

<b>Semester:</b>	3				
<b>Course Code:</b>	ME2010				
<b>Course Name:</b>	Engineering Innovation and Design				
<b>Credits Value:</b>	3 (Notional hours: 150)				
<b>Pre-requisites:</b>	ME1020				
<b>Core/ Optional:</b>	Core				
<b>Hourly Breakdown</b>	Lectures (hours)	Tutorials (hours)	Practical classes (hours)	Assignments (hours)	Independent Learning & Assessment (hours)
	10			70	70

**Course Aim:**

To provide a thorough exposure to the process of systematic design methodology from systems engineering perspective with a high emphasis on multi-disciplinary design aspects so that the students will be able to create innovative and realistic customer-driven engineered products.

**Intended Learning Outcomes:**

At the end of this course, students should be able to;

- **extract** the necessary information of a customer-driven engineered product to represent it using 2D multi-view drawings, 3D solid models for recreation,
- **apply** techniques systematically to develop innovative design concepts by considering a broad spectrum of design alternatives,
- **use** system design methodologies and tools to incorporate multi-disciplinary aspects in the engineering design,
- **demonstrate** the ability to fabricate and test mechanical systems in a studio environment,
- **demonstrate** the ability to contribute to the output of a self-managed team,
- **defend** the total design of the customer-driven engineered product orally and in writing.

**Course Content:**

- **Introduction to Reverse Engineering:** Information extraction, development of part models, assemblies, and drawings.
- **Introduction to Product Design:** Types of design, influence of design on cost and quality; life cycle assessment. Practices in generating creative design solutions, technology and innovative engineering solutions.
- **Problem Definition:** Problem statement; customer needs and market analysis, competitive product study (benchmarking), literature review, product design specifications, quality function

deployment, financial model and business plan, design review.

- **Concept Generation and Evaluation:** Functional decomposition, brainstorming, preliminary concept evaluations, feasibility analysis, technology readiness assessment, decision matrix, concept selection, design review.
- **Ergonomics in Mechanical Design:** Human factors, principles of user-friendly designs.
- **Design for Sustainability:** Environmental Impact, green design, life cycle analysis, design for zero waste, design for re-use.
- **Product Design:** Selection of a design, assembly/parts CAD modeling, bill of materials, assembly analysis, economic analysis.
- **Prototype Building and Testing:** Manufacturing of components, assembly of components, final design demonstration and presentation
- **Intellectual Property:** Intellectual property and patents

**Teaching/ Learning Methods:**

Classroom lectures, case studies, practical classes and in-class exercises and assignments

**Assessment Strategy:**

<b>Continuous Assessment</b> 70%	<b>Final Assessment</b> 30%		
Details:	Theory (%)	Practical (%)	Other (%) (Project Report and Presentations)
Assignments/Quizzes 70%			30 %

**Recommended Reading:**

- Karl T. Ulrich, Steven D. Eppinger (2016), *Product Design and Development* (6th Edition), McGraw-Hill Education, New York, USA.
- Ullman, D. G. (2010). *The Mechanical Design Process* (4<sup>th</sup> Edition). McGraw-Hill, New York, USA.
- Dennis K. Lieu and Sheryl Sorby (2009), *Visualization, Modeling, and Graphics for Engineering Design* (1st Edition), Delmar, Cengage Learning, New York, USA,.
- Hassan, M.H. (2016). *Systems Engineering Innovation and Design* (1<sup>st</sup> Edition). CreateSpace Independent Publishing Platform, North Charleston, South Carolina, USA.
- Singhose, W. & Donnell, J. (2012). *Introductory Mechanical Design Tools* (1<sup>st</sup> Edition). Lulu

Press, Inc, Morrisville, North Carolina.