



Computer Aided Engineering

This course focuses on an introduction to the Finite Element Analysis (FEA) method and its practical application. At the completion of this course the participant will have a fundamental understand of the finite element tool and how it can be applied to the design and development of better products.

Current popular industry software packages will be reviewed and discussed. Participants will bring information on specific company product designs to be discussed during this training for real application of these concepts, tools and techniques.

- First, the basics of finite element analysis and applicable engineering fundamentals are discussed to gain a common understanding of the application and general principles are reviewed. The methods capabilities as well as its limitations will also be discussed.
- Next, participants will focus on common model and element types and where and on what products they should be applied. The applications of the loads and boundary conditions will also be reviewed in detail along with industry examples.
- Lastly, participants will be shown how to run the model and interpret output results. A thorough understanding of what these results mean and how to use them to improve the product design will be discussed.



Course Syllabus

I IDENTIFYING INFORMATION

Course:	Computer Aided Engineering (CAE)
Prerequisite:	Understanding of product design and development Understand of manufacturing processes
Time Frame:	40 total contact hours
Instructor:	David Luik BS in Mechanical Engineering MS in Engineering Management 30 years in the product design engineering profession 15 years managing sales and operations business units Professor at Central Michigan University
Mobile:	(248) 420-3192
E-mail:	Dluik@earthlink.net

II REFERENCE MATERIALS

1. What Every Engineer Should Know About Finite Element Analysis by JR Brauer
2. MSC/NASTRAN Linear Static Analysis User's Guide by JP Caffrey and JM Lee
3. A Finite-Element Analyst's Guide to Instructing Designers by P Dvorak
4. Introduction to MSC/NASTRAN by the Mac-Neal-Schwendler Corporation
5. W.C. Roark's Formulas for Stress and Strain by Young

III COURSE GOALS AND OBJECTIVES

1. Understand the usefulness of finite element analysis and its application in the product development process
2. Be introduced to engineering fundamentals
3. Understand fundamentals of the finite element method
4. Learn to interpret results of analysis and how to improve product designs
5. Understand commercially available software and consulting organizations



IV METHODOLOGY

This course is a macro view of finite element analysis and its application to the product development process. Detailed interpretation of the results, their meanings and applications as applied to practical company projects will be discussed. Each module will introduce new material that will prepare the student for the proper application in the product engineering process.

Lectures

Each detailed subject will be presented in a lecture format outlining the theory and standardized accepted methodology. A PDF file of the lecture material will be provided for the student's personal use as reference material. Lecture note outlines will be distributed to the students for each lecture to help the student capture personal notes. A short video showing the concept covered and a discussion regarding application.

Specific Industry Examples

Real life industry examples will be covered that detail out the application of the theory to demonstrate how different companies apply these tools and techniques. This will give the students a clear understanding of how and why these techniques are utilized at different companies and industries in different manners.

In-Class Assignments

Using the theory and industry examples the student will outline how FEA can be applied to examples for their own products. These projects will increase in complexity as the students further develop their skills in applying these tools and techniques. The students will present their work to the group for review and discussion.

Specific Company Application

As a summary of the training we will apply these tools and techniques on a specific company project that is currently in development by the students. This will build a standard methodology on how to appropriately apply CAE at your company.



V COURSE OUTLINE & ASSIGNMENTS

Module 1

Introduction to CAE	PowerPoint lecture
Introduction to FEA	PowerPoint lecture
Industry Examples	PowerPoint lecture

Module 2

“The Hub of Analysis”	Video presentation
FEA Capabilities and limitations	PowerPoint lecture
In-Class Assignment, FEA calculations	Complete & present
Industry Examples	PowerPoint lecture
How FEA calculates data	PowerPoint lecture
Key assumptions in FEA for Design	PowerPoint lecture
“Brave New World”	Video presentation
Types of Simulations	PowerPoint lecture
Virtual Providing Ground	Video presentation

Module 3

CAD Modeling for FEA	PowerPoint lecture
Hands-On Computer Training	Demonstration
CAD Optimization	Video presentation
CAE Modeling Requirements	PowerPoint lecture
Model Properties	PowerPoint lecture

Module 4

Solving the Model	PowerPoint lecture
Before Running the Model	PowerPoint lecture
Hands on computer training	PowerPoint lecture
Display & Interpreting	PowerPoint lecture

Module 5

Overview of Popular Industry Offering	PowerPoint lecture
Course Review	PowerPoint lecture
Feedback Session	PowerPoint lecture