COURSE NUMBER: Vm250	**COURSE TITLE:** Design and Manufacturing I
CREDIT: 4	**PREREQUISITES:** VV156 or VV186, and VG101
TEXTBOOKS/REQUIRED MATERIAL: Kalpakjian and Schmid, Manufacturing Engineering and Technology, Fifth Edition, Prentice-Hall, 2001, ISBN: 0-201-36131-0	**PREPARED BY:** Mian Li **DATE OF PREPARATION:** July 03, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Mian Li	**SCIENCE/DESIGN:**
CATALOG DESCRIPTION: Basics of mechanical design: visual thinking, engineering drawing, and machine anatomy. Basics of manufacturing: processes, materials, and thermo-fluid aspects. Use of computers in various phases of design and manufacturing. Exposure to CAD systems and basic machine shop techniques. Design/manufacturing project.	**COURSE TOPICS:** 1. Visualization, geometry modeling, and engineering drawing 2. Computer Aided Design (CAD), Computer Aided Manufacturing (CAM) 3. Geometric dimensioning and tolerances 4. Customer requirement, QFD, concept generation and selection 5. Review of elementary statistics 6. Overview of engineering materials 7. Manufacturing processes 8. Writing technical reports and making technical presentations 9. Introduction to team-working
COURSE STRUCTURE/SCHEDULE: Lecture: twice per week, 90 minutes each; Laboratory: one per week, 3 hrs	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. Introduce students to the complexity of engineering practice and to follow the development of an idea from its conception to the construction of a prototype [2,3,5,6] 2. Develop the technical skills necessary to generate an engineering drawing and an engineering assembly using a modern CAD system [1,2] 3. Develop a 'hands on' experience through shop training and the construction of a physical artifact [4, 5, 6,9,10,11] 4. Introduce the elements of engineering communications, including graphical representation of artifacts, teamwork, written reports, and oral presentations [12] 5. Introduce uncertainty as an element of engineering practice, including material properties, process performance, and market demands [1, 3, 8]. 6. Obtain a basic understanding of various engineering materials and the manufacturing techniques used to produce these materials into useful products [7,9,10,11]
COURSE OUTCOMES [Program Outcomes in brackets]	After completing Vm250, students should be able to: 1. Students are able to read engineering drawings with different views, including orthographic views, hidden lines and cross sectional views. They understand the description of surface roughness, lay waviness and the representations of tolerances and surface finish on engineering drawings [a,c,k] 2. Students can create 2D and 3D models of engineering objects, engineering drawings with different views, and an assembly of the objects that make up engineered systems, using a CAD tool (e.g. Unigraphics) [c,k] 3. Students can understand uncertainty (i.e., tolerance, error, etc.) in engineering drawing and manufacturing: how to represent it and how it comes [a,b,j] 4. Students are able to use basic hand tools in a safe manner [c,k] 5. Students are able to move from CAD to CAM and use numerically controlled machines to produce simple artifacts [c,k] 6. Students are able to design a consumer device based upon market demands, through QFD analysis, concept generation and selection, and function analysis [c]. 7. Students understand basic machining processes [c,k] 8. Students are able to apply the statistics and probability in an elementary way. They can use the normal distribution and tables of the cumulative distribution to predict probabilities. They understand applications in geometric dimensioning and tolerances [a,b,e,j,k] 9. Students are able to identify the main classes of engineering materials, namely metals, polymers, ceramics and composites. They are able to distinguish the main physical and mechanical properties in these material classes. They also are able to name examples of artifacts made from these materials [b] 10. Students are able to name the most common processing techniques for metals: Cutting, casting, forging, rolling, extrusion, drawing, and heat treating. They are able to describe each process and give an example of an artifact made by the process [b] 11. Students are able to name the most common processing techniques for polymers and polymer composites: Injection molding, extrusion, blow molding, thermoforming, and compression molding. They are able to describe each process and give an example of an artifact made by the process. The students can state the differences between the processing of thermoplastics and thermosets [b] 12. Students can work together within a team to collaboratively accomplish a design task [d,f,g]
ASSESSMENT TOOLS [Course Outcomes in brackets]	Homework [1,2,3,6,7,8,9,10,11] Midterm and final Exam [1,2,3,6,7,8,9,10,11] Written reports [4,5,6,7,10,12] Project prototype [4,5,6,7,9,10,11,12] Project demonstration and oral presentation [12] Peer evaluations [12]