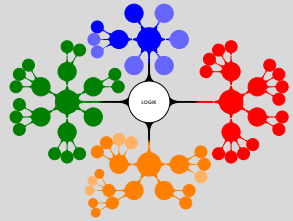
Lecture 1
First Meeting
Lecture Information, Installation of required tools/programs

IKC-MH.55 *Scientific Computing with Python* at October 13, 2023

Dr. Cem Özdoğan
Engineering Sciences Department
İzmir Kâtip Çelebi University



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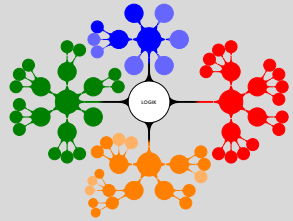

First Meeting & Introduction

- IKC-MH.55 Scientific Computing with Python 2023-2024 Fall
- FRIDAY 14:00-16:00 (T) H1-86
- Instructor: Cem Özdoğan, Engineering Sciences Dept. Faculty of Engineering and Architecture Building, H1-33
- TA: NA
- WEB page: http://cemozdogan.net/
- Announcements: Watch this space for the latest updates.

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Wednesday, October 4, 2023 In the first lecture, there
will be first meeting. The lecture notes will be
published soon, see Course Schedule section.
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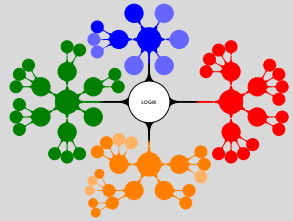
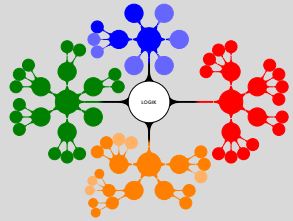
- All the lecture notes will be accessible via Tentative Course Schedule & Lecture Notes.
- All the example py-files (for lecturing and hands-on sessions) will be accessible via the link.



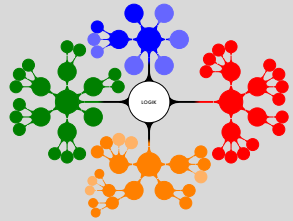
Lecture Information I

- Python is a well-designed, modern programming language and widely used in computational science and engineering.
- It is a powerful tool since it includes a wide range of features tailored for scientific computing.
- This course is not either a numerical methods or a programming python course.
- However, this course is designed to use computer programming to implement numerical algorithms for solving physics/engineering problems.
- Consequently, Python (fundamentals of programming in Python, NumPy, SciPy, Matplotlib libraries) and some numerical techniques (practice at physics/engineering problems) will be learned implicitly.



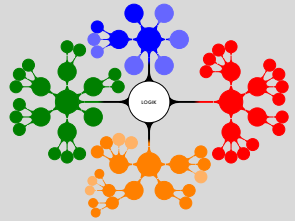
Lecture Information II

- You may be expected to do significant programming and problem solving.
- An understanding of the concepts of elementary calculus, in particular solutions of differential equations and Newtonian/wave mechanics are required but not mandatory since they will be explained as needed.
- Important announcements will be posted to the Announcements section of this web page, so please check this page frequently.
- You are responsible for all such announcements, as well as announcements made in lecture.



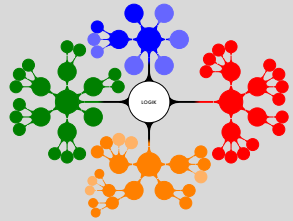
Course Overview I

- IKC-MH.55 is intended to provide students a practical introduction for using the computer as a tool to solve physics and engineering problems.
- The fundamental advantage of using computers in science is the ability to treat systems that cannot be solved analytically.
- So that computing has become a major tool in science/engineering and it is called the third pillar along with experiments and theory.
- Numerical techniques such as: Interpolation & Model Fitting, Derivatives & Integrals, Basic Linear Algebra, Eigenvalue Problems, Differential equations, ODE and PDE solvers are used to solve problems from all areas of science and engineering.
- Python implementation of these algorithms will be covered only whenever necessary in the context of the course.



Course Overview II

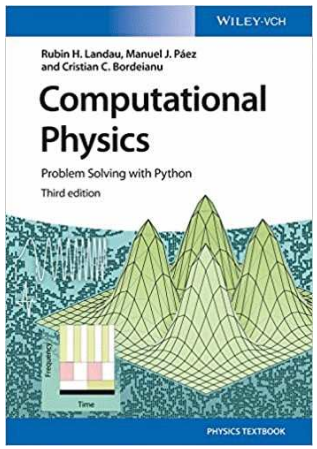
- Each class will be focused towards solving a particular physical/engineering problem.
- Problems will be drawn from diverse areas of real-life examples as much as possible.
- Theory or model, method of solution/algorithm, solution implementation (analytic, Python) and visualization /exploration will be outlined for the problem description.
- Upon completion of this course the students will be able to understand/explain/apply;
  - Learn how to work in a scientific computing environment.
  - Get familiarized with Python as a programming language for numerical computation.
  - Learn how to solve physics/engineering problems using numerical techniques.
  - Can solve demanding tasks with Python.
  - Learn to analyze problems, select appropriate numerical algorithms to solve the problem, implement them using Python.
  - Possess the basic knowledge of numerical modeling, data analysis and visualizing large amount of data.



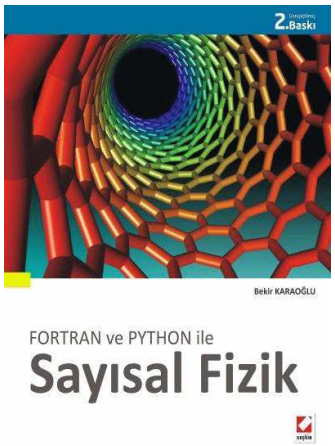
Text Book

- Lecture material will be based on them.
- It is strongly advised that student should read textbooks rather than only content with the lecture material supplied from the lecturer.
- Required: No & Recommended:

- Computational Physics: Problem Solving with Python by by Rubin H. Landau, Manuel J. Páez, Cristian C. Bordeianu, 3rd edition, 2015, Wiley.
- Learning Scientific Programming with Python by Christian Hill, 2nd edition, 2020, Cambridge University.
- Fortran ve Python ile Sayısal Fizik by Bekir Karaoğlu, 2nd edition, 2013, Seçkin Yayıncılık.
- Fizik ve Mühendislikte Python by R. Gökhan Türeci, Hamdi Dağıstanlı, İlkay Türk Çakır, 2021, Cengage Learning.



Recommended



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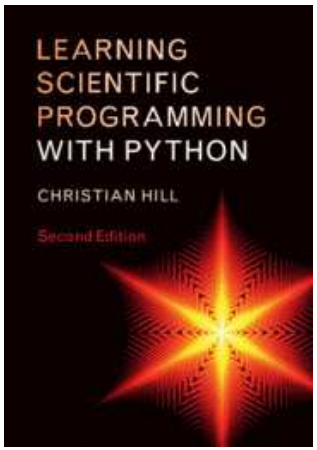

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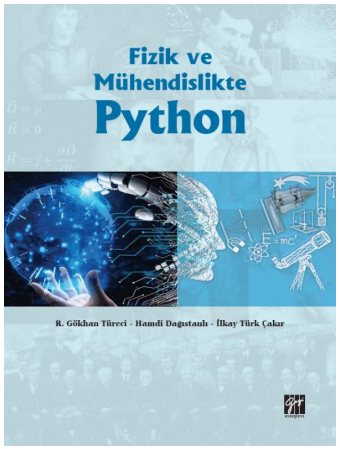

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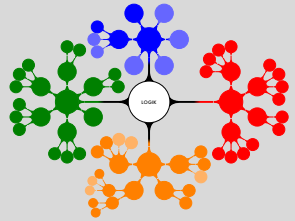
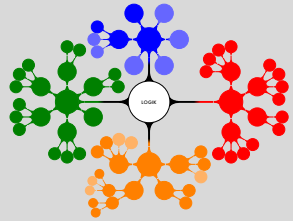


Online Resources

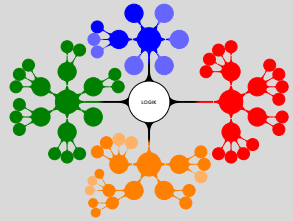
The following (some) resources are available online.

- https://python-course.eu/
- https://www.codecademy.com/catalog/language/python
- https://docs.python.org/
- https://scipy-lectures.org/
- https://matplotlib.org/stable/tutorials/index.html
- https://scipython.com/book2/
- https://pythonnumericalmethods.berkeley.edu/index.html



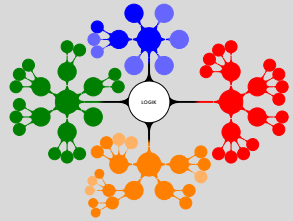
Grading Criteria

- Midterms & Final Exams: There will be one take-home midterm and one take-home final exam, will count 40% each and 60% of your grade, respectively.
- Homeworks/Assignments (or Term Project): ??



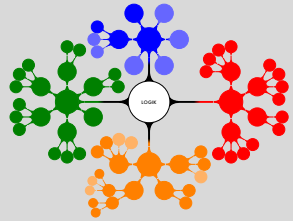
Policies

- Attendance is not compulsory (30%), but you are responsible for everything said in class.
- Academic Regulations:
  Derslere devam zorunluluğu ve denetlenmesi
  MADDE 18 - (1) Öğrencilerin derslere, uygulamalara, sınavlara ve diğer çalışmalara devamı zorunludur. Teorik derslerin % 30'undan, uygulamaların % 20'sinden fazlasına devam etmeyen ve uygulamalarda başarılı olamayan öğrenci, o dersin yarıyıl/yılsonu ya da varsa bütünleme sınavına alınmaz. Tekrarlanan derslerde önceki dönemde devam şartı yerine getirilmiş ise derslerde devam şartı aranıp aranmayacağı ilgili birim tarafından hazırlanarak Senato onayına sunulan usul ve esaslar ile belirlenir.
- You can use ideas from the literature (with proper citation).
- The code you submit must be written completely by you. You can use anything from the textbook/notes.
- I encourage you to ask questions in class. You are supposed to ask questions. Don't guess, ask a question!



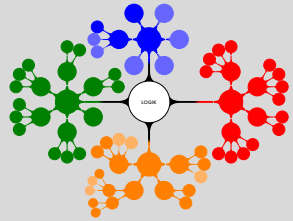
Linux System under VirtualBox

- Assuming you are using Windows OS.
- Download & Install VirtualBox-7.0.10-158379-Win.exe
- Download & Install kubuntu-22.04.3-desktop-amd64.iso under VirtualBox
- Post-Installation Steps of Kubuntu
  - ping google.com
  - # Setup "Display Configuration" for resolution
  - sudo apt-get install gcc make perl
  - sudo apt-get install python3
  - sudo snap install pycharm-community --classic
  - sudo apt-get install python3-tk
  - sudo apt-get install pyhton3-pip
  - sudo pip install numpy -U
  - sudo pip install scipy -U
  - sudo pip install matplotlib -U
  - # End of Post-Installation Steps of Kubuntu
  - sudo apt-get update # Regular Updates
  - sudo apt-get upgrade # Regular Upgrades
- See video for Installation of Kubuntu & PyCharm under VirtualBox.



Windows System

- Assuming you are using Windows OS.
- Download & Install Anaconda3-2023.09-0-Windows-x86_64.exe
- Download & Install pycharm-community-2023.2.2.exe
- See video for Installation of Anaconda & PyCharm.



Others

- Google Colaboratory and others !
- But, in take-home exams:
  - Prepare your report/codes.
  - Copy your files into a directory named as your ID.
  - Upload/send a single file by compressing this directory.
- Check the web page: IKC-MH.55 2023-2024 Fall frequently.