

00035022 Finite Elements for Engineering Analysis

Course Syllabus

Class Time and Location: *Wednesdays* 8:30-10:30 [Lectures], Auditorium 1, Kahn Bldg.;
Thursdays 12:30-14:30 [Tutorials], 440, Lady Davis Bldg.

Frontal lectures and tutorials will *not* be recorded.

Instructor: Prof. Pinhas Bar-Yoseph (460, Dan Kahn Bldg.)

Office Hours: Sundays 13:00-14:00

E-mail Address: baryoseph@me.technion.ac.il

Teaching Assistant: Amit Ashkenazi

Office Hours: Tuesdays 15:00-16:00 (103, Lady Davis Bldg.)

E-mail Address: amit.ash@campus.technion.ac.il

Course materials: Lectures and Tutorial notes will be posted on the course website.

General Course Description: This first undergraduate course on Finite Element procedures introduces students to the basic methodology, and techniques for FE solutions of engineering problems. Topics covered include: Mathematical background and weak formulation, FE formulations for 1D and 2D second-order Elliptic BVP's, Finite Element Error Analysis, Concepts and Implementation of FEA, Validation & Verification [V&V] in FEA, FE approximations of IVP's [Eigenvalue and time marching FE procedures].

Tentative Course Outline & Schedule

Week 1	A brief Introduction to the Finite Element Method [FEM](L) A Short Rehearsal on Numerical Analysis (T)	30.5.24 31.5.24
Week 2	Mathematical Aspects of the Galerkin Method (L/T)	5/6.6.24
	Shavuot	12/13.6.24
Week 3	Weak Formulation and FE Methodology (L,T)	19/20.6.24
Week 4	1D Second order BVP's- Lagrange Finite Element (C^0) (L)	26.6.24
	Student's day	27.6.24
Week 5	No tutorial Bar and Plane Truss Elements (L) / No tutorial	1.7.24 3/4.7.24
Week 6	Bar and Plane Truss Elements (L) Non-homogeneous B.C. and Elastic Rod and Plane Truss Element (T)	10/11.7.24
Week 7	Euler-Bernoulli Beam Element, Cubic Hermite Element (L) Non-homogeneous B.C. and Quadratic Element (T)	17/18.7.24
Week 8	FE Analysis of 2D Elliptic PDE's; Linear Triangular Element (L) Euler-Bernoulli Beam Element (T)	24/25.7.24
Week 9	1D Frame and Torsion elements, 2D Torsion, 2D Plane Elasticity (L) Linear and Quadratic Triangular Element and Preprocessor (T)	31.7.24 1.8.24
Week 10	Finite Element Error Analysis (L) Generalized Beam Element (T)	7/8.8.24
Week 11	Validation & Verification [V&V] in FEA (L,T)	14/15.8.24
Week 12	FE Approximations of Eigenvalue Problems (L,T)	21/22.8.24
	Project due date	1.9.24
	Project defense date & Final Examination-First Term [Moed A]	3.9.24
	Final Examination-Second Term [Moed B]	29.9.24

Grading Plan

Coursework will be weighted as follows:

Student Engagement and Classroom Attendance [extra credit points]: 5%

Individual Final Project: 70%

Homework assignments: 30%

* The student must pass the final project with a passing grade or higher; otherwise, the student fails the course - (Total grade=Final project grade).

Late Homework assignments will not be accepted.

Statement on Academic Dishonesty

Academic dishonesty is an extremely serious offense and will not be tolerated in any form.

Academic dishonesty in general is the presentation of intellectual work that is not originally yours. Examples include, but are not limited to, copying or plagiarizing class assignments including homework, reports, designs, and other submitted materials; copying or otherwise communicating answers on exams with other students; bringing unapproved aids, either in physical (written) or electronic form to an exam; obtaining copies of an exam prior to its administration, etc. Academic dishonesty violates both the ethical and moral standards of the Engineering profession and all infractions related to academic dishonesty will be prosecuted to the fullest via the Technion's Academic Court for Students.

For you, the honest student, academic dishonesty results in lower class curves, hence a depression in your GPA and class standing, while cheapening the degree you earn.

Statement on Use of Chatbots

Chatbots, such as ChatGPT, can only be used during this course only if given approval from the course staff. Any use of a chatbot must be given proper citation and be acknowledged in the assignment.

AI tools that use language models can be used to quickly create texts, and codes. They are highly effective yet can also give poor results if used without thought. Consequently, we will not allow their use, unless the need and the way they will be used are discussed with the course staff. Any unauthorized and uncredited use of these chatbots will be a violation of the Technion's Academic Integrity.