

DS 288 (3:0) Numerical Methods/
UE 201 (3:0) Introduction to Scientific Computing

Introduction

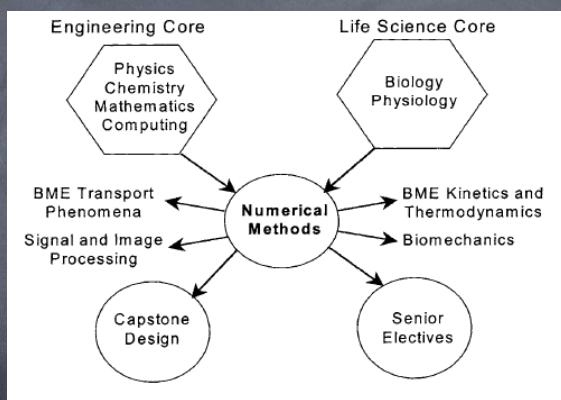
Phaneendra K. Yalavarthy

August 17, 2021

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Introduction

Numerical Methods -Applications



Ref: Dunn

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Introduction

Numerical Methods/Analysis

Methods: Formulation/Approximation

Analysis: Follows Methods (error/stability)

DS 288 (3:0): Numerical Methods

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How do we model a Scientific problem?

Problem Description



Mathematical Model

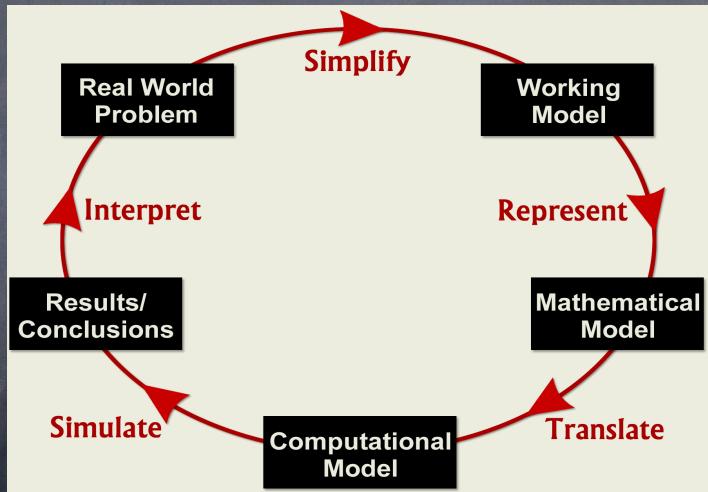


Calculating the Solution



Using the Solution

Scientific Computing Process

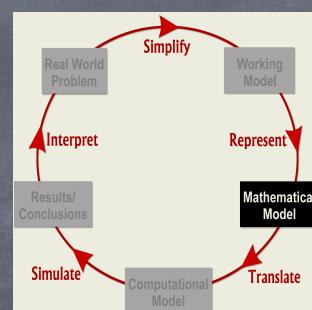


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Mathematical Model

Represent → Mathematical Model: Express the Working Model in mathematical terms; write down mathematical equations or an algorithm whose solution describes the Working Model.

In general, the success of a mathematical model depends on how easy it is to use and how accurately it predicts.



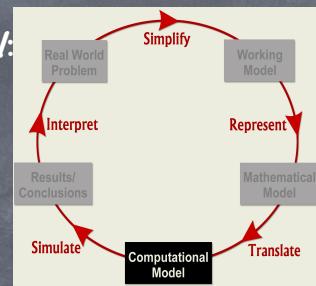
R. Allen, AIS Challenge, STI 2004 Presentation

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Computational Model

Translate → Computational Model:
Change Mathematical Model into a form suitable for computational solution.

Computational models include languages, such as Python, C++ or Java, or software, such as Matlab or Mathematica.



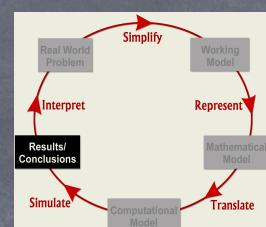
R. Allen, AHS Challenge, STI 2004 Presentation

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Results/Conclusions

Simulate → Results/Conclusions:
Run "Computational Model" to obtain *Results*; draw *Conclusions*.

- Verify your computer program; use check cases; explore ranges of validity.
- Graphs, charts, and other visualization tools are useful in summarizing results and drawing conclusions.



R. Allen, AHS Challenge, STI 2004 Presentation

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Introduction

DS 288: Numerical Methods

Credits: 3:0 3 hours of Lectures

Grading: Homeworks: 50%

Midterm Exam: 25%; Final Exam: 25%.

[ABSOLUTE GRADING]

Course Teams Link:

https://teams.microsoft.com/l/team/19%3acEvSGzJ5_kamfdszJJBtNZ4xejbwK6sQGamXRc9Nw81%40thread.tacv2/conversations?groupID=809bdad6-1080-450d-9d9c-6fedaa1ad6f02&tenantId=6f15cd97-f6a7-41e3-b2c5-ad4193976476

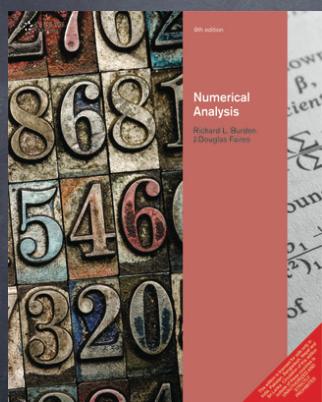
Bookmark it and regularly monitor the Teams Page

- Google form filling is compulsory

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Introduction

DS 288: Numerical Methods



Main Reference text book:

1. Richard L. Burden and J. Douglas Faires, "Numerical Analysis," Ninth Edition, Cengage Learning Publishers, 2011.

<https://www.cengage.co.in/category/higher-education/science-mathematics/mathematics/numerical-analysis/numerical-analysis-c2>

(additional text books will be used based on the topic and content)



Computing Packages: MATLAB/Octave

Links for MATLAB Tutorials are posted on the teams

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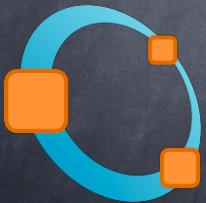
Computing Packages



DS 288: Numerical Methods

MATLAB TAH Model: (free for IISc students)

<http://www.serc.iisc.ac.in/software/matlab-tah-model-total-academic-headcount-license-tah/>



Octave: <http://www.gnu.org/software/octave/>

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Introduction

DS 288: Numerical Methods

Class Timings:
7:00 AM – 8:30 AM
Tuesday and Thursday

Office Hours: Friday 3:30 PM to 5:30 PM
(or by appointment)

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Important Policies

- You are registered for a professional degree, behave like professionals.
- No late home work submission is allowed.
- Honor the honor principle (if found copying, you shall fail the class)
- Have to meet the instructor for grading of homework solutions. Should be able to explain your work.
- Meet the instructor in the office hours alone.
- All announcements will be posted on the teams page, it is your responsibility to check it.
- No need to ask for permission to enter or leave the classroom, you can join in and out any time during the class.
- Please switch off your mobile phone and mute your mic, while joining the online classroom

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Important Notes

- You should fill up a google form posted on the Teams page for class registration (deadline Aug 23, 2021 7 AM)
- Get started on Matlab (if you are new to programming)
- Look at the files posted under information folder

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Thank you

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