

FACULTY OF **ENGINEERING**

DEGREE COURSE: **INDUSTRIAL ENGINEERING**

MASTER DEGREE: **INDUSTRIAL ENGINEERING / DESIGN**

SUBJECT: VIRTUAL TECHNIQUES IN DESIGN

LECTURER: ROBERTO RAFFAELI

Email address: roberto.raffaelli@uniecampus.it

OBJECTIVES

The course aims to provide the methods to understand and utilize tools of geometric modelling and virtual prototyping to support the design processes.

CONTENTS

Representation techniques and systematic design: Traditional and digital representation techniques, IDEF methods, design theory, the phases of the design process, QFD.

CAD systems: Introduction, CAD systems characteristics, role in the development process, modelling of surfaces and solids

Surface modelling: Representation of curves and surfaces, Spline and NURBS, surface modelling, fillets modelling, main functionalities of Rhinoceros

Mesh representation: Definition of a mesh, mesh algorithms

Solid modelling: Representation of a solid, the CSG and Brep models, the concept of modelling feature, modelling of parts and assemblies, parametric modelling, part families, drafting, data exchange, explicit modelling, integrated modules, main functionalities of SolidEdge

Computer Aided Engineering: Introduction, FEM, CAM, Rendering, KBE

Time compression techniques: Reverse Engineering and Rapid Prototyping

Design for X: Design for Assembly and Environment, End of Life, Design for Disassembly, Design for Costing

Virtual Reality: Systems and application of the Virtual Reality, Mixed Reality and Augmented Reality

User Centered Design: Ergonomics, Product Experience, Design for All

LEARNING OUTCOMES

1 At the end of the course the student is expected to know the methods and techniques to build virtual models of products starting from their geometric representation to the simulation of the physical behaviour.

2 The student will understand how to use the virtual models in the design phases to validate the product lifecycle.

2 Consolidated and innovative techniques for the multimodal and multisensory interaction with the virtual prototype will be presented. Outlooks on the most recent approaches for usability and ergonomic analysis will also be provided.

3 Industrial applications will be presented showing the problems related to the implementation of such tools in specific contexts.

ASSESSMENT

Written exam: multiple choice and open questions

RECOMMENDED TEXTBOOKS

Bordegoni M., Rizzi C., "Innovation in Product Design: From CAD to Virtual Prototyping", Springer, 1st Edition, 2011

Burdea G.C., Coiffet P., Virtual Reality technology, Wiley-Interscience, 2nd Edition, 2003

Pahl G., Beitz W., Feldhusen J. Grote G.H., "Engineering Design: A systematic Approach", Springer, 3rd Edition, 2007