L-Università ta' Malta
Faculty of Engineering

Postgraduate Student Handbook

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1.0 INTRODUCTION

The aim of this handbook is to answer the many questions you may have about the different aspects of studying for a degree at the Faculty of Engineering - University of Malta. The handbook contains practical information about the University, the Departments and the programme of studies offered by this faculty, including course regulations, study-unit learning outcomes and departmental procedures. It is an important reference document, which will help you to ensure that your time here is organised efficiently and to maximum benefit.

The Faculty of Engineering is located at the University's main campus and offers tuition and supervision to about 500 students at both undergraduate and postgraduate levels, while conducting research in all fields covered by its departments.

We believe the information provided in this Handbook is correct at date of publishing but may be subject to revision.

2.0 THE UNIVERSITY ONLINE PORTAL

The University Online Portal cab be accessed by following the link L-Università ta' Malta (um.edu.mt) (figure 1). Every student registered at the University of Malta will receive login credentials to the University's online portal from the University's Registrar/IT Services. It is important that you follow the instructions which are sent to you in order to activate your account to the portal. All the information about the university can be found on this portal after signing in with your personal login credentials. The Current students drop down menu on the left top corner of the portal contains most of the information you will need during your time at the University.

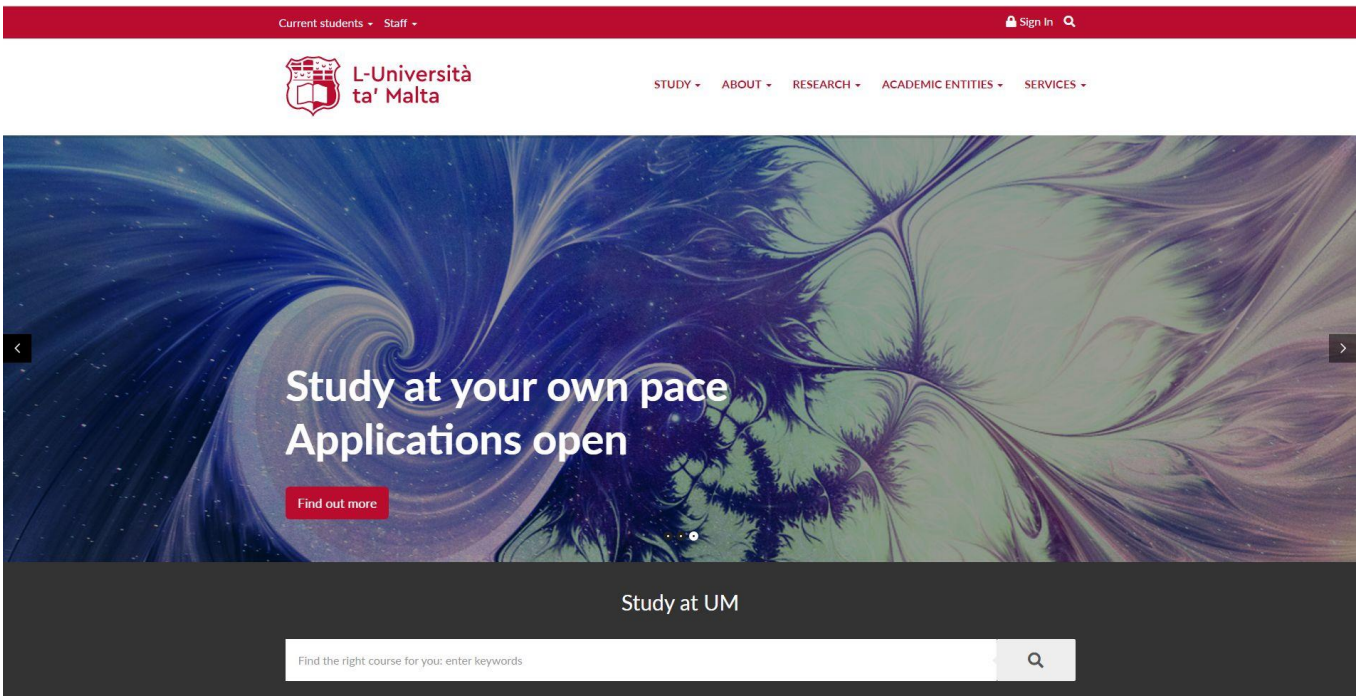

Figure 1 - The University of Malta Online Portal at http://www.um.edu.mt

3.0 THE UNIVERSITY CALENDAR

The University Calendar can be accessed by clicking Key dates in the Current Students drop down menu of the portal.

4.0 THE FACULTY OF ENGINEERING

The Faculty of Engineering is located at the University's main campus and offers tuition and supervision to a number of students at both undergraduate and postgraduate levels while conducting research in all fields covered by its departments.

The Faculty's web site is located on the University's portal by following the link https://www.um.edu.mt/eng, one can find general information about the faculty and its departments, the research being conducted within the faculty, information about our staff, the courses offered by our departments and faculty, the facilities within the faculty and most importantly students' resources.

Students resources include student notices, timetables, exam timetables, guidelines, information on students' representatives within the Faculty Board, specific information for undergraduate and postgraduate students, information pertaining to the Erasmus porogramme, the University's Engineering Student Association (UESA) and information on student branches of professional institutions.

The six departments within the Faculty of Engineering are:

- Department of Electronic Systems Engineering - http://www.um.edu.mt/eng/ese
- Department of Industrial & Manufacturing Engineering - http://www.um.edu.mt/eng/ime
- Department of Industrial Electrical Power Conversion - http://www.um.edu.mt/eng/epc
- Department of Mechanical Engineering - http://www.um.edu.mt/eng/mec
- Department of Metallurgy and Materials Engineering - http://www.um.edu.mt/eng/mme
- Department of Systems & Control Engineering - http://www.um.edu.mt/eng/sce

5.0 STUDENT ORGANISATIONS

5.1 University Engineering Students Association - UESA

UESA (University Engineering Students Association) is a non-political student organization which is directed towards students within the University of Malta. Since its birth, UESA's main aim is to help the engineering student familiarize and accustom himself within university life. In addition to this, its aim is to make campus life much better and more fun by organizing events aimed at young people while giving the education aspect the required importance.

UESA's objectives are achieved by building a good relationship with the staff at the faculty so as to serve as a bridge between the students and the lecturers. UESA is also recognised by the Chamber of Engineers, by having its own active representative in the chamber's executive. In 2004, UESA was officially admitted in the EYE – European Young Engineers council, thus also representing the engineering student on an international level.

UESA has in recent years gained "an exponential momentum" as described by one our alumni. Also, a rebranding took place, where the true new face of UESA is represented, that is; fresh, new and modern. These three words represent the true spirits of every member in the executive.

UESA's web site can be accessed by following the link provided on the Faculty's web site.

5.2 Kunsill Studenti Universitarji - KSU

The Kunsill Studenti Universitarji (University Students' Council) is the oldest national student union in Europe. KSU was founded by Arturo Mercieca (later Chief Justice Sir Arturo Mercieca) in 1901, as the Comitato Permanente Universitario. The student union involved itself in student politics as well as national politics. KSU represents all students attending the University, Junior College, Medical School and the Malta Centre of Restoration – on both a national and international level.

Although times have changed since the organization was founded, the aim of KSU remains unchanged. Although Malta has progressed greatly since 1901, this does not reduce the importance of the contribution that each and every student can give to University and society in general. Life and University should not only consist in studying, and KSU is an ideal forum where every student can express his or her ideas regarding issues that, strictly speaking, have nothing to do with his or her studies. KSU gives the student the opportunity not only to attend, but also to form part of University.

Although in itself KSU is a dynamic organization and therefore it is open for change and debate, like other organizations, it finds its roots in a set of fundamental objectives on which the organization was founded. Over the past 113 years, KSU has been working:

- To represent students in whatever issues concern them, whether it is on a national or international level.
- To serve as an official link between students and the relevant authorities.
- To achieve the democratization of education in Malta.
- To coordinate activities with other organizations, and
- To cultivate an interest in students in the fields of education, socio-political and cultural issues.
- To pressure authorities into assuring the highest level of quality in Higher Education.

Website: http://www.ksu.org.mt/

5.3 University of Malta Racing Team - UoMR

UoMR is a team of university students from various courses such as Engineering and B.Com who have embarked on an exciting project to design, build and race a formula style racing car in a prestigious competition designed for universities all over the world. Engineering students are particularly encouraged to join this venture towards extra curriculum engineering related activities.

The team successfully participated in Formula ATA 2014, achieving great results. The design and manufacturing of a new car which will participate in Formula ATA 2015 has already started, with new members joining the original members. If you have any suggestions, could offer some help or just would like some information, please do not hesitate to contact them.

The UoMR web site can be accessed by following the link provided on the Faculty's web site.

In this website you will find more information on the team, the car and the competition, with frequent updates on our progress. In the news section, one can find these updates, along with informative car and engineering related posts, written by ourselves. In addition, one can find all of UoMR's partners in the "Our Sponsors" page, which have made all of this possible, so we appreciate if you could check out

their products and services.

6.0 ENGINEERING PROFESSIONS

6.1 The Chamber of Engineers - CoE

The Chamber of Engineers (CoE) is the main local organisation catering for the interests of Maltese Professional Engineers. The Chamber was founded on the 28th April 1978.
The Chamber of Engineers is today an ever growing, dynamic and very active organisation which is continuously discussing ways and means of both enhancing and safeguarding the profession.
At both a local and European level, the Chamber actively participates in international discussion groups through the Chamber's affiliation with the European Federation of National Engineering Associations (FEANI). It has also hosted the annual FEANI meeting on two occasions in 1994 and in 2004. The Chamber's role in Malta is also recognised. The Chamber has a representative voice on a number of local Authorities and Government Boards.
The CoE organises various activities such as, visits to engineering concerns and projects, and engineering fora amongst others. The most prestigious activity is the Annual Engineering Conference, organised in April or May of each year.
In December, the chamber organizes an Annual Reception during which the Malta Engineering Excellence Awards, for Innovation, Leadership and LifeTime Achievement, are presented. A novelty in the calendar is the Annual Concert.
The Chamber also organises regular lectures which offer an ideal opportunity for attendees to broaden their knowledge on different Engineering concerns and provides one with an ideal opportunity to meet fellow engineers with whom one can talk, share experiences, identify common problems and discuss potential solutions.
The Chamber organises courses for the Engineering Community on Health and Safety, Quality, Management, Building Services, Technical and Information Technology subjects. The CoE publishes a regular journal - "Engineering Today" - providing a medium for the exchange of technical articles and views on subjects relating to the profession.
The Chamber of Engineers offers unique opportunities, both on an individual basis and as a Professional body, through its ongoing work to enhance the co-operation between Engineers for the good of our society, and by ensuring that the Engineer's voice is heard at government level.
Students are encouraged to form part of the chamber. The Chamber also supports the Faculty of Engineering through the award of prizes to students showing an outstanding achievement.
Website: http://www.coe.org.mt/

6.2 Malta Group of Professional Engineering Institutions – MGPEI

The Malta Group of Professional Engineering Institutions represents locally three of the leading British Engineering Institutions:

- The Institution of Engineering and Technology (IET) - http://www.theiet.org/
- The Institution of Mechanical Engineers (IMECHE) - http://www.imeche.org/
- The Institution of Civil Engineers (ICE) - https://www.ice.org.uk/

MGPEI's Mission:

- To promote the advancement of electrical, mechanical, civil, manufacturing and information engineering and to facilitate the exchange of information and ideas.
- To provide a broad range of services to members, to assist them in developing their careers by improving their capabilities as engineers and to play their full part in contributing to society.
- To raise the standing and visibility of the profession and to maintain a high standard of

professional conduct.

The Malta Group which represents approximately 400 members between the three Institutions, invite its members and even members of the general public to all of the activities organised by the Group. The Malta Group has a committee of 10 members and committee meetings are held once every month. The main aims of the committee are to organise activities of a technical nature and interest for the members and also to encourage communication between the members of the three parent Institutions. The committee also carries out interviews of prospective members and helps the younger members with the development of their carriers. All the committee members work on a purely voluntary basis for the benefit of their colleagues.

Members are obliged by the Institutions Charter to keep up-to-date and competent by continuing professional development. The activities organised by the Group are aimed in this direction. They also help to bring the members together in an informal environment, helping to promote good relations between members as well as to facilitate the co-operation of the members between themselves in the practice of their profession.

The Group is always on the look-out for opportunities to get people from industry and commercial organisations related to engineering to give presentations to the members. Although local engineers give most of the presentations, whenever we can, we make use of the services of engineers/technical managers coming from international companies who happen to be in Malta on business. This is also a way of giving the opportunity to commercial organisations to present their engineering products to engineers and architects practicing in the local field. It is all about co-operation where these presentations are to the benefit of both the commercial organisations and our members. Presentations with an international input attract the biggest audiences and are very well received by our members.

Engineering students are welcome to form part of this group and become members of its representative institutions. Every year undergraduate students are invited to give a presentation on their undergraduate project. The best presentation and project is awarded a cash prize. The organization is also in charge of the local IET Present Around the World Competition that provides engineers with the possibility to present their work at both local and international level. The winner of the local heat is awarded a cash prize and all inclusive flight and accommodation to attend represent Malta in the international competition.

Website: http://www.maltagpei.org.mt/

Chairman: Ing. Joe Camilleri, email: joevcamilleri@gmail.com

Country representatives:

IMechE: Prof. Duncan Camilleri, email: duncan.camilleri@um.edu.mte
IET: Ing. Charles Cuschieri, email: ccuschieri@camilleriandcuschieri.com
ICE: Dr. Ruben P. Borg, email: ruben.p.borg@um.edu.mt

6.3 The Royal Institution of Naval Architecture - RINA

The Royal Institution of Naval Architects, founded in 1860, is an internationally renowned and highly respected professional institution and learned society, whose members are involved at all levels in the

design, construction, maintenance and operation of marine vessels and structures. Members of RINA are widely represented in industry, universities and colleges, and maritime organisations in over ninety countries.
RINA has accredited the B.Eng.(Hons.) in Mechanical Engineering, for the area of study in Applied Mechanics and Thermofluids Engineering, as satisfying the requirements for corporate membership of RINA. Graduates of the Mechanical Engineering Degree and corporate members of RINA attain a professional qualification demonstrating an accomplishment of high levels of professional standards, competence and integrity. Corporate members are entitled to apply for registration as a Chartered Engineer (C.Eng.) by the Engineering Council (UK), depending on their academic achievements, professional development and experience. The B.Eng.(Hons.) in Mechanical Engineering features on the Maritime Courses Directory as an International Professional accredited and recognised degree course. http://www.rina.org.uk/Maritime-Courses-Directory . The institution also awards the "RINA Student Naval Architect Award" for the best marine related final year undergrduate project, in addition to "Certificates of Achievement", presented during the final year project exhibition.
Website: http://www.rina.org.uk
Country representative: Dr. Inġ. Claire De Marco, email claire.demarco@um.edu.mt

6.4 The Institution of Engineering Design - IED

The Institution of Engineering Designers U.K. was established in 1945. It is a professional body for designers who operate in widely diverse areas of design practice. The Malta Branch started to operate on 28th June 1978 with 21 members. The late Mr. K.J. Wilcocks F.I.E.D. was the first branch secretary and Mr. O. Cardona F.I.E.D. together with Mr. A. Darmenia Gay M.I.E.D. were the first members of the I.E.D. committee. From January 2001 to March 2010, Prof. Ing. Jonathan C. Borg acted as the regional coordinator of the IED Malta branch. At present Dr. Ing. Philip Farrugia holds this post. The Malta Branch strives to promote professional design practice by annually organizing a number of technical and social activities for its members.
Website: http://www.iedmalta.org

7.0 EDUCATIONAL POLICY

7.1 Course Aims and the Learning Experience

Your aim in choosing your postgraduate degree course is undoubtedly to specialise in your chosen branch of study and qualify as a competent professional engineer in that field. Our aim is to assist you in the best ways we can to achieve that goal. There are various elements of knowledge, skills, experience and understanding which are to be found in competent engineers and your course will give you the opportunity to acquire and develop these. By the end of your course, we expect that you will:

- have a good working knowledge of the fundamentals of systems and processes which are generally recognised to be in the domain of mechanical engineering, electrical engineering and its related subjects with principle focus on the related engineering field depending on the chosen course i.e. mechanical or electrical and electronics engineering.
- be able to understand, model and predict the behaviour of engineering artefacts through the application of scientific and technological principles
- have had a great deal of practice in creating new solutions, adapting old ones, and in using your acquired knowledge in the various engineering fields that you choose to follow during the course

We also expect you to develop many new capabilities which are not simply concerned with engineering technology; in fact we will be disappointed if your outlook does not change radically during your course. In particular, we expect that you will:

- continue to develop the capacity you already have to learn about many things - a good engineer can do anything
- increase your skills in communicating and working effectively with others - engineers work in teams and lead teams
- grow to understand your place as an engineer in a complex and fascinating professional community - the world is your oyster.

7.2 Student Charter

Departmental staff aims to:

- be responsible and responsive in all matters related to students
- respect individual students as partners in the learning process
- maximise learning opportunities
- minimise bureaucracy and ensure the transparency of procedures
- maintain a friendly and caring environment
- operate an efficient information system
- identify clearly the responsibilities of staff and students
- facilitate innovative developments where appropriate
- ensure equality of opportunity for all

7.3 University Statues, Regulations and Bye-Laws

The various statues, regulations and bye-laws governing the University can be found on the University's portal by following the link https://www.um.edu.mt/about/governance/statutesregulationsbyelaws. Of

particular interest are the following:

- General Regulations for University Postgraduate Awards
- Ph.D. and M.Phil. Degrees Course Regulations
- University Assessment Regulations
- University Student Discipline Regulations
- Bye-Laws pertaining to your programme of studies.

We encourage you to read the above list of documents.

7.4 Assessment and Feedback

The Faculty fully subscribes to the approach of assessment and feedback stated by the University. The Faculty also recognizes that in addition to constituting a formal response to assessment, feedback also incorporates informal communication between staff and students, either individually or collectively, that provides information on progress and performance. This implies a more bilateral process in which students are encouraged to seek feedback by actively engaging with staff as appropriate.

8.0 HEALTH AND WELLNESS

The Health and Wellness Centre on the University Campus offers services aimed at enhancing the wellness of UM staff and students. Professional support, to help UM staff and students take on the challenges and grasp the opportunities that may arise as a result of everyday life situations, is readily available at our Centre.

To contact the Health and Wellness Centre call on +356 2340 3988 or send an email to mailto:health-wellness@um.edu.mt.

The services offered by the centre includes chaplaincy, counselling, substance dependency support, mental health support, sexual health, nutrition and disability support. Further information is available on the Centre's web site (https://www.um.edu.mt/services/health-wellness).

9.0 USEFUL ADMINISTRATIVE AND OTHER INFORMATION

You are encouraged to contact the department's secretaries for all your administrative queries related to your programme of studies. The faculty office personnel and all lecturers and technical staff are always happy to assist you too.

9.1 Access to Buildings outside Normal Hours

If you wish to have access to University premises outside normal hours it is important that you contact the Lab Officers in charge and the respective Head of Department.

9.2 Use of Computing Facilities and Resources

The University will not permit the use of its computer facilities and resources for access to, or transmission of, information which is considered by the University to be unacceptable; illegal; in breach of university policies, such as those on Equal Opportunities and Harassment; wasteful of resources or not commensurate with the provision of facilities for legitimate educational purposes.

Examples of such unacceptable use may include:

- accessing or displaying pornographic material;
- stating defamatory opinions or views concerning individuals or organisations;
- accessing or displaying discriminatory material or material which encourages discrimination;
- engaging in games or chain E-mail;
- publishing information which is intended to misinform and thereby causes anxiety or inconvenience to another;
- unauthorised use of University logos, titles etc;
- spamming;
- corrupting or destroying another user's data; violating the privacy of other users;
- disrupting the work of others; misuse of networked resources such as the introduction of viruses.

The University actively monitors usage of the University computer facilities and resources which includes monitoring the access to, publication or receipt of, any Internet materials by any user.

10.0 UNIVERSITY SAFETY REGULATIONS

Emergency telephone numbers (internal) - 2340 2440
Emergency telephone number (external) - 112/196 Fire/Police/Ambulance

Health and safety within the University is organised in accordance with the University Safety Policy which can be accessed through the University Health and Safety web site (https://www.um.edu.mt/services/administrativesupport/safety).

The University's Health and Safety Officer can be contacted on Ext 2993 or Ext 3450.

11.0 E-LEARNING

E-learning is 'the use of information and communications technology (ICT) to enhance and/or support learning'. Currently, e-learning is primarily delivered through the University's Virtual Learning Environment (VLE) and Electronic Student Information Management System (eSIMS) platforms.

11.1 Virtual Learning Environment (VLE) Platform

The VLE platform can be accessed through the Current Students drop down menu on the University Portal. The VLE platform is a web-based learning environment which provides tutors with a range of tools to support students with their studies. It contains study-unit areas that are only accessible to students who are registered to the respective study-units. Through this platform students will have access to resources related to their study units. Additionally assignments and dissertations are generally uploaded using this platform.

11.2 Electronic Student Information Management System eSIMS frequently asked questions

The eSIMS platform can be accessed through the Current Students drop down menu on the University Portal. This platform enables students, academics and administrative staff to manage information online including

- Enrolling for each academic year
- Registering for each year's study units
- Viewing messages via eSIMS intray

- Viewing/updating personal details
- Viewing registered course details
- Viewing registered study-unit details
- Viewing University of Malta academic record
- Viewing historic and latest results
- Submitting feedback regarding lectures

12.0 LIBRARY FACILTIES

The Main Library is located on the University campus with branches at the Mater Dei Hospital (Health Services Library), Junior College, and the University Gozo Centre, Plus stack Depositories at San Gwann and Msida.

The library portal can be accesses by following the Library link on the Current Students drop down menu on the University portal. On this portal guidelines and policies, a search engine and electronic resources including books, journals, dissertations, etc are available online.

13.0 FACILITIES AND LABORATORIES WITHIN THE FACULTY OF ENGINEERING

13.1 Department of Electronic Systems Engineering

Embedded Systems Laboratory

A computer network with Labview and Altium licenses to design PCBs and control electronic systems
50MHz Arbitrary programmable function generators
200Mhz Digital Storage Oscilloscopes
Triple Output programmable precision bench power supplies
3GHz Mixed Domain Oscilloscope (includes logic analyzer, spectrum analyzer and protocol analyzer)
National Instruments Data Acquisition Boards
FPGA Development Boards
Microcontroller Development Boards

Electronics Laboratory

20Mhz programmable function generators
100Mhz Digital Storage Oscilloscopes
Various bench power supplies
General purpose soldering stations

Electronics Manufacturing Laboratory

PCB Structuring Laboratory
UV Laser PCB structuring system
CNC PCB structuring system
Multilayer Press
Stereolithographic 3D Printer
Eyepiece-less Stereo Inspection Microscope (21x -120x magnification)
X-ray Inspection facility (up to 5600x magnification)

PCB Finishing Laboratory

Through-hole copper and tin plating facility

Hand operated mechanical through-hole plating facility
Vapour phase Oven
Reflow oven with 8 independently controlled heating zones
Dry film Solder mask Laminator
Brushing machine
Ultrasonic cleaner

PCB Assembly Laboratory

High speed, high accuracy solder paste dispenser
Weller high precision rework station
Advanced soldering/desoldering stations ideal for SMT soldering
Weller Hot air station
Manual pick and place systems
Semi-automatic pick and place systems
Eyepiece-less Stereo Inspection Microscope (10x - 60x magnification)

13.2 Department of Industrial and Manufacturing Engineering

CAD/CAM Systems Laboratory

CAD Systems (2D, 3D, Animation)
CAD/CAM Systems
MoldFlow, 3D Studio max, AutoCAD, Autodesk Inventor
Tecnomatix - manufacturing development and simulation package,
Statistical process control and AI software
Picza LPX-250 3D Laser scanner
HP Plotter (up to A1 printing)

Robotics and Industrial Automation Laboratory (RIAL)

Mitsubishi RV-6SL 6-DOF revolute industrial robot, 91cm reach, 6kg payload, with controller upgrade, tracking card, and adjustable gripper, or vacuum gripper. Mounted on a highly reconfigurable table.
Epson E2S651S 4-DOF SCARA robot, 65cm reach, 5kg payload
Two Cognex/DVT smart image sensors (machine vision)
Six Mitsubishi FX1N-24 PLCs
Two flat belt conveyors (one with variable speed)
Machine vision lighting (ring light, strobe)
Other sundry equipmet, oscilloscope, components and tools

Metrology Laboratory

Metrology Equipment Including CMM and Surface Roughness Measurement
Calibration of Metrology Equipment in Roundness, Linear and Angular Measurements

CNC Laboratory

CNC Vertical Milling Machine 2 ½ axis
CNC Vertical Machining Centre 3 axis

Advanced Manufacturing Laboratory

CNC Electric Discharge Machining (EDM) with Micro EDM capabilities
Rapid prototyping equipment Plastic – Dimension 1200es
Rapid prototyping equipment Titanium - ARCAM EBM S12 (Electron Beam Machining)
Thermoforming machine
Injection moulding machine (Boy 22E) with a clamping force of 200kN equipped with a second vertical injection unit

University (Engineering) Workshop

Conventional Machine Tools including centre lathes, milling, surface and cylindrical grinding, gear hobbing, drilling and welding

13.3 Department of Industrial Electrical Power Conversion

Energy Conversion and Power Quality Laboratory

Grid Connected PV and Wind Systems
Passive/Active Filters for Power Factor Improvement
200V AC 28kVA 3-phase and 200V DC 20kW Supply for Testing Purposes
High voltage and current DC supplies
Electrical Drives and Control Simulation Software
Harmonic Voltage and Current Measurement Set-up
100kVA Flywheel UPS

Power Electronics Laboratory

Vector controlled Induction Motor, Permanent Magnet Synchronous Motor and Switched Reluctance Rigs
Switching Frequency Current Sensing for Power Electronics and Control
High Bandwidth Instrumentation for Power Electronic Measurements
Water Tank for Electric Outboard Testing
Low to Medium Power Machine Loading Units
50kW regenerative machine loading unit

Electrical Machines Laboratory

Domestic Scaled Combined Heat and Power Plant
Vertical Axis Wind Turbine Setup

Electrical Mobility Laboratory

Electric Car with Lithium Ion Battery Technology
Electric Boat
Solar Catamaran

13.4 Department of Mechanical Engineering

Thermodynamics Laboratory

Laboratory experiments for thermodynamics and heat transfer
Testing of internal combustion engines
One electrical dynamometer, two water brakes and other smaller dynos
Demonstration type gas turbine
Testing of air conditioning setups, including variable speed (inverter)
Heat transfer in pipe facility
Supersonic nozzle setup
Labview and Keithley data acquisition systems

Structural Mechanics Laboratory

Machine diagnostics
Vibration monitoring
Run-up Run down vibration testing
Order analysis
Modal analysis
Dynamic balancing of machines
Sound level monitoring
Tensile and impact testing
PhotoStress® Plus analysis kit from Vishay Precision Group – Micro-Measurements

CAE Lab - Computer Aided Engineering Laboratory

Computer facilities to run the following engineering software:
Ansys Mechanical and CFD
MATLAB/ Simulink
WindPRO (EMD)
WAVE/ VALDYN (Ricardo)
Mechanical Analysis Design Package (Mentor Graphics)
Bentley Academic SELECT
Naval Architecture & Offshore Engineering Software
MAxsurf Enterprise
Multiframe Advanced
Sac Marine Enterprise
SACS Offshore Structure Enterprise
MOSES Advanced
3D CAD and design Modelling
ESATAN-TMS: ITP Engines UK is kindly sponsoring the Department of Mechanical Engineering of the University of Malta with the software licence for the analysis and simulation software ESATAN-TMS for their undergraduate degree program

Fluids Laboratory

Low wind speed wind tunnel 38 x 38 cm
Low wind speed wind tunnel 900 mm diameter
Wave making generator 8 m long and 750 mm wide and 1 m deep
Multi-channel hot wire anemometry
Fluid mechanics data acquisition systems
PIV – Stereo and 3D

13.5 Department of Metallurgy and Materials Engineering

Process Equipment

Plasma Assisted Physical Vapour Deposition (PA-PVD)
Ion Beam-Assisted Deposition
Gas Nitriding Furnace
Vacuum Furnace with 5 bar overpressure
Laser Added Manufacture Centre
Air Furnace
Low temperature foundry furnace
Martempering/ Austempering salt bath
3-axis CNC machining station

Mechanical Testing Equipment

Tension/ Charpy Impact tester
5 ton multipurpose mechanical testing centre
10 ton bend testing centre
25 ton multipurpose dynamic testing centre
Brinell/ Vickers Macro hardness tester
Knoop/ VickersMicro hardness tester
IRHD/ Shore polymer hardness tester
Pin-on-disk wear tester
Reciprocating sliding tribo-corrosion tester
Rotary bending fatigue tester
Gear tribological tester

Calibration Equipment

Load cell calibration system
Temperature calibration system

Sample Preparation Equipment

NC precision cut off saw
Thermosetting cold mounting station
Hot mounting phenol sintering station
Manual/ automatic sample polishing stations
Automatic electro polishing station

Characterisation Equipment

Optical Microscopy with real time image acquisition
Incident light Microscope with Nomarsky, UV and dark field attachments
Side projected light stereo microscope
Support metallographic microscopes
Confocal microscope with 3 excitation lasers and multispectral analyser
Potentiodynamic wet cell corrosion testers
Laser Induced Breakdown Spectrocopy (LIBS)
Dilatometer with inert gas chamber
3D stylus surface profilometer

Scanning Electron Microscope (SEM) with:
In-lens backscattering detector
In-lens secondary electron detector
External secondary electron detector
Solid state angular selective backscatter detector

Electron Probe Micro-analysis (EPMA) within SEM including:
Energy dispersive spectroscope (EDS)
Wavelength dispersive spectroscope (WDS)
Electron Backscatter Diffraction (EBSD)

Ultra high vacuum Integrated Characterisation Facility including:
Surface analysis by electron kinetic energy analysis(XPS) through:
- Hemispherical electron energy analyser
- Ag/ Al Monochromated X-Ray source
- Ag/Mg X-ray source
- High intensity electron source
- Low energy UV source (UPS)
- Rastering ion source
- Large area ion source
Quadrupole mass spectrometer
Low energy electron diffraction (LEED)
Secondary electron detector
Surface analysis by surface probe microscopy through:
- Atomic force microscopy (AFM)
- Scanning tunnelling microscopy (STM)

X-ray diffraction analysis with:
θ/ 2θ Goniometer
Parallel beam / Bragg Brentano optics
Variable temperature (cryo to 450 °C) reaction chamber
High temperature reaction chamber
Thin film attachment
Capillary attachment
4 axis + tilting attachment
SDD/ scintillating detectors

X-ray powder diffraction with:
θ/ 2θ Goniometer
Cu/ Mo primary X-ray source
Bragg Brentano optics
Variable high temperature reaction chamber

Nano Indentation equipment with:
Wet cell attachment
Resistive high temperature reaction chamber
Peltier cooled low temperature attachment

Dynamic testing attachment
Piezo nanopositioner

13.6 Department of Systems and Control Engineering

Biomedical Engineering Laboratory

Vicon Optical Motion Analysis System
Tekscan Body Pressure Measurement System
Biopotential (e.g. EEG) Acquisition System
Non-invasive Biomedical Data Acquisition System
Diagnostic Ultrasound System
Haptic Feedback System
Rehabilitation Robotic Manipulator
Thermal Imaging System
Spectral Camera
Signal Processing Boards
Data Acquisition Boards
High-end servers and computing equipment
Matlab and Simulink Research Licences

Control Systems Engineering Laboratory

Programmable Logic Control (PLC) units with state of the art Human Machine Interfaces (HMIs)
Various mobile robot teams and other high end mobile robots
Robotic manipulators
Force, torque, laser and inertia sensors for robotic applications
Embedded and tablet PC for real time computer control of mobile systems
Fingerprint/palm and iris biometric scanners
Stereo cameras with pan/tilt actuation
Analogue and digital area scan cameras and smart cameras with LED illumination
Various digital and analogue video grabbers and camera multiplexers
Electronic test and measurement instrumentation
PC interfaced servos and process control units
Various PC interface units for computer control
A computer network with various licenses for simulation and real-time control of systems