2022 FRE Pre-Program Boot Camp Curricula

*Subject to minor changes
As of March 2022

Online Boot Camp Course FRE-GY 5010

Dates: May 24, 2022 - July 5, 2022

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
- 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	5/24	DS	Markets: Money & foreign exchange (**The Economist**: Ch 1-2)
2	5/26	DS	Markets: Fixed income markets (Ch 3-4)
3	5/31	DS	Markets: Corporations and equity (Ch 7)
4	6/2	DS	Markets: Exchange-traded derivatives (Ch 8-9)
5	6/7	DS	Markets: Financial institutions
6	6/9	DS	Markets: Innovation and structuring
7	6/14	DS	Calculus: Differentiation and integration, analytic and numerical
8	6/16	DS	Calculus: Constrained optimization, numerical methods
9	6/21	DS	Linear Algebra: Basics, matrices, matrix operations
10	6/23	DS	Linear Algebra: Regression and inference
11	6/28	DS	Differential Equations: Analytic solutions
12	6/30	DS	Probability: The Gaussian (normal) and related distributions

13	7/5	DS	Statistics: Hypothesis testing
14	7/7	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.
- *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 18, 2022 - August 31, 2022

Instructor: Prof. Pasquale Cirillo (PC)

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	8/18	PC	Logic reasoning and basic mathematics.
2	8/19	PC	Some more advanced mathematics.
3	8/20	PC	Review of basic probability and statistics.
4	8/22	PC	Towards statistical testing.
5	8/25	PC	Markov chains.
6	8/26	PC	Random walks and martingales.
7	8/27	PC	The Brownian motion.
8	8/29	PC	Introduction to stochastic calculus.
9	8/30	PC	Basics of finance and risk management.
10	8/31	PC	Final written 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 18, 2022 - August 31, 2022

Instructor: Prof. Conall O'Sullivan (COS)

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

Location: Tandon Campus, Room TBA

Required Texts for Course:

- **Introduction to Python for Econometrics, Statistics and Data Analysis**, author Kevin Sheppard (4th edition PDF available for free download: https://www.kevinsheppard.com/files/teaching/python/notes/python_introduction_2020.pdf)
- **Python Data Science Handbook**, author Jake VanderPlas (available for free on Google Colabs and on Github: https://jakevdp.github.io/PythonDataScienceHandbook/)
- **Introduction to Statistical Learning**, authors James, Witten, Hastie, and Tibshirani (1st edition PDF, sufficient for this course, is 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)

Topics:

#	Date	Instr	Topic: Subtopic
1	8/18	COS	Introduction to programming in Python Introduction to NumPy and SciPy
2	8/19	COS	Computation and functions in NumPy

3	8/20	COS	Introduction to Pandas
4	8/22	COS	Linear and logistic regression with Statsmodels
5	8/25	COS	Times series with Python
6	8/26	COS	Introduction to machine learning and Scikit-Learn
7	8/27	COS	Hyperparameters, model validation and feature engineering
8	8/29	COS	Naïve Bayes classification and support vector machines
9	8/30	COS	Decision trees, random forests, PCA and other ML algorithms
10	8/31	COS	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. A pass grade will be awarded upon passing 6 out of 9 assignments and achieving a grade of 50% or more in the final test on day 10 (August 31).