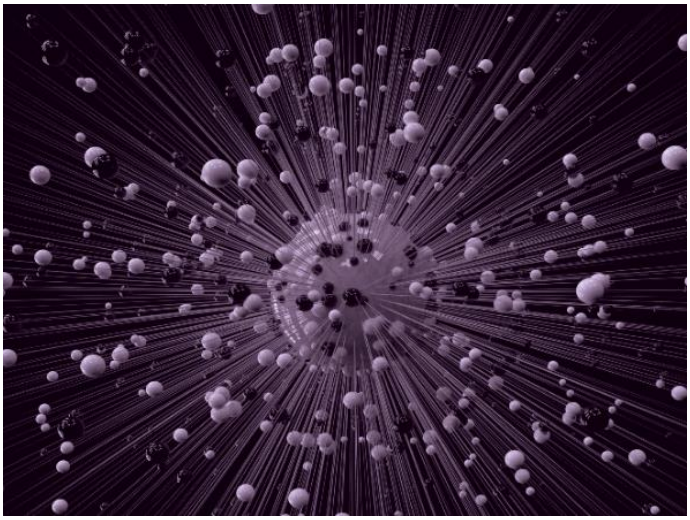
MCAST MASTER OF ARTS IN PRODUCT DESIGN



CODE: UC7-E11-18
Launching September/October 2021

Online Application and Cost Details Available at:
https://shortcourses.mcast.edu.mt/courses/MASTERS

Entry Requisite: First degree in Engineering; Information Technologies; Communication; Environmental Studies; Product Design.

Delivery Mode - Blended Learning over 5 Semesters (2 ½ Years): 7 Modules taught in a total of around 30 weekend campus sessions (a weekend session consists of a Friday evening lecture from 17:30 to 20:30 and a Saturday morning lecture from 9:00 to 13:00) and 3 modules carried out online through eLearning using the MCAST Moodle Platform.

The Master of Arts in the Product Design programme develops the artistic and humanistic skills belonging to design culture together with the technical know-how that relates to production technology, materials, and manufacturing costs. It strives to meet the need of operating in a worldwide landscape of heightened competition where the designer can increase the value of a consumer product by creating innovation – in both aesthetics and usability – that takes advantage of available technologies and ever-changing consumer lifestyles. Candidates will build an improved critical capability to explore contemporary design languages, focus on experimentation with innovative inter-disciplinary technologies and materials from preliminary concept to finish, focus on developing sustainable production and consumption processes.

Learning Outcomes:

Upon successful completion of this Masters Programme the participants will be able to:

1. Evaluate and identify the appropriate representation and prototyping techniques through innovative materials and processes;
2. Appraise and justify the functional, performance and usability aspects in relation to the social and cultural phenomena related to design;
3. Identify the quantitative and qualitative data aspects of the discipline in order to pursue the profession at an international level or to pursue studies further;
4. Examine the essential contents of communication digital media, as well as through data processing and physical illustrations;
5. Master additional communication skills including those required for an audience of teachers or external subjects of different genres;
6. Analyse the social context of customer demands and be able to evaluate different design choices focusing on economic aspects, while also taking into account social, environmental and ethical consequences;

First Year (Semesters 1 & 2: 30 ECTS) – Exit Option: Post Graduate Certificate

1. Product Representation
2. Design Issues
3. Optimisation of Topology and Design
4. Theoretical and Applied Mechanics
5. Mechanical Tests, Models and Prototypes

Second Year (Semesters 3 & 4: 30 ECTS) – Exit Option: Post Graduate Diploma

6. Principles of Product Design
7. Product Design Studio
8. Human-Centred Product Design
9. Internet of Things (IoT)
10. Culture and Communication

Third Year (Semester 5: 30 ECTS) – Final Exit: Masters

Dissertation

STUDY UNIT 1

Product Representation

MQF Level 7

6 ECTS

E-learning: No

Rationale

Modern engineering design and manufacturing with four areas of emphasis: engineering design, systems, design for manufacturing and manufacturing processes. This unit will introduce students to the perception of an object as a product. System thinking is the essence of engineering design. Students will learn about tools for object interpretation. This unit will enable students to learn how to articulate design specifications, how to make a system design based upon selected components in mechanical electronics/electrical domain, how to document the system integration of subsystems and finally, develop this into a prototype. Students will also learn how to respect standard requirements in design with the aim to make the product compatible to other standardised parts and components in different engineering fields. This unit will be oriented to the analysis of product shape requirements, especially with respect to the involvement of relevant stakeholders and the use of methodical tools for product design.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Synthesize and apply existing research methodologies, techniques, and technical skills to determine an approach by using mechanical drawing rules and standards;
2. Master the principles of mechanical design with respect to the technology of production;
3. Evaluate, model and provide the appropriate technology for the production of parts and devices;
4. Design, with respect to standards, requirements for standards parts;
5. Analyse, evaluate and present a designed product and consider the potential possibilities for further improvement of the product or device;
6. Present a determined product to a specific audience;

STUDY UNIT 2

Design Issues

MQF Level 7

6 ECTS

E-learning: No

Rationale

This unit exposes students to the integration of the engineering design approach and management disciplines for determining manufacturing rate, cost, quality and flexibility. Topics include process physics, equipment design and automation/control, quality, design for manufacturing, industrial management, and systems design and operation. This unit will be oriented to the analysis of product life cycles, especially with respect to the involvement of relevant stakeholders and the use of methodical tools for product life-oriented design (DFX).

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Synthesise and apply existing research methodologies in design and technical skills to determine the analytical approach to design;
2. Evaluate the physical principles of mechanical design in respect to static loading and deflection criteria;
3. Synthesise and apply the physical principles of mechanical design with respect to vibration loading;
4. Develop functional products with respect to stress, strain and deflection;
5. Implement integrated engineering design with respect to assembly design;

STUDY UNIT 3

Optimisation of Topology and Design

MQF Level 7

6 ECTS

E-learning: Yes

Rationale

The optimisation of topology in design is an important issue in order to reduce mass, stress concentration, cost of production and prevent mistakes that are often the consequence of the lack of experience of the designer. A designer can perform an optimisation by using different software automatically; however optimisation is interactive process, where the new design of the product should be estimated in regards to the mechanical carry capacity and material capability. The objective of this unit is to give students the necessary knowledge to use topology optimisation as a design tool.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Synthesise and apply existing research methodologies in design approach by using topology optimisation tools;
2. Evaluate the principles and challenges of the optimization process;
3. Understand the methods for solutions regarding minimum mass, target natural frequencies and maximum possible stiffness;
4. Use commercial software for product optimization of geometry;
5. Use optimized topology tools in product design;
6. Justify own choices in a presentation given to a particular audience;

STUDY UNIT 4

Theoretical and Applied Mechanics

MQF Level 7

6 ECTS

E-learning: No

Rationale

Theoretical and Applied Mechanics provides a foundation in engineering science and applied mathematics that prepares students to carry out analytical or numerical research and to develop models to solve a wide variety of engineering problems. This unit provides basic knowledge from classical fields such as solid and fluid mechanics to more novel trends in science such as computational methods for engineering design. It covers not only traditional mechanics of rigid and deformable bodies, and fluid mechanics, but also mechanics of different materials that are used in structural design, and finite element methods (FEM) in mechanics. Some practical problems will be solved both analytically and numerically. Finite elements will be used not just for stress analysis, but also for design and optimisation. Projects are an integral part of the unit and the appropriate software for FEM should be available for students.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Solve engineering problems in the field of structural analysis;
2. Understand the physical principles controlled by the laws of continuum mechanics;
3. Define, model and calculate a mechanical issue with the emphasis on methodological design, strength conditions, thermodynamics, dynamics or flow;
4. Solve simple physical problems numerically using the appropriate software;
5. Analyse, evaluate and interpret the results and consider potential possibilities for further improvement of the structure;

STUDY UNIT 5

Mechanical Tests, Models and Prototypes

MQF Level 7

6 ECTS

E-learning: No

Rationale

This unit introduces the student to the different types of mechanical tests, physical models and prototypes. Mechanical testing covers a wide range of tests with the purpose to determine the mechanical properties of material to analyse the structural response to a given action. The most commonly used mechanical tests will be explained in detail, such as hardness, tensile, fracture, fatigue, and creep testing. This unit also describes the fundamental principles of different methods of model making and prototyping and questions how they can be used in the conceptual and detailing design stages of the design process. Focus will be placed on the designed product in terms of usability and technical functionality. Special attention will be given to rapid prototyping as a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data. Construction of the part or assembly is usually done using 3D printing or "additive layer manufacturing" technology.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Formulate experiments involving hardness tests, tensile tests, fatigue tests, fracture mechanics and creep tests, destructive and non-destructive test methods as well as interpret the results and their effect on structural design;
2. Construct the necessary tests to find out the structural response and analyse the results;
3. Understand the fundamental principles of the different methods of model making and prototyping;
4. Identify the optimal technique to quickly create scale models and other assembly parts with the use of emergent digital fabrication technologies;
5. Design, rationalise and fabricate physical artefacts by using the available technology;

STUDY UNIT 6

Principles of Product Design

MQF Level 7

6 ECTS

E-learning: Yes

Rationale

This unit exposes students to the demands and complexity of product design in respect to shape, material, colour and other sensory properties of physical artefacts and their relation to the user-product interaction. Students will gain insight into social, cultural, economic and technological influences on product aesthetics. The focus of the unit is on standards and guidelines, culture, environment, aging and complexity in the product design process while also providing strategies for their application with the goal of enhancing user satisfaction.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Apply the fundamental principles of product design;
2. Identify and implement the universal, cultural and individual aspects of product aesthetic;
3. Understand how product design affects perception and interaction;

STUDY UNIT 7

Product Design Studio

MQF Level 7

6 ECTS

E-learning: No

Rationale

Project work that will provide experience in solving realistic design problems for consumer products by combining the intellectual and manual skills required for product design. Emphasis is given to the identification and framing of the design problem and the application of advanced design methods for creating feasible design solutions. Students will be guided through every phase of the design process, from initial research and idea generation to the final design of the chosen concept. This unit will also cover the basic organisational aspects of product design and writing design documentation. The inclusion of product design professionals from the industry in the discussions of students' ideas during the design concept evaluation is recommended.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Identify how to translate design research into useful and usable products;
2. Create, evaluate and select product design concepts;
3. Formulate and communicate constructive criticism on the work of others;
4. Develop, evaluate and iterate prototypes;
5. Prepare a comprehensive visual presentation of a design and present it to a professional audience;

STUDY UNIT 8

Human-Centred Product Design

MQF Level 7

6 ECTS

E-learning: No

Rationale

This unit introduces students to human-centred and experience-driven design with special focus on a multi-disciplinary approach to product design projects. Product designers should consider the complete context of a user's interaction and experience with the designed products, with attention to cognitive, emotional, physical, social and cultural factors. By applying ergonomic, ethnographic and social science methodologies, the designer is able to gain a better understanding of users, their needs and the context of use, with the goal of designing engaging products. This unit provides a combination of theoretical background on the demands, opportunities, tools and methods for achieving good User Experience and their practical application through collaborative product design project work.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Incorporate a user-centred approach into the design process;
2. Understand the full complexity of product design and its impact on people's lives;
3. Apply rapid prototyping techniques to build prototypes for evaluation;
4. Develop usability tests and subjective evaluations during the design process;

STUDY UNIT 9

Internet of Things (IoT)

MQF Level 7

6 ECTS

E-learning: Yes

Rationale

With tens of billions of smart devices in use and their vast network connections, the importance of Internet of Things (IoT) technologies cannot be overemphasised. Development of networking, intelligent things with the aim of enhancing quality of life, increasing safety and overall productivity are among the imperatives of the digital age we live in. An enormous emerging job market implies that a dedicated unit on the Internet of Things is a crucial component in any up-to-date product design curriculum.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Understand the different embedded computing technologies available;
2. Analyse the influence of the falling costs of hardware, software and wireless communications on the emergence of the new markets with the universal networking of non-electronic devices and ordinary things;
3. Arrange M2M communication protocol options and design procedures of the Industrial IoT networks;
4. Design intelligent home systems and propose products to be deployed in smart city systems;
5. Assemble basic IoT interface solutions by identifying the required hardware and software;
6. Analyse different opportunities for IoT application, focusing on entertainment performance and interpret the study to develop a product;
7. Understand how to integrate various cloud services and the IoT network of sensors and actuators;
8. Secure IoT data collection into the cloud-based server, perform massive data analytic transformation in the cloud and generate user friendly graphic enhanced reports;

STUDY UNIT 10

Culture and Communication

MQF Level 7

6 ECTS

E-learning: No

Rationale

The unit of Culture and Communication provides many opportunities for students to relate their own life experiences to contemporary cultural differences and highlights the concepts that are intimately linked with what is intrinsically human. This unit introduces students to the understanding of intergroup relationships as opposed to interpersonal ones. Close examination of cultural practices, humanistic skills, and knowledge of the design of creative products, will give students an understanding of cultural products. This leads to a deeper understanding of aesthetics and human-centred design, the study of which helps find and formulate cross-cultural generalisations and better business organisation. It also provides students with a better understanding of the perception and physical requirements of users, which is followed by improved information on new product design. In communication it is an important point to find the convergence between the different methods of understanding reality. Even concepts that translate easily across languages do not have identical meanings, so one must pay attention to the many different aspects when aiming to understand and compare cultures and design products.

Learning Outcomes

Upon successful completion of this unit, participants will be able to:

1. Define the origins of culture, with a focus on the more contemporary aspects;
2. Understand communication as a means of exchanging information, what communicational skills entail and also verbal, non-verbal and electronic means of communication;
3. Analyse cultural individualism /collectivism and its relationship with culture;

4. Understand the historical relations between culture, communication and academic practice;
5. Identify the resources required to interpret cultural products and practices;
6. Relate own cultural values through design, the practical and theoretical aspects of cultural bound product design and solve cultural differences using communication;