

Academic year 2025/2026

Courses offered by the programme

Mathématiques appliquées (MA)

Semester(s) :

Curricula are organized in groups of courses (Unités d'Enseignement (UE)), consisting of several courses (Éléments Constitutifs (EC)). An EC is a teaching module including lectures (cours magistraux (CM)), tutorials (travaux dirigés (TD)), laboratory work (travaux pratiques (TP)), projects (PR), conferences (CONF), personal work (TA) and possibly other pedagogical activities (DIV). Some internships (stages (ST)) are compulsory

Commonly used abbreviations

CM : Lectures

TD : Tutorials

TP : Laboratory Work

CONF : Conferences

TA : Personal Work

PR : Project

ST : Internship

DIV : Miscellaneous

Numerical Methods and Finite Elements	GMA07-MNEF
Number of hours : 42.00 h	3.00 ECTS credit
CM : 20.00 h, TD : 22.00 h	
Reference Teacher(s) : RAGNEAU Eric	

Objectives :

Understanding the methods and algorithms involved in finite element calculation code. Basics of F.E.M. in order to fully understand calculation software. Application of the methods to solve various field problems in deformable Solid Mechanics and Heat Transfer. Application of the various formulas to practical problems using CAST3M software.

Content :

Introduction: Main points. Understanding the basic tools of numerical analysis: Interpolation, Approximation. Numerical resolution of systems of linear equations. Numerical integration techniques. Partial differential equations. Boundary problems: Finite Elements Methods. Variational formulation of a boundary (Reminder). Matrix formulation of the method in plane elasticity. Interpolation function of plane elements. Generalisation to 3D. Curved isoparametric elements. Problems associated with numerical integration. Specific elements: beams, thin plates, thick plates, shells. Extension of the method to heat transfer problems.

Bibliography :

Zienkiewicz : La méthode des Eléments finis. Edisciences Gallagher : Introduction au calcul par Eléments Finis. Editions Pluralis Batoz, Dhatt : Modélisation des structures par éléments finis. Editions Hermès K. J. Bathe : Finite Element Procedures in Engineering Analysis. Prentice et Hall

Requirements :

Basics of Continuum Mechanics.

Organisation :

2 hours per week.

Evaluation :

Three-hour written examination at the end of the semester.
Continuous assessment mark.

Target :