

DATA SCIENCE FUNDAMENTALS

COURSE SYLLABUS

LECTURER: YA Manon

PHONE: 0973966147

EMAIL ADDRESS: manonya37@gmail.com

CLASS HOURS: 45 hours

CREDITS: 3 credits

A. COURSE DESCRIPTION

Why are data analytics skills in such high demand? Companies report the [largest skills gap](#) in data analytics, and the demand for data analytics skills is growing over [15 times faster](#) than the demand for the average skill in the US.

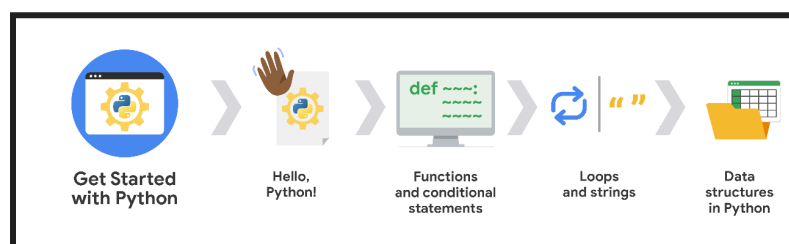
Throughout this program, you will explore concepts and scenarios that will help you grow your knowledge and skills as a data professional. During this course, you will complete hands-on activities that are similar to work performed by data analytics professionals every day. In doing so, you'll gain experience that will help you effectively reveal the stories within the data . By the end of this course, you'll understand how to program using Python, prepare data for analysis, utilize basic statistics with data, prepare data machine learning capabilities, and much more.

It will progressively help students to master 3 levels:

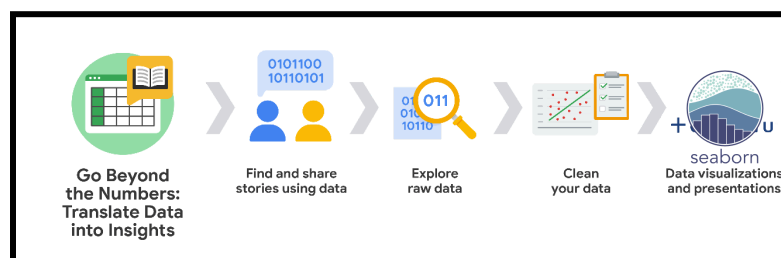
☒ General knowledge about Data Science



☒ Data analytic with Python



☒ Data Visualization



Data Scientist is the sexiest job in the world!

It can be true, but to be prepared for the future, you should embrace the methodology and critical thinking, not only the tools. That’s why we bring this program leveraging real-life experiences.

B. COURSE ORGANIZATION

The course will be a mix of lectures to bring the overview, individual technological watch and team work on practical examples to learn the different elements.
Making it condensed in bootcamps will help to learn differently too, by experiencing intense learning both theoretically and by experience.
We will encourage a lot of presentations from students to work on communication skills and argumentation.

C. COURSE PREREQUISITE

N/A

D. COURSE LEARNING OUTCOME (LO)

Upon completion of this course, the students will be able to:

- LO1: Define Data Science and its importance in various domains
- LO2: Define Artificial Intelligence and its applications in different fields
- LO3: Differentiate between Data Science and Artificial Intelligence
- LO4: Define Machine Learning and its role in Data Science
- LO5: Gain an Understanding of Programming concepts relevant to Data Science
- LO6: Recognize the purpose and benefits of using Jupyter Notebooks
- LO7: Understand the basic syntax and structure of a programming language
- LO8: Manipulating strings and performing operations on them
- LO9: Explore the build-in functions available in Python for various purposes
- LO10: Understanding list data types in Python
- LO11: Understanding tuple, set data types in Python
- LO12: Understanding dictionary and their application
- LO13: Understand and apply conditional statements in Data analytics
- LO14: Learn how to control the program flow using loops
- LO15: Develop custom functions for code organization and reusability
- LO16: Learn application numpy in math operation for Data Science
- LO17: Learn data manipulation and analysis, including one-dimensional data
- LO18: Explore DataFrame and apply function for Data Analytics
- LO19: Acquire advance techniques for handling missing values in data
- LO20: Understand the concepts of grouping and aggregating data and creating pivot tables
- LO21: Adding more data for our workplace project
- LO22: Understand how data visualization enhances for data visualization
- LO23: Gain proficiency in using Matplotlib
- LO24: Develop skills in interpreting and analyzing visualizations
- LO25: PACE framework (Plan, Analyze, Construct, Execute) for data science
- LO26: Apply data analytics techniques and tools to solve a real-world problems

- LO27: Manage and execute a data science project using the PACE
- LO28: Present Project results.

E. COURSE OUTLINE

| Week | Session | Topic | Learning Outcomes | Number ofHour |
|------|---------|---|----------------------|---------------|
| 1 | 1 | <ul style="list-style-type: none"> What is Data Science? What is Artificial Intelligence (AI)? What is the difference between Data Science and AI? | LO1 LO2 LO3 | 1.5 |
| | 2 | <ul style="list-style-type: none"> What is Machine Learning? Programming for Data Science? | LO4 LO5 | 1 |
| | 3 | <ul style="list-style-type: none"> Tool for Data Professional (Jupyter Notebooks) Writing first programming | LO6 LO7 | 1.5 |
| | 4 | <ul style="list-style-type: none"> String and Indexing (Functions) Built-in Function in Python | LO8 LO9 | 2 |
| 2 | 1 | <ul style="list-style-type: none"> List (Methods and Functions) Tuple, Set (Method and Functions) | LO10 LO11 | 3 |
| | 2 | <ul style="list-style-type: none"> Dictionary Project Ideas (during class) | LO12 | 1.5 |
| | 3 | <ul style="list-style-type: none"> Conditional Statement | LO13 | 1.5 |
| 3 | 1 | <ul style="list-style-type: none"> Control Structure Build-own function | LO14 LO15 | 3 |
| | 2 | <ul style="list-style-type: none"> Introduction to Numpy and Linear-Algebra for Data Science and Arrays and Build-in Function in Numpy | LO16 | 1.5 |
| | 3 | <ul style="list-style-type: none"> Introduction to Pandas and Series in Pandas | LO17 | 1.5 |
| 4 | 1 | <ul style="list-style-type: none"> DataFrame and Function in DataFrame for Data Analytics | LO18 | 3 |
| | 2 | <ul style="list-style-type: none"> Missing Value, Handling Techniques (Advanced) Group By and Pivot table with Pandas | LO19 LO20 | 3 |
| 5 | 1 | <ul style="list-style-type: none"> Adding Columns and Rows with Pandas Why Data Visualization ? Data Visualization with Matplotlib | LO21 LO22 LO23 | 3 |
| | 2 | <ul style="list-style-type: none"> Interpret Visualization with Matplotlib and Seaborn | LO24 | 3 |
| 6 | 1 | <ul style="list-style-type: none"> The PACE framework for data Science Project | LO25 | 3 |
| | 2 | <ul style="list-style-type: none"> Project: Data Analytics with real problem1 | LO26 | 3 |
| 7 | 1 | <ul style="list-style-type: none"> Project: Apply PACE framework with real problem2 | LO27 | 3 |

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|---|---|--|------|---|
| | 2 | <ul style="list-style-type: none"> Final presentation: Communicate /Present results | LO28 | 3 |
| 8 | | Final Exam | | |

***These course outlines and schedules are subject to change without prior notice.

F. RESOURCES AND REQUIRES SUPPLIES

References:

1. [Introduction of Artificial Intelligence and Data Science: AI for Everyone, Andrew Ng](#)
2. Google [Advanced Data Analytics](#)
3. Data Literacy content: <https://thedataliteracyproject.org/learn>
4. Data Visualization by Andy Kirk
5. The Functional Art by Alberto Cairo
6. Learning Python, Fourth Edition by Mark Lutz

Coursework will be assessed as follows:

G. METHOD OF ASSESSMENT

- **Class Activity Involvement: 30%**
- **Mid-term Data Literacy Exam: 30%**
- **Final assessment: 40%**

I. CLASSROOM RULES OF CONDUCT

1. You should come to class regularly for better understanding of the lessons and you need to complete the assignments and projects. Any reports of free-riders within the group will be investigated, and you will get 0pt on your presentation if you have no contribution to the project work.
2. Please raise your hand if you have any questions. Questions will always be encouraged in this class. Activeness is appreciated!
3. As a student, you need to respect your classmates when they express their ideas or raise questions. In addition, you can also share your ideas if you have any!