation in Manufacturing (IC-FAIM)

The overall goal of this research initiative is to amplify innovation and creativity in manufacturing through improved product development stakeholder collaboration.


The overall goal of this research initiative is to amplify innovation and creativity in manufacturing via the prediction of consequences through the simulation of product life phases and the visualization of product and manufacturing system performance measures during manufacturing system design.

Both initiatives fall within what has been termed as an **Innovation Cloud**. Within this cloud is a product development process that involves multiple experts (e.g. designers, production managers, suppliers, etc.) from different areas who collaborate together in developing new innovative products and production systems. These ideas are developed within **IC-FAIM**. One of the main stumbling blocks when it comes to the implementation of innovative ideas is the justification of possibly new capital expenses in the short term and prediction of long term profits/returns and other performance metrics such as assembly time, environmental impacts, product quality etc. Therefore **LS-FAIM** is aimed at carrying out simulations that can help predict the consequences of the innovative ideas generated whilst comparing their feasibility from a different performance metric perspective.

Industrial partners:
On Wednesday the 23rd of March 2011 the Department of Industrial and Manufacturing Engineering, University of Malta, held a Public Lecture on Quality Control in the Plastics Manufacturing Industry.

The Public Lecture was presented by Prof Dr Ing. Achim Frick, a professor at the Faculty of Mechanical Engineering, Aalen University, Germany. Prof Frick is Head of the “Polymer Engineering Technology Transfer Centre – PETZ” which provides polymer engineering services to industries and also the head of the research Institute of Polymer Science and Processing (IPSP). Prof Frick is also the author of several scientific publications concerning his research subjects and also author of books related to polymer testing and troubleshooting.

On Wednesday the 17th of November 2010 the Department of Industrial and Manufacturing Engineering, University of Malta, held a Public Lecture on Creativity in Engineering Design. The Public Lecture was presented by Prof Dr Ing. Peter Leibl, a professor at the Department of Precision and Micro Mechanics, Munich, University of Applied Sciences, Germany. His research interests are Product Design, Design to Cost, Machine Elements and Innovation management.

The Public Lecture was well attended with a student audience, engineers from industry, University lecturers and staff. Following the public lecture some refreshments were served, and the audience continued their discussions with Prof Leibl.

The Department of Industrial and Manufacturing Engineering would like to thank the outgoing Dean, Professor Ing. Robert Ghirlando for the excellent services rendered to the faculty during his deanship.

The Department would also like to congratulate Dr Ing. John C. Betts, on his recent appointment as Dean of the Faculty of Engineering, and wish him good luck with this deanship, whilst offering our utmost support to the Faculty.

The research project entitled “A rationalisation of industrial automation requirements and service provision in Malta, with a focus on the development of new modular reconfigurable industrial automation systems”, acronym AUTOMATE, closed officially on 30 November 2010. The project was funded under the national research and innovation program 2006, receiving approximately €140,000 through the Malta Council for Science and Technology.

The project has resulted in a number of important contributions in the areas of reconfigurable manufacture and of manufacturing automation at both the national and international levels. A national survey on the use of automation in Maltese manufacturing companies, and of impediments to its use, has been conducted as part of the project, and has resulted in a clear understanding of the current state of affairs in Malta. During the project, AUTOMATE researchers have developed a new model to aid in the development of reconfigurable, and where applicable automated, manufacturing systems for the production of product part families. Meanwhile, a highly versatile manufacturing automation test bed has been designed, developed and set up in the DIME Robotics and Industrial Automation Laboratory (RIAL), for potential use in the development of automation solutions to a wide range of manufacturing companies operating in diverse sub-sectors. During the project, three test case manufacturing problems submitted by our industrial partners were addressed and solved using the new model and test bed. Following completion of the reconfigurable model development, of the survey analysis, and of the three industrial test cases, condensed guidelines for the implementation of manufacturing automation were developed, with a special focus on the local environment.

We would like to thank our three industrial partners – ProMinent, Cheops, and Toly – for providing the test cases, as well as our partner the Malta Chamber of Commerce, Enterprise and Industry (MCCEI) for helping in the collection of survey data and in the dissemination of the research results through a national workshop organized in April 2009.
Prof Ing. Jonathan C. Borg and Dr Ing. Philip J. Farrugia attended the DesignED Asia Conference organized by Hong Kong Polytechnic University in Hong Kong as part of the Business of Design Week (BODW) event during 28th November - 3rd December 2010.

During this visit the Maltese delegation also visited Hong Kong Design Institute.

In May 2011, Dr Ing. Arif Rochman attended the 27th International Meeting of the Polymer Processing Society (PPS), held in Marrakech, Morocco. He presented a paper on “Polymer Moulding Process in Post Crystallization Temperature Region”. The goal of the society and the conference respectively is to provide a mechanism and format for interaction and presentation of research results in the international polymer processing community; and to foster scientific understanding and technical innovation in polymer processing by providing a discussion forum for the worldwide community of Engineers and Scientists in the field.

In April 2011, Dr Ing. Arif Rochman attended the 14th International ESAFORM Conference on Material Forming at Queen’s University, Belfast, UK. He was a co-author of a presented paper on semi-solid moulding of polymer materials. ESAFORM is a European association with a mission to stimulate the applied and fundamental research in the field of material forming. The main general goals of ESAFORM are to reinforce the importance of material forming in Sciences and Industry and to enhance teaching and research in manufacturing processes among others.


In September 2010, Dr Ing. Philip J. Farrugia, Dr Ing. Arif Rochman and Mr Josef Attard attended a training course at the ARCAM Training Centre in Gothenburg, Sweden. The course covered a range of topics related to the Electron Beam Melting (EBM) Machine found at the DIME labs.

Ing. Pierre Vella and Mr Joseph Curmi attended a training programme on the Sodick AP3L electrical discharge machine. The training was held at Sodi-Tech, EDM Ltd. in Coventry, UK by Sodick’s Applications Manager. It was a three full day course that was customized to cater for the specific needs of the work that will eventually be carried out on the machine.

The last 12 months have seen 5 students defend their theses successfully to complete their postgraduate research degrees at DIME.


Participation in International Conferences

**4M CONFERENCE, Bourg en Bresse, France**

In November 2010, Ing. Pierre Vella attended the 4M 2010 Conference, which was held in Bourg en Bresse and Plastipolis, PEP, Oyonnax, France. During the conference, additional research results of ongoing work being carried out, was presented in two papers, concerning the methodology for capability maturity assessment of micro nano technology process chains.

**IDMME 10, Bordeaux, France**

In October 2010, Dr Ing. Philip J. Farrugia, Ing. Emmanuel Francalanza and Mr Ryan Cann attended the International Conference on Integrated, Interactive and virtual product Engineering, held in Bordeaux, France. Mr Ryan Cann presented the paper entitled “Towards Sketch-based Modelling for Laser Cladding”, whilst Ing. Emmanuel Francalanza presented the paper entitled “Factory Planning Through Paper-based Computer-Aided Sketching”. Dr Ing. Philip J. Farrugia chaired a session on Global Design & Manufacturing. The Maltese delegation had the opportunity to taste the famous wine and cheese of the French region.

**ICME 10, Capri, Italy**

In June 2010, Ing. Emmanuel Francalanza attended the Intelligent Computation on Manufacturing Engineering, which was organised by the Department of Materials and Production Engineering, University of Naples “Federico II” in the beautiful island of Capri by the shores of Naples in Italy. Many interesting talks and presentations were given, notably a keynote by Professor Gerald Byrne the then CIRP President and Professor Engelbert Westkamper from the Fraunhofer IPA research institute, Germany. The conference is one of the CIRP International Conferences. CIRP is the world leading organization in production engineering research and is at the forefront of design, optimization, control and management of processes, machines and systems. Ing. Emmanuel Francalanza delivered a paper titled “A Framework Supporting Manufacturing System Synthesis for Optimizing Product Families”.

**1st IEEE International Conference on Applied Bionics and Biomechanics (ICABB-2010), Venice, Italy**

In October 2010, Dr Ing. Michael A. Saliba, Ing. Carmel Ellul, and Mr David J. Cassar attended the 1st IEEE International Conference on Applied Bionics and Biomechanics (ICABB-2010), in Venice, Italy. The main objective of the conference was to reunite research groups, scientists, engineers and practitioners to present recent results, technological innovations and promising future directions in Applied Bionics and Biomechanics. During this conference the DIME HAND Research Group presented papers on the development of reporting and test standards for artificial hands, and on the development and evaluation of a prototype force feedback glove based on magnetorheological fluid.

New Equipment

**Plastic 3D Printer: Fused Deposition Modeller (FDM)**

The DIME has acquired a Fused Deposition Modeller (FDM) via ERDF012. This machine is capable of generating 3D physical models made from ABS directly from Computer-Aided Design (CAD) data. Such a technology can be used across a wide spectrum of sectors including consumer product design, architecture, archaeology and prototyping of medical implants.

**Electrical Discharge Machine (EDM)**

Two state of the art machines, an Electron Beam Machine (EBM) and an Electrical Discharge Machine (EDM) with micro EDM capability, have been installed at the DIME labs. This equipment has also been procured via the ERDF012. A number of projects are already running on these machines, and further research work is planned to be carried out in the coming year.

**Electron Beam Machine (EBM)**

**SCARA ROBOT**

During 2010, the Robotics and Industrial Automation Laboratory (RIAL) within DIME acquired two major pieces of equipment. The first is an Epson SCARA robot model E2S651S, with a reach of 650 mm and a payload capacity of 5 kg. This means that with the Mitsubishi RV-6SL revolute robot (reach 910 mm, payload 6 kg) acquired in 2008, RIAL now boasts two state of the art industrial robots. The second major piece of equipment acquired by the RIAL is a variable speed conveyor for use in manufacturing automation projects.

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