Fall 2022 – Course Announcement

Numerical Methods for Engineers–CEEN 405/505
3 Hours Credit, Room/TIme: TBA

Instructor: D.V. Griffiths
Coolbaugh Hall: CO252, Tel: 273 3669, d.v.griffiths@Mines.EDU
Web: `www.mines.edu/~vgriffit`

Based on a textbook co-authored by the instructor ("Numerical Methods for Engineers", by D.V. Griffiths and I.M. Smith, 2nd ed, Taylor & Francis/CRC Press, 2015*), this course combines theory with practical programming experience, in which all students will be given a powerful suite of pre-written programs for solving a wide range of engineering problems. Students will be introduced to the numerical techniques needed to obtain solutions to problems which are either intractable analytically or too tedious to tackle by traditional "hand" techniques. Error analysis will be introduced where necessary, but the emphasis of the course will be directed towards obtaining solutions to the types of problems encountered by engineers in design, analysis and research.*

a Introduction and programming preliminaries: Philosophy of numerical analysis, programming languages, errors, introduction to course software. Discussion of the types of engineering problems which require solution by numerical methods.

b Linear algebraic equations (Chapter 2): Gaussian elimination, LU factorization, symmetry and banding, pivoting, iterative methods.

c Nonlinear equations (Chapter 3): Simple iteration, interpolation methods, extrapolation methods, systems of equations.

d Eigenvalue equations (Chapter 4): Orthogonality and normalization, direct and shifted iteration, the generalized eigenvalue problem, transformation methods, characteristic polynomial methods.

e Interpolation and curve fitting (Chapter 5): Lagrangian polynomials, difference methods, numerical differentiation, least square methods.

f Numerical integration (Chapter 6): Newton-Cotes rules, Gaussian rules, Special integration rules, multiple integrals.

g Ordinary differential equations (Chapter 7): Initial value problems, Runge-Kutta methods, systems of equations, θ-methods, predictor-corrector methods.

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<u>**Course textbook:**</u>

Numerical Methods for Engineers,
D.V. Griffiths and I.M. Smith
Second Edition
Chapman & Hall/CRC, 2015

<u>**Assessment:**</u>

Homework	one third	A	$\geq 90\%$
Exam I	one third	B	$\geq 80\%$
Exam II	one third	C	$\geq 70\%$
		D	$\geq 60\%$
		F	$< 60\%$

- Office hours for D.V. Griffiths (CO 252, d.v.griffiths@mines.edu), Tuesday 2-4 pm and by appointment.

- Homework will be due one week after being handed out. **Late homework will not be accepted.**

- Students enrolled in CEEN505 will have one additional homework assignment.

- All homework assignments should be **high quality presentations**. Work must be word processed or <u>neatly hand written</u>.

- The exams will be open book/open notes.