

MECH2520 Design and Manufacturing I

Course Code: MECH2520	Course Title: Design and Manufacturing I
Required Course Or Elective Course: Required	Terms Offered (Credits): Spring (3 credits)
Faculty In Charge: Robin Ma Michael Wang	Pre/Co-Requisites: NA
Course Structure: Two sections (L1 and L2) Lecture: 1 day per week (2 hours) Laboratory: 1 day per week (2 hours)	
Textbook/Required Material: <u>HKUST Library on line full text e-book database</u> <ol style="list-style-type: none">1. <i>Materials Selection in Mechanical Design (4th Edition)</i>, Michael F. ASHBY, 2011, Elsevier.2. <i>Dimensioning and Tolerancing Handbook</i>, By: P. DRAKE, Jr., 1999, McGraw-Hill.3. <i>Mechanical Engineers' Handbook (2nd Edition)</i> Edited by: Myer KUTZ, 2006 John Wiley & Sons.4. <i>Mechanical Engineer's Reference Book (12th Edition)</i>, Edited by: Edward H. SMITH, 1998, Elsevier.5. <i>Machinery's Handbook (27th Edition) & Guide to Machinery's Handbook</i>, Erik OBERG; Franklin D JONES.; Holbrook L. HORTON; Henry H. RYFFEL, 2004, Industrial Press6. <i>Manufacturing automation</i>, Yusuf ALTINTAS, 2012, Cambridge University Press,7. <i>Product Design for Manufacture and Assembly</i>, Geoffrey BOOTHROYD, Peter DEWHURST, Winston KNIGHT, 2nd Edition, 2011, CRC Press,8. <i>Design for Manufacturing - A Structured Approach</i>, Corrado POLI, 2001, Elsevier.9. <i>Engineering Materials 1 – An Introduction to Properties, Applications, and Design (4th Edition)</i> Michael F. ASHBY; David R. H. JONES, 2012, Elsevier.10. <i>Geometrical Dimensioning and Tolerancing for Design, Manufacturing and Inspection - A Handbook for Geometrical Product Specification Using ISO and ASME Standards (2nd Edition)</i>, Georg HENZOLD, 2006, Elsevier.11. <i>Materials Selection and Applications in Mechanical Engineering</i>, Aravamudhan RAMAN, 2007, Industrial Press.12. <i>Mechanical Assemblies - Their Design, Manufacture, and Role in Product Development</i>, Daniel E. WHITNEY, 2004 Oxford University Press.13. <i>Engineering Design Handbook - Design Guidance for Producibility: (AMCP 706-100)</i>, U.S. Army Materiel Command General14. <i>Engineering Design Methods - Strategies for Product Design (3rd Edition)</i>, Nigel CROSS, 2000, John Wiley & Sons <u>References:</u> <ol style="list-style-type: none">1. British Standard – BS3082. http://www.manufacturing.net/ - global design news3. http://www.deskeng.com/ - desktop engineering4. http://galaxy.einet.net/galaxy/Engineering-and-Technology/Mechanical-Engineering.html – El Galaxy5. http://www.rxn.com/~demu001/mechdes/mechdes.php – mechanical design resources6. http://web.ansi.org/internet_resources/overview/overview.aspx?menuid=12#powered – standards organizations	

Course Description:

1. Introduction to the Engineering Design Process and Engineering Graphics
2. Design Specification and Evaluation
3. Geometric Construction, Sketching, Orthographic Projection, Auxiliary Views;
4. Dimensioning and Tolerancing
5. Manufacturing Methods
6. Design for Manufacturing
7. Design for Assembly

Course Topics:

1. Engineering Design – Creative Process; Design Specification; Design Evaluation; Product Lifecycle Management; Design Portfolio
2. Engineering Drawings - Communication Tool; Drawing Standards; Orthographic Projection; 3D Drawing
3. Dimensioning and Tolerancing – Basic Concepts; Dimensional Tolerances - Limits and Fits, Cumulative Tolerances; Geometric Tolerances and Measurement
4. Material Selection -Types of Materials; Design for X (Strength, Deformation);
5. Material Specification and Evaluation
6. Design Evaluation: Quality Function Deployment
7. Design for Assembly
8. Design for Manufacturing
9. Primary Manufacturing Processes - Mold and Die Related Processes (Casting, Molding, Forming, Sheet Metal Forming, Powder Metallurgy, Composite Manufacturing)
10. Secondary Manufacturing Processes: Machining Processes: (Turning, Drilling, Shaping, Milling, Grinding and Abrasive Processes, Non-Traditional and Thermal Cutting Processes)
11. Tertiary Manufacturing Processes – Surface Finishing Processes (Cleaning and Surface Treatments, Coating and Deposition Processes)
12. Physical Vapor Deposition (PVD) and Chemical Vapor Deposition (CVD)
13. Jigs and Fixture Design

Course Objectives:

1. To provide the students with a basic understanding of the design process and procedure.
2. To provide the students with an understanding on dimension and tolerance specification and its importance in product design.
3. To introduce the concept of material selection and design for assembly and manufacturing.
4. To introduce the basic manufacturing processes and the relevant design considerations.
5. To articulate effective design communication.

Course Outcomes:

- A. Develop an engineering design specification for a product based on initial concepts.
- B. Develop design alternatives and conduct design evaluation based on a design specification.
- C. Communicate effectively via engineering drawings and design presentation.
- D. Conduct detailed component design to meet the engineering specification of parts or assemblies.
- E. Select appropriate manufacturing processes for engineering parts based on design requirements.

Assessment Tools:	SolidWorks Drawing Test (Compulsory)	Pass
	Peer evaluation	10%
	Two In-class Quiz	10%x2
	Project presentation	20%
	Design Project	
	Phase 1 – Engineering specification development – individual	20%
Phase 2 – Detailed Design – Group	30%	