Course Outline

EE522: SELECTED TOPICS IN QUANTITATIVE ECONOMICS 2

Semester 1/2022 (August 8th – November 26th, 2022)

1. **Lecturer and course administrator with contact information**

Wasin Siwasarit, Ph.D

Office: Room 455, Faculty of Economics

E-mail: wasin@econ.tu.ac.th

Office hours: Tuesdays and Thursdays 1– 2 PM (or by appointment)

2. **Class Date, Time and Venue**

Date: Tuesday & Thursday

Time: 09.30 - 11.00 AM

Place: Room 201, Faculty of Economics

Enrollment key #BE Moodle: 1469
(http://bemoodle.econ.tu.ac.th/)

Zoom: Join Zoom Meeting https://zoom.us/j/5687917661 Meeting ID: 568 791 7661 (Using this ID to join for the classes: Sep 13,15 2022)

3. Course Description and Course Objectives

Number of Credit: 3

Prerequisite: -

Course Description:

In the current information economy, large corporations and public sectors organizations possess significant amount of business transaction and external data generated by new technologies such as Internet of Things (IoTs), cloud computing, and blockchain. To make informed business judgment out of this valuable asset, organizations need to maximize their capacity to deal with Big Data and to turn them into business insights. This course provides Big Data and analytics knowledge and skills, allowing students to successfully pursue a data analytics project involving a large set of financial, accounting or economic data and to generate sound business strategies.

Course Objectives:

This course provides students the opportunities to critically define business problem based on a thorough business landscape analysis, to appropriately identify needed data types, and to constructively obtain and prepare business, financial, accounting and economic for pursing a data analytics. Students are trained to select appropriate analytics tool: Python and algorithms when analyzing the data set at hand. Students are also expected to effectively generate and communicate their strategic recommendations and execution plans derived from the analytics.

On completion of the course students will be expected to:

1. Define financial/economic problem/issue based on a thorough business landscape analysis.

2. Prepare internal and external data needed for a data analytics project.

3. Select appropriate analytics tools and algorithms for performing descriptive, predictive, and prescriptive analytics.

4. Formulate effective strategic recommendations and execution plans based on insights derived from the analytics.

4. Course evaluation, grading criteria, grading system, and course rules

4.1 Evaluation

a. Formative Assessment

1. In-class assignments and feedbacks
2. In-class short case discussion feedbacks
3. Group project and workshop
4. Final Examination

b. Summative Assessment

1. Tools and Percentage Weight in Assessment and Evaluation

Evaluation Methods	Expected Learning Outcomes (CLO)	Week	Percentage
Mid-term exam	CLO 1,2,3	1-8	25%
Final exam	CLO 1,2,3	9-16	30%
Group project	CLO 1, 2,3,4	1-16	15%
In class problems/Assignments	CLO 2,3,4	1-16	10%
In-class tests (4 small tests) Using the 2 of 4 to calculate the score.	CLO 1,2,3	1-16	10%
Case Discussions/ Participation and Class Contribution/Professionalism	CLO 2,3	1-16	10%
Total			**100%**

2. Grading System

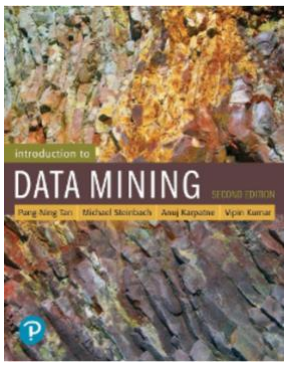
Grade	Score	Achievement	GPA
A	90-100	Excellent	4.0
B+	85-89	Very Good	3.5
B	80-84	Good	3.0
C+	75-79	Fairly Good	2.5
C	70-74	Fair	2.0
D+	65-69	Poor	1.5
D	60-64	Very Poor	1.0
F	<60	Fail	0.0

Student should earn “D” grade and above to pass the course.

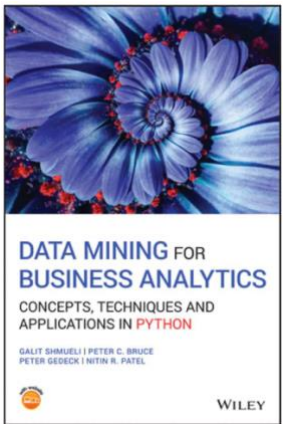
5. Reference materials

5.1 Main textbook

Pang-Ning Tan, Michael Steinbach, Vipin Kumar, ***Introduction to Data Mining*** *, Addison Wesley, ISBN: 0-321-32136-7, 2005. (PMV)*

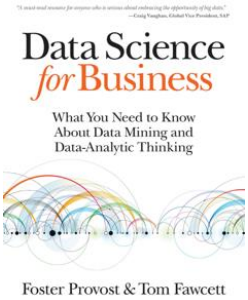


Galit Shmueli, Peter Bruce, Inbal Yahav, Nitin Patel, and Kenneth C Lichtendahl Jr, ***Data Mining for Business Analytics: Concepts, Techniques, and Applications in Python****, Wiley, ISBN: 978-1-119-54984-0 (GPINK)*



5.2 Recommended texts and materials

Foster Provost and Tom Fawcett , Data Science for Business: Fundamental principles of data mining and data analytic thinking, O'Reilly 2013.



Ewen Gallic, Python for economists.

Luis Pedro Coelho and Willi Richert, Building Machine Learning Systems with Python, 2nd Edition, Packt publishing 2013.

John Guttag, Introduction to Computation and Programming using Python.

Tom M. Mitchell, Machine Learning, 1st Edition McGraw-Hill 1997.

Kevin P. Murphy. Machine Learning: A Probabilistic Perspective, MIT Press 2012.

Christopher M. Bishop. Pattern Recognition and Machine Learning, Springer 2007.

T. Hastie, R. Tibshirani, and J. Friedman. The Elements of Statistical Learning. Springer 2011.

S. Haykin. Neural networks and learning machines. Pearson 2008.

6. Course plan

Session	Topic	Lecturer/ Reading/Lab
Session 1-2: **Tuesday 9-08-2022** **Thursday 11-08-2022**	**Introduction** • Why Big Data? What is data mining? Why data mining? Data Mining Process, relation to Business Intelligence techniques. • Introduction to Data Mining Tasks (Classification, Clustering, Association Analysis, Anomaly Detection). What is a model? Basic terminologies, predictive modeling. • Real-world data mining applications ***Introduction to Python*** Learn the basics of Python, one of the world's most popular and powerful programming languages, and see how it can be utilized in Economics and Finance. ***Introduction to NumPy*** Learn the basics of NumPy, a Python package for handling large, multi-dimensional arrays and matrices, to quicken your economic and financial analyses.	***Ch.1(PMV)***
Session 3-6: **Tuesday 16-08-2022** **(Class cancellation)** **Thursday 18-08-2022** **Tuesday 23-08-2022** **Thursday 25-08-2022** **Tuesday 30-08-2022** +(Make-up class)	**Data and Preprocessing** • Understanding of Data, what is data? Types of attributes, properties of attribute values, types of data, data quality • Sampling, Data Normalization, Data Cleaning, Similarity Measures	***Ch.2(PMV)*** ***Basic Python: Pandas*** ***Case Study: analyzing stock returns*** ***-Bitcoin returns***

Session	Topic	Lecturer/ Reading/Lab
	• Feature Selection/Instance Selection, the importance of feature selection/instance selection in various big data scenarios ***Introduction to Pandas*** *Learn the basics of Pandas, a Python package for data manipulation and analysis, and discover how to access economic and financial data from APIs.*	
Session 7-10: **Thursday 1-09-2022** **Tuesday 6-09-2022** **Thursday 8-09-2022** **Tuesday 13-09-2022** (Zoom program)	***Visualizing Economic and Finance Data*** *Learn the basics of Matplotlib, a Python package for data visualization, and discover how to optimize a portfolio of stocks.*	***Case Study: analyzing asset prices*** ***-Stock returns***
Session 11-13: **Thursday 15-09-2022** (Zoom program) **Tuesday 20-09-2022** **Thursday 22-09-2022**	***Statistics for Data Analysis*** *Learn how to calculate and interpret several descriptive statistics using the Python library NumPy.* ***Hypothesis Testing with SciPy*** *Learn SciPy, a Python module for comparative statistics, in order to perform many different statistical tests in code.*	***Case Study: COVID-19 and Resale Price of Luxury Masks*** ***Case Study: Firm Level Innovation and CE0 Compensation***
MID-TERM EXAM ***Saturday, October 1, 2022*** ***1.00-4.00 PM*** ***Open book; Open everything.***		
Session 14-15: **Tuesday 4-10-2022** **Thursday 6-10-2022**	***Prediction and Classification: Basic Concepts and Techniques*** • Basic Concepts. • General Framework for Classification. • Model Overfitting •Model Selection	***Ch.3(PMV)***

Session	Topic	Lecturer/ Reading/Lab
	•Model Evaluation	
Session 16-17: **Tuesday 11-10-2022** **Thursday 13-10-2022** (Make-up class)	***Linear Regression***	***Ch.6(GPINK)*** ***Case Study: 3-Factor model, 5-Factor model***
Session 18-19: **Tuesday 18-10-2022** **Thursday 20-10-2022**	***Logistic Regression***	***Ch.10(GPINK)*** ***Case study: Predict Loan Funding with Loan Profile***
Session 20-23: **Tuesday 25-10-2022** **Thursday 27-10-2022** **Tuesday 1-11-2022** **Thursday 3-11-2022**	***Classification and Regression Tree***	***Ch.7(GPINK)*** ***Case Study: B2B customer buying stage prediction***
Session 24-25: **Tuesday 8-11-2022** **Thursday 10-11-2022**	***Association Rules and Collaborative Filtering*** ***Cluster Analysis***	***Ch.14,15(GPINK)*** ***Case Study: Modeling consumer behavior for targeted marketing (banking and/or online advertising)***
Session 26-28: **Tuesday 15-11-2022** **Thursday 17-11-2022** **Tuesday 22-11-2022**	***Text Analytics***	***Ch.20 (GPINK)*** ***Case Study: Sentiment Classification on movie reviews (IMDb)***
Session 29: **Thursday 24-11-2022** (Thanksgiving Day) Before Black Friday	***Wrap Up*** ***Project Presentations***	
FINAL EXAM ***Tuesday, December 6, 2022*** ***9.00 AM-Noon*** ***Open book; Open everything.***		