Integrated design of biomedical systems

Medical implants, such as bone replacements, are the very definition of products that require a high level of customization. Every person is distinctly different, and so there is no one-size-fits-all solution where implants are concerned. The aim of this course is to give an overview of how CAD (Catia) and topology optimization software (Altair Optistruct) can exploit the benefits and capacity of additive manufacturing by generating customized implant designs with improved performance (stiffness, stability, motion, bone in-growth) and weight reduction. By combining these technologies, companies are increasing functionality while decreasing costs and design time.

Class Topics: Basic knowledge in high-end CAD modelling including the architecture of CATIA V5 interface, 3D solid modelling, 3D surface modelling and assembly of parts - Introduction to topology optimization concepts - Use of manufacturing constraints in topology - Orthopaedic implants with lattice structures - Coupling Topology Optimization with Additive Manufacturing.

Class style: Hands-on exercises - Students will learn how to interpret and use topology optimization results - During the class, students will be exposed to industrial applications and examples - One student per computer – Use of one of the additive manufacturing machines from the lab to build a designed biomedical implant.

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