

# 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/](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
Quiz	20 mins for each tutorial quiz, and 45 mins for each practical quiz	40	N	Individual
Numerical Problem Solving	1 hour each	5	N	Individual
Final Exam	2 hours	55	N	Individual

Teaching Periods

## Sydney City Campus - Term 1 (2024)

### Sydney City

#### 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-SC1\\_SC\\_1#subjects](https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ENGR3020_24-SC1_SC_1#subjects))

## 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](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](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** 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-SC3\\_SC\\_1#subjects](https://classregistration.westernsydney.edu.au/even/timetable/?subject_code=ENGR3020_24-SC3_SC_1#subjects))