Course Instructor: César A. Terrazas-Nájera, Ph.D.
Email: caterrazas2@utep.edu

Class TA: Angel Ortega, agortega@miners.utep.edu
Office Hours: Tu-Th: 12:00-1:20

Class Meeting Schedule: Online
Class Duration: Aug 23rd, 2021 – Dec 2nd, 2021

Course Description: An introduction to solid modeling concepts and software, dimensioning, and basic computer-aided engineering.

Course Objectives:
At the end of this class, the typical students should be well prepared to make drawing for any type of structures, machines, and any connection elements. The students will be able to sketch models that can be used for 3D print. Besides, the students will be able to run a simulation for their models to check the analysis required for design purposes. The objectives can be summarized as:

- Explain the design to the manufacturing process used to take a digital model to a physical part through CNC programming.
- Summarize the toolset available in Fusion 360.
- Demonstrate knowledge and skills in Fusion 360, applying design and manufacturing workflows to take digital parts to physical prototypes.

Course Content
- 2D Sketching
- 3D Modeling
- Drafting
- Parts Assembly
- Simulation (stress/thermal)
- Rendering and animation
- CAM and 3D Printing
- Design Projects

Course Requirements
- Computer capable of running Autodesk's Fusion 360.
- Limited-term laptop checkout is available at the Library and Engineering Technology Center. Desktops at Library may be used to complete assignments, but Laptops will be required for quizzes and assignments.

Software
- Autodesk Fusion 360
- Fusion 360 | Free Software for Students and Educators at: https://www.autodesk.com/campaigns/education/fusion-360
Grading

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework (12)</td>
<td>1200</td>
</tr>
<tr>
<td>Discussion boards (6)</td>
<td>300</td>
</tr>
<tr>
<td>Assessments (Quizzes 3)</td>
<td>300</td>
</tr>
<tr>
<td>Team Contract</td>
<td>50</td>
</tr>
<tr>
<td>Projects (2)</td>
<td>500</td>
</tr>
<tr>
<td><strong>Total Points</strong></td>
<td><strong>2350</strong></td>
</tr>
</tbody>
</table>

**Grading Scale:** The final grade will be calculated based on the points you have accumulated as follows:

- A $\geq 2100$
- $2100 \geq B > 1880$
- $1880 \geq C > 1645$
- $1645 \geq D > 1400$
- $1400 \geq F$

The instructor reserves the right to revise this grading plan. However, the students will be informed of any changes during the semester.

**Homework:** The description for each homework assignment will be posted on Blackboard, and the due date for each assignment will be on Sunday at 11:59 pm.

**Projects:** There will be one individual and one team project in this course. Both projects will challenge you to apply the materials covered in class and force you to apply knowledge from outside the class to complete it. Project 1 (team effort) will cover all the fundamentals of Modeling, and it will include a functional assembly. Project 2 (individual effort), it will cover modeling and simulation fundamentals that will be applied to a real-life problem.

**Discussion boards:** for this online course, students will be required to participate in discussion boards – both an initial post and responses to their peers. Students will also have a collection of smaller assignments throughout the week to build toward larger projects. Each of the activities is given point values that add up to the total 300-point participation grade. These points cannot be made up.

**Homework and Projects' Policy**

*To pass this class, the student MUST demonstrate proficiency with the concepts and software. If a student miss 50% of the assigned homework and one project, the instructor has the right to drop him/her from class or assign an “F” grade for the class.*

*Late submission for the homework within two days after the deadline will be accepted with a 40% deduction.*

**Technology Requirements**

Course content is delivered via the Internet through the Blackboard learning management system (LMS). Ensure your UTEP email account is working and that you have access to the Web. You may use any of the primary Web browsers—Explorer, Google Chrome, Firefox, Safari, etc. When having technical difficulties, try switching to another browser.
You will need to have or have access to a computer/laptop, printer, scanner, webcam, and microphone. You will need to purchase a USB (flash drive). You will need to download or update the following software: Microsoft Office, Adobe, Windows Media Player, QuickTime, and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course. If you encounter technical difficulties of any kind, contact the Help Desk.

**Netiquette**

- Always consider the audience. Remember that members of the class and the instructor will be reading any postings.
- Respect and courtesy must be always provided to classmates and to the instructor. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a F2F situation.
- Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professors only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

**Drop Policy**

To drop this class, please contact the Registrar's Office to initiate the drop process. If you cannot complete this course for whatever reason, please contact me. If you do not, you are at risk of receiving an "F" for the course.

**Drop/Withdrawal Deadline: October 29th, 2021**

**Accommodations Policy**

The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services, and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services.

**Scholastic Integrity**

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another as one's own. Collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a
UTEP student is unacceptable and will not be tolerated. All suspected violations of academic integrity at The University of Texas at El Paso must be reported to the Office of Student Conduct and Conflict Resolution (OSCCR) for possible disciplinary action. To learn more visit HOOP: Student Conduct and Discipline.

**Student Resources**

UTEP provides a variety of student services and support:

**UTEP Library**: Access a wide range of resources, including online, full-text access to thousands of journals and eBooks, plus reference service and librarian assistance for enrolled students.

- **Help Desk**: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in-person if on campus.
- **University Writing Center (UWC)**: Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- **Math Tutoring Center (MaRCS)**: Ask a tutor for help and explore other available math resources.
- **History Tutoring Center (HTC)**: Receive assistance with writing history papers, get help from a tutor, and explore other history resources.
- **Military Student Success Center**: UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- **RefWorks**: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.

**ACES & Tutoring Center**

Please note there are tutoring services available in the ACES center. Tutoring is free to you; the Department pays them. If tutors are not used, the Department may stop funding them. Check the schedule of the tutors and make use of the services. For more details, visit the

**ME Advising Blackboard > cc mech acadav: MECH Academic Advising > Tutoring & Resources**

At the link, you can find tutor schedules, the location of the ACES center, and the list of tutors available. For more information, send an email to METutors@utep.edu

**Harassment Policy**

The Department has a zero-tolerance policy for harassment. Engagement in any behavior considered harassment will be reported to the proper authorities. In addition to generally understood forms of harassment, the Department also treats the following behavior as harassment:

- Repeated emails and/or calls regarding subjects that have already been addressed. Once a decision has been made or a question answered, a student who continues to ask the same question will be given a warning by the recipient of the email/call. If the student continues, the behavior
will be reported. Questions that seek understanding of course material are not harassment, but repeated questions about a grade or an administrative decision are.

- **Grades are NOT negotiable, ever.** If you believe a grading mistake has been made, you must follow the process described in the UTEP catalog. Any request for a grade elevation that is NOT based on a mistake is considered harassment and will be reported immediately.

**COVID-19 Precautions**

- Please stay home if you have been diagnosed with COVID-19 or are experiencing COVID-19 symptoms. If you are feeling unwell, please let me know as soon as possible, so that we can work on appropriate accommodations. If you have tested positive for COVID-19, you are encouraged to report your results to covidaction@utep.edu, so that the Dean of Students Office can provide you with support and help with communication with your professors. The Student Health Center is equipped to provide COVID 19 testing.

- The Center for Disease Control and Prevention recommends that people in areas of substantial or high COVID-19 transmission wear face masks when indoors in groups of people. The best way that Miners can take care of Miners is to get the vaccine. If you still need the vaccine, it is widely available in the El Paso area, and will be available at no charge on campus during the first week of classes. For more information about the current rates, testing, and vaccinations, please visit epstrong.org

**Tentative Schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Activities: Reading/Watch</th>
<th>Assessments</th>
</tr>
</thead>
</table>
| 1    | Class Introduction | Installation of Fusion 360 Example  
What's Fusion 360?  
File and Project Administration | -Syllabus quiz  
-Discussion board-  
1(Introduction): due on Sunday, Aug 28th, at 11:59 pm. |
|      |        | The basics of using Fusion 360 ▼  
Understand how Fusion stores your data  
Create a New Project and a New Folder in a Project.  
Accessing and Customizing Tools.  
Understanding Bodies and Components.  
Capture Design History | Watch videos in the link/Complete lessons 1-4  
Link: https://academy.autodesk.com/course/137992/introduction-design-manufacturing-associate |
| 2    | 2D Sketches | Learning how to create and define sketches ▼  
Create a basic sketch  
Fully Define a Simple Sketch  
Define Constraints with Example  
Polygon Tools  
Gear Example  
iPhone Example | H.W.#1  
due on Sunday, Sept 5th, at 11:59 pm  
1)Submit a screenshot after step 1 in lesson-5  
2)Submit a screenshot for the modified angle with all dimensions in |
<table>
<thead>
<tr>
<th>3</th>
<th>2-3D Sketches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feature Creation (extrude, revolve, sweep)</td>
<td></td>
</tr>
<tr>
<td>Feature Modification</td>
<td></td>
</tr>
<tr>
<td>Basics of Feature Creation ▼</td>
<td></td>
</tr>
<tr>
<td>• Create and Shell Drafted Part.</td>
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<tr>
<td>• Create a Revolve</td>
<td></td>
</tr>
<tr>
<td>Basics of Feature Modification ▼</td>
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<tr>
<td>• Apply Fillets to a Model</td>
<td></td>
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<tr>
<td>• Create a Feature Pattern</td>
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<tr>
<td>Watch videos in the link/Complete lessons 6 &amp; 7.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>4</th>
<th>Saving an STL file for 3D Printing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Motion with Assembly Joints</td>
<td></td>
</tr>
<tr>
<td>Animations and Rendering</td>
<td></td>
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<tr>
<td>Detailed Drawing</td>
<td></td>
</tr>
<tr>
<td>Export an STL File ▼</td>
<td></td>
</tr>
<tr>
<td>Mechanical motion with assembly joints ▼</td>
<td></td>
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<tr>
<td>• Apply an as-Built Joint</td>
<td></td>
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<tr>
<td>• Drive and Animate a Joint</td>
<td></td>
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<tr>
<td>• Edit a Joint Limit</td>
<td></td>
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<tr>
<td>Animations and Renderings ▼</td>
<td></td>
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<tr>
<td>• Explode a Component</td>
<td></td>
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<tr>
<td>• Create a Rendering</td>
<td></td>
</tr>
<tr>
<td>Create a Detailed Drawing from the Animations ▼</td>
<td></td>
</tr>
<tr>
<td>• Add Parts of a Table</td>
<td></td>
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<tr>
<td>• Add Drawing Dimensions</td>
<td></td>
</tr>
<tr>
<td>Watch videos in the link/Complete lessons 8-11</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>5</th>
<th>Integrated Manufacture Workspace CAD/CAM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Simulation Workspace</td>
<td></td>
</tr>
<tr>
<td>Static Load Simulation</td>
<td></td>
</tr>
<tr>
<td>Integrated Manufacture Workspace ▼</td>
<td></td>
</tr>
<tr>
<td>• Define a New Tool</td>
<td></td>
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<tr>
<td>• Create a Facing Toolpath</td>
<td></td>
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<tr>
<td>• Create a Contour Toolpath</td>
<td></td>
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<tr>
<td>• Simulate a Program</td>
<td></td>
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<tr>
<td>• Export an NC File</td>
<td></td>
</tr>
<tr>
<td>Integrated Simulation Workspace ▼</td>
<td></td>
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<tr>
<td>• Use Simplify to Remove Bodies</td>
<td></td>
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<tr>
<td>• Select a Simulation Material</td>
<td></td>
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<tr>
<td>• Activate Automatic Contacts</td>
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<tr>
<td>• Solve and Review a Simulation</td>
<td></td>
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<tr>
<td>• Add Load Conditions</td>
<td></td>
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<tr>
<td>• Clone a Simulation Model</td>
<td></td>
</tr>
<tr>
<td>Watch videos in the link/Complete lessons 12&amp;13</td>
<td></td>
</tr>
</tbody>
</table>

(2D) after step 2 in lesson-5
3) Submit a screenshot after fixing the fillet feature of the model in step 2 of lesson 5 (3D model screenshot).

H.W.#2 due on Sunday, Sept. 12th, at 11:59 pm

H.W.#3 due on Sunday, Sept 19th, at 11:59 pm

H.W.#4 due on Sunday, Sept 26th, at 11:59 pm

Discussion board due on Saturday, at 11:59 pm.
<table>
<thead>
<tr>
<th>Week</th>
<th>Assignment</th>
<th>Description</th>
<th>Resources</th>
<th>Due Date</th>
</tr>
</thead>
</table>
| 6    | Course Challenge Assignment | Course Challenge Assignment in lesson 14: [link](https://academy.autodesk.com/course/137992/introduction-design-manufacturing-associate)  
Note: data resources are available for students in lesson-1 step-4.  
**Quiz (1)** | | H.W.#5 due on Sunday, Oct 3rd, at 11:59 pm. |
| 7    | 3D Modeling | Enroll in this course: [link](https://academy.autodesk.com/course/126271/introduction-3d-modeling)  
(Complete lessons 2 to 6)  
A quick overview of 2D and 3D Modeling in Fusion 360  
A simple exercise: Modeling from 2D sketches to a 3D CAD Model  
Overview the types of modeling and workspaces in Fusion 360  
Parametric modeling in Fusion 360: Sketching  
Parametric Modeling in Fusion 360: From 2D to 3D | | H.W.#6 due on Sunday, Oct 10th, at 11:59 pm |
| 8    | 3D Modeling | Freeform modeling and sculpting  
Direct modeling  
Watch videos in the link/Complete lessons 7&8  
**Link:** [link](https://academy.autodesk.com/course/126271/introduction-3d-modeling) | | H.W.#7 due on Sunday, Oct 17th, at 11:59 pm |
| 9    | Assembly | Assembly Modeling  
Technical Drawing and Documentation in Fusion 360  
Watch videos in the link/Complete lessons 9&10  
**Link:** [link](https://academy.autodesk.com/course/126271/introduction-3d-modeling)  
**Quiz (2)** | | H.W.#8 due on Sunday, Oct 24th, at 11:59 pm. |
| 10   | Introduction to CAD and CAE Using Fusion 360 | Enroll in the course below: [link](https://academy.autodesk.com/course/120630/introduction-cad-and-cae-fusion-360)  
Week 4 - Assemblies  
- Assemblies Lecture  
- Assemblies Reference | | H.W.#9 due on Sunday, Oct 31st, at 11:59 pm.  
-Submit the team contract (in Welcome Module) by Sunday, Oct 31st, at midnight. |
| 11   | Simulation - Static Stress | Week 8 Simulation – Static Stress  
- Linear Structural Analysis Lecture  
- Linear Structural Analysis References | | H.W.#10 due on Sunday, |
| 12 | Simulation – Thermal – and Thermal Stress | Week 10 Simulation – Thermal and Thermal Stress ▼  
- CFD and Thermal Analysis Lecture  
- Thermal and thermal stress analysis reference  
Watch videos in the link/Complete lessons in week-10  
| 13 | CAM and CNC Manufacturing  
Model and assemble a 3D Printer -z Axis | Week 12 CAM and CNC Manufacturing ▼  
- CAM and CNC Manufacturing- Lecture  
- Tool Library  
- Setup  
- Adaptive Overview  
- 2D Finishing  
- 3D Finishing  
- Stock Simulation  
- Toolpath Management  
- Post Process  
Watch videos in the link/Complete lessons in week-12  
**Model and assemble a 3D Printer -z Axis**  
**Quiz (3)** | H.W.#12 due on Sunday, Nov 21st, at 11:59 pm  
Discussion board due on Sunday at 11:59 pm |
| 14 | Generative Design | Generative Design Overview▼  
- Generative Design mindset  
- Shape Optimization vs. Generative Design  
Generative Design Preserve and Obstacle Geometry ▼  
- Preserve Geometry  
- Create Obstacle Geometry for Motor Mounts  
- Create Obstacle Geometry for the Gas Tank and Motor  
Generative Design study setup▼  
- Generative Design Loads and Constraints  
- Set Generative Design Objectives  
- Explore manufacturing methods  
- Solve a Generative Study  
- Explore Generative Outcomes  
- Explore Manufacturing Outcomes  
- Create a 3D Design from a Generative Outcome  
Post-process a generative outcome ▼  
- Review a Generative Model  
- Edit a Generative Model  
- Setup a Simulation Study  
- Analyze Simulation Results | Discussion board due on Sunday, Nov 28th, at 11:59 pm |
<table>
<thead>
<tr>
<th>Date</th>
<th>Assignment</th>
<th>Description</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Design Project #1</td>
<td>(Team project) The description is listed in the project's file.</td>
<td>Thursday, Dec 2nd, at 11:59 pm</td>
</tr>
<tr>
<td>16</td>
<td>Design Project #2</td>
<td>(Individual project) The description is listed in the project's file. (This is the week of the final exam)</td>
<td>Tuesday, Dec 7th, at 11:59 pm</td>
</tr>
</tbody>
</table>

The above schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students.