|  |  |
| --- | --- |
| **Course Number** | MNET 303 |
| **Course Name** | Advanced Techniques in CAD/CAM |
| **Course Structure** | 2-2-3 (lecture hr/wk - lab hr/wk – course credits) |
| **Course Coordinator/****Instructor** | Dr. S. Lieber/Mr. J. Beshay |
| **Course Description** | Applications including hands-on experience with CAD/CAM systems. Emphasis is on understanding how displayed objects are represented and manipulated on the computer. Laboratory experiences contribute to an understanding of the advantages and limitations of CAD/CAM systems. |
| **Prerequisite(s)** | MET 105 |
| **Corequisite(s)** | None |
| **Required, Elective or Selected Elective** | Elective |
| **Required Materials** | Paul J. Schilling, Randy H. Shih Parametric Modeling with Solidworks 2019. SDC Publications 2019, ISBN: 9781630572259 |
| **Computer Usage** | Software: ***Solidworks***.  |
| **Course Learning Outcomes(CLO)** | By the end of the course students should be able to: 1. Develop CAD models with Parametric CAD software.
2. Develop CAM models with CAM software.
3. Apply knowledge of Manufacturing and Inspection processes to CAD/CAM.
4. Conduct Engineering Analysis with CAD/CAM.
5. Prepare Engineering documents/reports.
 |
| **Class Topics** | Castings and Forging process, CAD sketch and extrude, Cutting Operations (Mill, Wire EDM, Drill), CAD Mirror & Revolve, Helical Sweep, Pattern, CAM Milling/Drilling, CAM Turning, Inspection Methods, CAD Assembly, Geometric Dimensioning & Tolerancing, CAD 3D Annotation, Part and Assembly Drawing Formats/Templates, Working with STEP Files, Sheet Metal Modeling, Additive Manufacturing, CAD Blend and Shell:**CAD/CAM Project:**  Project 1: Each student will describe the manufacturing processes needed to fabricate an existing modeled part. A Project Report will be submitted.Project 2: Each student will model the parts for an assembly. Students will prepare engineering drawings for parts and the assembly. Students will conduct engineering evaluation of fit and function. A Project Report will be submitted. |
| **Student Outcomes** | The Course Learning Outcomes support the achievement of the following MET Student Outcomes and TAC of ABET Criterion 9 requirements:**Student Outcome a** - an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities**Related CLO – 1-4****Student outcome b** - an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;**Related CLO –3-4****Student outcome c** - an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;**Related CLO – 3-4****Student Outcome d** - an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.**Related CLO – 1-4****Student outcome f** - an ability to identify, analyze, and solve broadly-defined engineering technology problems**Related CLO – 3-4****Student Outcome g** - an ability to communicate effectively regarding broadly-defined engineering technology activities**Related CLO – 5****Student Outcome m** - technical expertise having added technical depth in mechanical design, solid mechanics, and electro-mechanical devices and controls.**Related CLO - 1-4** |
| **Grading Policy**Note: Grading Policy may be modified by Instructor for each Section in the Course) | Homework 30 %Project 1 & 2 20 %Two Quizzes 30 %Final Exam 20 %**Note**: There are two quizzes during the semester. There will be no makeup quizzes.  |
| **Academic Integrity** | NJIT has a zero-tolerance policy regarding cheating of any kind and student behavior that is disruptive to a learning environment. Any incidents will be immediately reported to the Dean of Students. In the cases the Honor Code violations are detected, the punishments range from a minimum of failure in the course plus disciplinary probation up to expulsion from NJIT with notations on students' permanent record. Avoid situations where honorable behavior could be misinterpreted. For more information on the honor code, go to <http://www.njit.edu/academics/honorcode.php>  |
| **Student Behavior** | * No eating or drinking is allowed at the lectures, recitations, workshops, and laboratories.
* Cellular phones must be turned off during the class hours – if you are expecting an emergency call, leave it on vibrate.
* No headphones can be worn in class, unless allowed by the professor.
* Unless the professor allows the use during lecture, laptops should be closed during lecture.
* During laboratory, if you are finished earlier, you must show the professor your work before you leave class
* Class time should be participative. You should try to be part of a discussion
 |
| **Modification to Course** | The Course Outline may be modified at the discretion of the instructor or in the event of extenuating circumstances. Students will be notified in class of any changes to the Course outline. |
| **Prepared by** | Mr. J. Beshay |
| **Course Coordinated by** | Dr. S.Lieber |

### Class Hours

|  |  |  |
| --- | --- | --- |
| Monday | 5:45 PM – 9:50 PM | 2302 GITC Building |

### Office Hours

By appointment e-mail joseph.beshay@njit.edu

### Homework & Project - Important

**Homework**

1. Homework sets are due one week after they are assigned. . Late penalty is minus 25% each week. Assignments more than one week late will not be accepted.
2. Homework must be submitted in the format provided by the professor.
3. Projects are due on the dates indicated. No late projects will be accepted.
4. Projects should be submitted in the format provided by the professor.

### Grading Legend

|  |  |
| --- | --- |
| **GRADE** | **NUMERIC RANGE** |
| A | 90 to 100 |
| B+ | 85 to 89 |
| B | 80 to 84 |
| C+ | 75 to 79 |
| C | 70 to 74 |
| D | 60 to 69 |
| F | 0 to 59 |

### Course Outline

| **Week** | **Topics** | **Homework Assignment** |
| --- | --- | --- |
| **1**January 27 | Description of Castings & Forgings Introduction to Solid Modeling (Solidworks)* Introduction (Chapter 1)
* Parametric Modeling Fundamentals (Chapter 2)
 | 1. Chapter 2 Tutorial
2. Chapter2: 3, 4
 |
| **2**February 3 | Description of Cutting Operations (Mill, Wire EDM, Drill) Solid Modeling:* Constructive Solid Geometry Concepts (Chapter 3)
* Idler Arm Part

**Project 1 Assigned** | 1. Chapter 3 Tutorial
2. *Bearing* (Chapter 14 p. 14-6)
3. Idler Arm Tutorial
 |
| **3**February 10 | Description of Turning Operations (Screw Threads) Solid Modeling:* Revolve, Helical Sweep, Pattern
* Thumb Screw
 | 1. Thumb screw Tutorial
2. Start U-Bracket (Chapter 7)
3. Cap Screw (Chapter 14 p. 14-7 with Thread and Relief)
 |
| **4**February 17 | Symmetrical Features in Design (Chapter 11) | 1. Pulley (Chapter 11, p. 11-1thru 11-17)
2. Finish U-Bracket (Chapter 7)
3. Base-Plate (Ch. 14, p. 14-6)
4. Collar (Ch. 14, p. 14-4)
 |
| **5**February 24 | **Quiz #1**Description of Inspection MethodsSolid Modeling:* Assembly (Chapter 14)
 | 1. **Finalize Project 1**
2. Shaft Support Assembly (14-1 thru 14-28)
 |
| **6**March 2 | **Project 1 Submitted**Dimensioning/Tolerancing & GD&T Part 1Solid Modeling:* Part Drawings & Associative Functionality (Chapter 8)
 | 1. Chapter 8 Tutorial
2. Pulley Drawing (11-18 thru 11-32)
 |
| **7**March 9 | Dimensioning/Tolerancing & GD&T Part 2Solid Modeling:1. Reference Geometry & Auxillary Views (Chapter 9)

**Project 2 Assigned**  | 1. Chapter 9 Tutorial
	1. Create Part Drawing with Overall Dimensions
2. GD&T Homework
 |
| **SPRING BREAK 3/15-3/22** |
| **8**March 23 | Dimensioning/Tolerancing & GD&T Part 3Solid Modeling:* Assembly Drawings
 | 1. Shaft Support Assembly Drawing (14-29 thru 14-37)
2. Shaft Hanger Tutorial
	1. Create Part Drawing with Overall Dimensions
 |
| **9**March 30 | Solid Modeling:* Sheet Metal Part 1
 | 1. Sheet Metal Designs (Chapter 13)
 |
| **10**April 6 | **Quiz #2**Solid Modeling:* Sheet Metal Part 2
 | 1. Support Bracket Tutorial
	1. Create Part Drawing with Overall Dimensions
 |
| **11**April 13 | Additive Manufacturing (Ch. 10)* STL File generation Tutorial (10-12 thru 10-25)

Solid Modeling:* Blend/Shell
* Dryer Housing (Chapter 12)
 | 1. Chapter 10 STL Tutorial
2. Dryer Housing (Chapter 12)
 |
| **12**April 20 | Master Cam Tutorials* Introduction
 | 1. MasterCAM Intro. Tutorial
 |
| **13**April 27 | Master Cam Tutorials* Lathe
 | 1. Lathe Tutorial
2. **Finalize Project 2**
 |
| **14**May 4 | **Submit Project 2**Solid Modeling:* Family Table
 | Cotter Pin Tutorial * Create Part Drawing with Overall Dimensions
 |
| **15**TBD | **Final Exam** |  |