2024 FRE Pre-Program Boot Camp Curricula

*Subject to minor changes
As of February 2024

Online Boot Camp Course FRE-GY 5010

Dates:　　　　　　　May 21, 2024 - July 2, 2024

Instructor:　　　　　Prof. David Shimko (DS)

Time and location:　Tuesdays and Thursdays, Online

　　　　　　　　　　　8:00 a.m. – 10:00 a.m. New York (Eastern) Time

Required student preparation in advance of online course:

- Your personal laptop must be loaded with Excel.
  Install the **Data Analysis** and **Solver** add-ins.
- You may load your computer with a free download of Python. Anaconda is the recommended method to install the Python scientific stack. Once you have downloaded Anaconda you can run Python code in the interactive Jupyter Notebook environment. You could even try writing simple programs on your own before the boot camp starts. If you are completely unfamiliar with Python, we strongly suggest you take an online course to begin getting up to speed, such as Coursera.
- Purchase the texts for the online course, or identify alternative sources from your previous study.

Recommended texts for preparation:

- **Guide to Financial Markets, The Economist,** 6th Edition. Free PDF available at: https://media.economist.com/sites/default/files/pdfs/Guide_to_Financial_Markets_6e.pdf

- **A Primer for the Mathematics of Financial Engineering**, Second Edition (Financial Engineering Advanced Background Series), by Dan Stefanica
- **A Linear Algebra Primer for Financial Engineering**: Covariance Matrices, Eigenvectors, OLS, and more (Financial Engineering Advanced Background Series), by Dan Stefanica

Topics:

#	Date	Instr	Topic: Subtopic
1	5/21	DS	Markets: Money & foreign exchange (**The Economist**: Ch 1-2)
2	5/23	DS	Markets: Fixed income markets (Ch 3-4)
3	5/28	DS	Markets: Corporations and equity (Ch 7)
4	5/30	DS	Markets: Exchange-traded derivatives (Ch 8-9)
5	6/4	DS	Markets: Financial institutions
6	6/6	DS	Markets: Innovation and structuring
7	6/11	DS	Calculus: Differentiation and integration, analytic and numerical
8	6/13	DS	Calculus: Constrained optimization, numerical methods
9	6/18	DS	Linear Algebra: Basics, matrices, matrix operations
10	6/20	DS	Linear Algebra: Regression and inference
11	6/25	DS	Differential Equations: Analytic solutions

12	6/27	DS	Probability: The Gaussian (normal) and related distributions
13	7/2	DS	Statistics: Hypothesis testing
14	7/4	DS	Timed exam for certificate

Instructor Notes:

- *Reminder:* Even if you only intend to attend selected lectures of the **online** boot camp, we highly recommend that you register. You will not be penalized for online lectures that you do not attend. You will receive a passing grade if you register, even if you do not attend.
- *Python note:* Google Colabs is an online environment where one can run Python code using a web browser without having Python installed on your machine. This might help those who have not downloaded Anaconda or who have had trouble with their Anaconda installations.

In-Person Boot Camp Course FRE-GY 5030

Dates: August 16, 2024 - August 30, 2024

Instructor: Prof. Ludovic Tangpi

Time: Morning: 9:00 AM - 12:00 PM

Location: Tandon Campus, Room TBA

Required Texts for Course:

- **A Practical Guide to Quantitative Finance Interviews**, Xinfeng Zhou, 2008. [Note that this will be provided as an e-book by the department]
- **Heard on the Street: Quantitative Questions from Wall Street Job Interviews**, 19th Edition, Timothy Crack, 2018. [Students will be required to purchase this book on their own]

Topics:

#	Date	Instr	Topic
1	8/16	PC	Basics of probability theory
2	8/19	PC	Random variables
3	8/20	PC	Conditioning and independence
4	8/21	PC	Poisson and normal distribution
5	8/22	PC	From probability to statistics
6	8/23	PC	Random walks and Makov chains
7	8/26	PC	Stochastic processes
8	8/27	PC	Brownian motion, stochastic integral, Ito formula
9	8/30	PC	Final test.

Instructor Notes:

- Every day, in class, we will solve many exercises together. Some *extra problems* will be assigned on a daily basis for you to solve at home.
- The final test will contain 10 questions (at least 4 questions will be taken from the *extra problems* assigned every day during the week). To pass the test students need to answer correctly (with details, not just the final number) at least 5 questions. There will be no grade, but only a pass/fail.

Onsite Course FRE-GY 5040

Dates: August 16, 2024 - August 30, 2024

Instructor: Derek Snow

Time and location: Afternoon: 1:00 PM - 4:00 PM

Location: Tandon Campus, Room TBA

Machine Learning for Finance with Python

Required Texts for Course:

- **Python Data Science Handbook**, author Jake VanderPlas (available for free on Google Colab and on Github: https://jakevdp.github.io/PythonDataScienceHandbook/)
- **Introduction to Statistical Learning**, authors James, Witten, Hastie, and Tibshirani (2nd edition PDF available for free download: https://www.statlearning.com/)

Optional Text for Course:

- **Elements of Statistical Learning**, authors Hastie, Tibshirani and Friedman (2nd edition PDF available for free download: https://web.stanford.edu/~hastie/Papers/ESLII.pdf)

Code Preparation:

- Don't come to the class completely unfamiliar with Python. If you are not yet up to speed do 2-3 of the following before the session.
    - [Harvard CS50](#) - Introduction to Python Programming
    - [Helsinki Python Programming](#) - Programming MOOC with exercises (see detail below for sign-up)
    - [Friendly Kaggle Competitions](#) - Learn from and participate in competitions like [Titanic](#), and [House Price](#).
- It is a bootcamp, so we will go over many core topics quite fast, don't get caught out.

Topics:

#	Date	Instr	Topic: Subtopic
1	8/16	DS	Pandas and Numpy for Finance
2	8/19	DS	Linear Regression Models
3	8/20	DS	Linear Classification Models
4	8/21	DS	Times series with Python
5	8/22	DS	Hyperparameters, model validation and feature engineering
6	8/23	DS	Non-linear Regression Models
7	8/26	DS	Non-linear Classification Models
8	8/27	DS	Unsupervised Learning Models
9	8/30	DS	Final test

Instructor Notes:

- Each day there will be an in-class open book Python assignment to complete and submit.
- The course has a pass/fail grade. You have to obtain a grade of 50% or more in the final test on day 9 (August 31).
- If you get above 40% but below 50% I will also look at the quality of your weekly python submissions to determine if you should pass.