Course guide
340086 - MAPR - Layout and Prototyping

Last modified: 19/05/2026

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 717 - DEGD - Department of Engineering Graphics and Design.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL DESIGN AND PRODUCT DEVELOPMENT ENGINEERING (Syllabus 2009). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: FREDERIC VILÀ MARTÍ

Others: Primer quadrimestre:
NORA ISABEL MARTINEZ ANTUNEZ - D3111, D3112, D3121
FREDERIC VILÀ MARTÍ - D3011, D3012, D3021, D3022, D3023, D3111, D3112, D3121

PRIOR SKILLS

Knowledge of graphic representation and 3D modeling tools (Autocad, NX and / or SolidWorks).

REQUIREMENTS

Previous subject as a requirement: Graphic Expression.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
D21. D21. Ability purchasing power to take decisions related to graphic representation of concepts.
D41. D41. Control of tools related to design processes.
D42. D42. Knowledge of design tools to apply them in design and redesign projects.
D48. D48. Ability to know and apply creative process and its organization.
D54. D54. Ability to analyze, design and project in design workshops.

Transversal:
04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
06 URI N3. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

TEACHING METHODOLOGY

The theory sessions will present the contents of the subject, introducing the subject, concepts, methods and techniques, with examples and practical cases to facilitate their compression and using audiovisual media (transparencies and videos).
The practical work sessions (laboratory practices) will be face-to-face and guided sessions with exposition of concepts, techniques and procedures for the resolution of practical work using the existing digital prototyping tools in the laboratory, in which the monitoring will be monitored. achievement of the objectives proposed by the teacher in each of the sessions.
All assessment tests for the subject are expected to be face-to-face.
The start of the 2020/21 academic year is planned with theory sessions taught online (non-face-to-face sessions) and face-to-face and guided laboratory practice sessions, which will monitor the achievement of the objectives proposed by the teacher in each one of the sessions.
All the assessment tests of the subject are expected to be face-to-face.
Depending on the evolution of the COVID-19 and what the center dictates at each moment, it will be possible to go to a totally face-to-face or totally non-face-to-face teaching, but the start of the course of this subject is expected to be in the hybrid scenario exposed in the previous paragraph.
All the sessions will be present and guided and the achievement of the objectives proposed by the teacher in each of the sessions will be monitored.

LEARNING OBJECTIVES OF THE SUBJECT

Models and prototypes are a fundamental element of design in the process of developing a product. The course explains the existing professional techniques and tools, applicable to the design process and its stages until obtaining a model and / or prototype. The course aims to introduce and practice the new CAD / CAM design technologies and the use of numerical control machines for rapid prototyping. We will integrate technology as a tool for the designer, maintaining the importance of working with the sensibility of the designer, the care of the presentation and the correct use in the study materials.

STUDY LOAD

Type	Hours	Percentage
Hours large group	30,0	20.00
Hours small group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. Introduction

Description:
1.1. DIY / DIWO
1.2. Makers: The new industrial revolution.
1.3. The digital manufacturing laboratory and its machinery.

Full-or-part-time: 8h
Theory classes: 8h

2. Models and prototypes: Understand models and prototypes as a fundamental element of design in the process of developing a product.

Description:
2.1. Difference between a model and a prototype.
2.2. Basic stages of making a model and/or a prototype.
2.3. Materials, techniques of construction and finishing of a model and/or prototype.

Specific objectives:
2.1. Know the difference between a model and a prototype.
2.2. Understand the basic stages of making a model and/or a prototype.
2.3. Know the materials, techniques of construction and finishing of a model and/or prototype.

Full-or-part-time: 2h
Theory classes: 2h

3. 3D Scanning

Description:
3.1. Introduction.
3.2. Types of 3D scanners.
3.3. Contactless 3D scanning techniques.
3.4. 3D scanner settings
3.5. Examples of 3D scanners.
3.6. Reverse engineering.

Full-or-part-time: 2h
Theory classes: 2h

4. Rapid prototype

Description:
4.1. What is rapid prototyping?
4.2. Subtractive manufacturing vs additive manufacturing vs formative manufacturing
4.3. Subtractive manufacturing: COâ□□ laser cutting
4.4. Additive manufacturing vs 3D printing
4.5. Additive manufacturing and Industry 4.0
4.6. 3D printing technologies and processes
  4.6.1. SLA: Stereolithography
  4.6.2. SLS: Selective Laser Sintering
  4.6.3. FFF/FDM: Fused Filament Fabrication / Fused Deposition Modeling
  4.6.4. BJ: Binder Jetting
  4.6.5. MJ or PJ: Material Jetting or PolyJet
  4.6.6. MJF: MultiJet Fusion
  4.6.7. Metal 3D printing
4.7. 3D printing and thermoforming

Full-or-part-time: 6h
Theory classes: 6h

5. Democratized 3D Printing Technologies: Filament and Resin

Description:
5.1. Filament vs Resin 3D Printing
5.2. 3D Printing with Filament:
  5.2.1. Filament 3D Printing Process
  5.2.2. Parts of a Filament 3D Printer
  5.2.3. Types of Filaments: Characteristics, Properties, and Uses
5.3. 3D Printing with Resin:
  5.3.1. Resin 3D Printing Process
  5.3.2. Parts of a Resin 3D Printer
  5.3.3. Types of Resins: Characteristics, Properties, and Uses
5.4. 3D Printer Testing and Calibration
5.5. Common Print Errors and Solutions
5.6. Post-Processing Surface Treatments:
  5.6.1. Mechanical Treatments
  5.6.2. Thermal Treatments
  5.6.3. Chemical Treatments

Full-or-part-time: 6h
Theory classes: 6h

GRADING SYSTEM

The assessment of the course is based on two main components:
• Theoretical part assessment, accounting for 30% of the final grade.
• Practical part assessment (laboratory), accounting for 70% of the final grade.

1. Theoretical Assessment

The theory component will be evaluated through two methods:

a) Continuous Assessment.
During the in-person theory sessions, assessment activities related to the course content covered in class will be carried out. These assessments will be conducted without prior notice and always during the regular schedule of the theory sessions.

b) Final Exam.
During the final exam period, students will take a final multiple-choice exam (on Atenea) covering all theoretical content taught throughout the course.

Final theory grade: The highest score between the following two options will be considered:
• The weighted arithmetic average of the continuous assessment quizzes
• The grade obtained in the final exam

Note: No course assessments will take place during the midterm exam week.

2. Practical Assessment (Laboratory)

The practical component will be evaluated based on the work carried out during the laboratory sessions. The lab work consists of five practical assignments, each contributing a specific percentage to the final practical grade:

• Practice 1 (5%): Introduction to the Digital Modeling and Prototyping Laboratory: safety rules and use of machinery and instruments.
• Practice 2 (10%): Laser cutting: design and production of an object using the laser cutter.
• Practice 3 (15%): 3D printing: design of a part and printing using the lab's 3D printers.
• Practice 4 (10%): 3D scanning: learning and applying 3D scanning techniques.
• Practice 5 (60%): Design and construction of a prototype or model using the available digital prototyping machines in the lab.

EXAMINATION RULES.

If a student for any reason, justified or not, is unable to attend one of the assessment tests on the set day he will have a grade of 0 (not presented).
There will be no re-evaluation of the practical part of the subject, ie only the theory part of the subject will be re-evaluated (30% by weight).

BIBLIOGRAPHY

Basic:
- Bryden, Douglas. CAD y prototipado rápido en el diseño de producto. Barcelona: Promopress, 2014. ISBN 9788415967088.
- Hallgrimsson, Bjarki. Diseño de producto : maquetas y prototipos. Barcelona: Promopress, 2013. ISBN 9788492810529.
- Anderson, Chris. Makers : la nueva revolución industrial. Argentina ; España [etc.]: Empresa Activa, 2013. ISBN 9788496627703.
- Thompson, Rob. Prototyping and low-volume production. London: Thames & Hudson, 2011. ISBN 9780500289181.

Complementary:
- Thompson, Rob. Manufacturing processes for design professionals. New York [NY]: Thames & Hudson, 2007. ISBN 9780500513750.
- Lefteri, Chris. Making it : manufacturing techniques for product design [on line]. 2nd ed. London: Laurence King, 2012 [Consultation: 13/02/2024]. Available on: https://ebookcentral-proquest-com.recursos.biblioteca.upc.edu/lib/upcatalunya-ebooks/detail.action?pq-origsite=primo&docID=1876117. ISBN 9781856697491.