CVE154 (Numerical Solutions to Civil Engineering Problems)

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for Sections W45M23, W45M456, W56T23, and W56T456
during A.Y. 2024-2025 S1

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1 Overview

The content of this syllabus-like document has been drafted on 21 August 2024 in consultation with the majority of students of the said sections. Let it be known that the students present on those fateful meetings agreed to the contents herein.

2 Reference materials

We will use:

- *Numerical Analysis, 9th edition* (by Richard L. Burden and J. Douglas Faires) as the *Main Reference*; and
- *Numerical Recipes: The Art of Scientific Computing, 3rd edition* (by William H. Press, Saul A. Teukolsky, William T. Vetterling, and Brian P. Flannery) as a *Supplemental Reference*.

It would not hurt to consider the following freely available resources.

- *Numerical Methods in Engineering with Python 3* (by Jaan Kiusalaas)
- *Programming for Computations – Python, 2nd edition* (by Svein Linge and Hans Peter Langtangen)

3 Main topics

There will be five main topics, each requiring *one or more laboratory activities* and *one exam*.

1. Root-finding, univariate case (see Chapter 2 of Main Reference)
2. Linear systems, direct and iterative schemes (see Chapters 6 and 7 of Main Reference)
3. Root-finding, multivariate case (see Chapter 10 of Main Reference)
4. Interpolation and approximation (see Chapters 3 and 8 of Main Reference)
5. Ordinary differential equations (see Chapter 11 of Main Reference)

4 Grading system

A student's *final percentage grade* (f) is computed as the weighted sum of the student's ratings in the exams (e), in the laboratory activities (l), in quizzes (q), in seatworks (s), in homeworks and assignments (h), in attendance (a), and in participation (p):

$$f = 0.30e + 0.35l + 0.15q + 0.07s + 0.05h + 0.03a + 0.05p.$$

Passing the course requires a final percentage grade of *at least 60 %*. The *final numeric grade* is then determined as follows.

- $f \geq 95.556 \rightarrow\ 1.00$
- $91.110 \leq f \leq 95.555 \rightarrow\ 1.25$
- $86.665 \leq f \leq 91.109 \rightarrow\ 1.50$
- $82.219 \leq f \leq 86.664 \rightarrow\ 1.75$
- $77.774 \leq f \leq 82.218 \rightarrow\ 2.00$
- $73.328 \leq f \leq 77.773 \rightarrow\ 2.25$
- $68.883 \leq f \leq 73.327 \rightarrow\ 2.50$
- $64.437 \leq f \leq 68.882 \rightarrow\ 2.75$
- $60.000 \leq f \leq 64.436 \rightarrow\ 3.00$
- $f \leq 59.999 \rightarrow\ 5.00$