

## Course Syllabus for TECH 5311

**Course Title:** **TECH 5311:** Computer Aided Engineering  
**Prerequisites:** TECH 5310 (Computer Aided Drafting and design) and MATH 2471 (Calculus I) or consent of instructor.  
**Instructor:** Dr. Jitendra S. Tate  
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### Required Texts:

- Pro/Engineer Wildfire Instructor (latest version) update by David S. Kelley, McGraw-Hill Higher Education,
- ANSYS tutorials in the PDF format will be provided by the instructor.
- Class handouts and notes will be the primary learning resources for the lecture-based topics.

### Course Description:

Application of computer hardware and software to the design of products and systems; geometric modeling; engineering computational methods; overview of engineering analysis software which may include finite element analysis, manufacturing simulation and solid modeling, and rapid prototyping.

### Course Objectives:

Engineering design begins with market surveys whereby a product need is identified. Based on this identification, a conceptual design is created. Before the product can be manufactured, the conceptual design has to be refined and a detailed design produced. Detailing a conceptual design involves determining material specifications, dimensions, tolerances, performance measures, etc. There are determined by engineering analysis.

Engineering analysis is a computationally intensive process whereby the product behavior is mathematically modeled and the response of the model to various loads, such as forces, moments, temperatures, etc. determined. The results of the analysis help determine sizes and material specifications. This process is highly iterative and would involve many man-hours if performed manually. Thus, digital computers are used to create models, analyze models and display the results of analysis.

One of the very widely used engineering analysis technique is called Finite Element Analysis (FEA). FEA programs allow engineers to build a model of the desired component, apply loads, and specify material properties and boundary conditions. Then, the CAE software performs the time-intensive analysis computations and displays the results using the graphics capability of the CAD system. The CAD model built for the analysis may also be used as an input for rapid prototyping processes which produce a physical three-dimensional model of the component from its three-dimensional CAD counterpart.

This course will cover the general aspects of computer aided engineering analysis. The material covered will give designers the background necessary to determine component response to several loading conditions. Various topics covered include geometric modeling, computational techniques for engineering analysis, modeling physical systems and design analysis using industry standard software, and rapid prototyping.

### Topic Covered:

- Strength and stability consideration in engineering design
- 3D Modeling using Pro/Engineer Wildfire 3.0 (Basic modeling and No assembly concepts)
- Engineering computational methods (using MS Excel)
- Finite element modeling using ANSYS 9.0
- Rapid Prototyping – Guest lecture

### Evaluation:

Evaluation will be based primarily on homework assignments, class works, a group project, and two exams (a Test 1 and 2). The homework assignments will be included in this course to affirm retention of concepts. Besides these assignments, the group project and exams are required components of this course. Conscientious attendance is also expected.

**Grading (Scale: 90-100 (A), 80-89.9 (B), 70-79.9 (C), 60-69.9 (D), 59.9 or less (F)):**

|        |   |     |
|--------|---|-----|
| Test 1 | - | 25% |
|--------|---|-----|

|                                            |   |             |
|--------------------------------------------|---|-------------|
| Test 2                                     | - | 25%         |
| Classworks/ Computer assignments/Homeworks | - | 25%         |
| Project/Final Exam                         | - | 25 %        |
| <b>TOTAL</b>                               |   | <b>100%</b> |

**Attendance (unexcused)**

**Reduction of 2% per day absence**

\* During lab sessions, you will be working on Pro/Engineer and ANSYS tutorials. These tutorials are considered as classwork. Computer assignments will be based on these tutorials. Since this is CAE course, engineering analysis and ANSYS tutorials will be given more weighting. Homework will be based on lecture topic covered on mechanics of materials and design.

Additionally, the student's overall performance that will be subjectively decided by the instructor will play a role in letter grade determination.

*Absences:*

Absences are not recommended in general. Scheduled exam absences or overdue homework and projects will not be accepted unless there exists legitimate excuses (illness, death in the family, etc.) and adequate documentation is furnished. However, it is the student's responsibility to obtain class notes, handout materials, if any, etc. when a scheduled lecture is missed. Any other departmental policies on absences must be adhered to.

*General Policies and Procedures:*

- 1) No food or drinks are permitted in the classroom.
- 2) No smoking or tobacco use of any kind in the lab or classrooms per state law.
- 3) No cell phone use during appointed class times.
- 4) All departmental and University policies on academic integrity and absences apply and should be taken very seriously.
- 5) You must check your emails regularly and also need to visit 'BlackBoard' for important announcements, due dates, course documents, and assignments.

*Special Needs:*

Students with special needs (as documented by the Office for Disability Services) should identify themselves to the instructor at the beginning of the semester so that provisions for accommodation can be made.