

ENGR 3020 NUMERICAL METHODS IN ENGINEERING

Credit Points 10

Legacy Code 300488

Coordinator Haiping Zhu ([https://directory.westernsydney.edu.au/search/name/Haiping Zhu/](https://directory.westernsydney.edu.au/search/name/Haiping%20Zhu/))

Description The finite element method is a powerful numerical tool for analysing a wide range of engineering problems. The objective of this subject is to introduce the basic and fundamental principles of the finite element techniques by primarily focusing on their applications in the area of structural, solid and soil mechanics.

School Eng, Design & Built Env

Discipline Other Engineering And Related Technologies

Student Contribution Band HECS Band 2 10cp

Check your fees via the Fees (https://www.westernsydney.edu.au/currentstudents/current_students/fees/) page.

Level Undergraduate Level 3 subject

Pre-requisite(s) MATH 1019 AND MECH 2003

Learning Outcomes

On successful completion of this subject, students should be able to:

1. Apply the basic principles of finite element theory to analyse the mechanical behaviours of beams, trusses, frames and 2D plane stress and plane strain problems;
2. Formulate finite element algebraic equations for elasticity;
3. Explain the workings and limitations of commercial finite element packages;
4. Apply finite element programs to solve practical engineering problems.

Subject Content

Constitutive stress-strain relationships in elasticity
 Strain-displacement relationship
 Potential energy in elastic body
 Principle of minimum potential energy
 Finite element method for bar, beam, frame and truss analysis
 Governing equations of elasticity
 Shape functions
 Plane analysis
 Two dimensional and axisymmetric finite element analysis
 Linear triangular element,
 Four noded quadrilateral element
 Higher order elements (six-noded triangle and 8-noded quadrilateral Element)
 Solver appreciations
 Constraints and pressure loadings
 Stress and strain results
 Sources of errors

Assessment

The following table summarises the standard assessment tasks for this subject. Please note this is a guide only. Assessment tasks are

regularly updated, where there is a difference your Learning Guide takes precedence.

Type	Length	Percent	Threshold	Individual/ Group Task	Mandatory
Numerical Problem Solving	20 mins for each tutorial quiz, and 45 mins for each practical quiz	40	N	Individual	N
Numerical Problem Solving	1 hour each	5	N	Individual	N
Final Exam	2 hours	55	N	Individual	N

Teaching Periods

Spring (2024)

Penrith (Kingswood)

On-site

Subject Contact Haiping Zhu ([https://directory.westernsydney.edu.au/search/name/Haiping Zhu/](https://directory.westernsydney.edu.au/search/name/Haiping%20Zhu/))

View timetable (https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ENGR3020_24-SPR_KW_1#subjects)

Parramatta City - Macquarie St

On-site

Subject Contact Haiping Zhu ([https://directory.westernsydney.edu.au/search/name/Haiping Zhu/](https://directory.westernsydney.edu.au/search/name/Haiping%20Zhu/))

View timetable (https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ENGR3020_24-SPR_PC_1#subjects)

Sydney City Campus - Term 3 (2024)

Sydney City

On-site

Subject Contact Peter Lendrum ([https://directory.westernsydney.edu.au/search/name/Peter Lendrum/](https://directory.westernsydney.edu.au/search/name/Peter%20Lendrum/))

View timetable (https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ENGR3020_24-SC3_SC_1#subjects)

Sydney City Campus - Term 2 (2025)

Sydney City

On-site

Subject Contact Peter Lendrum ([https://directory.westernsydney.edu.au/search/name/Peter Lendrum/](https://directory.westernsydney.edu.au/search/name/Peter%20Lendrum/))

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=ENGR3020_25-SC2_SC_1#subjects)

Spring (2025)

Penrith (Kingswood)

Hybrid

Subject Contact Haiping Zhu ([https://directory.westernsydney.edu.au/search/name/Haiping Zhu/](https://directory.westernsydney.edu.au/search/name/Haiping%20Zhu/))

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=ENGR3020_25-SPR_KW_3#subjects)

Parramatta City - Macquarie St

Hybrid

Subject Contact Haiping Zhu ([https://directory.westernsydney.edu.au/search/name/Haiping Zhu/](https://directory.westernsydney.edu.au/search/name/Haiping%20Zhu/))

View timetable (https://classregistration.westernsydney.edu.au/odd/timetable/?subject_code=ENGR3020_25-SPR_PC_3#subjects)