SPELMAN COLLEGE, ATLANTA, GA – ECONOMICS DEPARTMENT

COURSE SYLLABUS

DATA SCIENCE AND ANALYTICS FOR ECONOMICS AND MANAGEMENT AND ORGANIZATION

SPRING 2024

PROF. CAMPBELL

COURSE NUMBER: Econ 374

COURSE PROFESSOR:

Millicent Springs-Campbell, MBA PMP
Phone: Please use email
Default email: msprings@spelman.edu
Back-up (only if Spelman email is down): millicent21@yahoo.com

Office Hours: Mondays and Tuesdays: 12:00pm –1:00pm;
By appointment

CREDIT HOURS: 4 **LECTURE HOURS:** 4

PREREQUISITE: Introduction to Statistics and Econometrics (Econ 203) or equivalent, Introduction to Computer Science (CIS 105 or 111) or equivalent, Econometrics (Econ 303) is preferred.

REQUIRED TEXTBOOK: NONE

REQUIRED SUPPLIES Python, Jupyter, and a jump drive.

RECOMMENDED TEXTBOOK:

Practical Econometrics: data collection, analysis, and application by Chrstiana E. Hilmer and Michael J. Hilmer

COURSE DESCRIPTION:
This course is an introduction to the field of data science and exposure to data mining. Data science is used in all social sciences including Economics, and also Business. This course will expose students to all phases of data science: from data cleaning, transformation and formatting; data storage and management; exploratory data analysis and generating hypotheses from the data; to machine learning, and communicating results through visualization and storytelling.

COURSE PURPOSE/GOAL:
This is designed to prepare students within the Economics Major and Management and Organization minor (or students interested in these fields) to work with unstructured data sets to derive results for critical decision making. The course is an elective for Economics Majors, a non-elective course for the Management and Organization minor, and a course that can serve as general credit for all Spelman majors. The course is designed to foster an active learning environment. Students must have familiarity with statistical methods through ECON 203 or its equivalent and program coding through CIS 105 or CIS 111.

BEHAVIORAL OBJECTIVES:

On completion of the course, students should be able to:

- Articulate the five phases of data science.
- Extract, clean, and reformat unstructured datasets into usable datasets for analysis.
- Demonstrate proficiency in exploratory analysis such as visualization and outlier detection and interpretation.
- Articulate concepts of machine learning.
- Conduct methods of predictive analysis (such as regression analysis, regression trees and k-means).

- Effectively communicate data analysis and results orally.
- Demonstrate proficiency in data formatting using Python and Excel.

COURSE VIRTUES

This course is based on the following virtues that must be adhered to throughout the semester:

- **Authentic engagement** – Become intrinsically motivated in complex, open-ended projects that require engagement in the class; carry out high quality work because you value statistics and your own education.
- **Intellectual curiosity** – Be open to new ideas; ask questions when you're not sure you understand; try thinking about things in new ways.
- **Self-reflection** – Assess your strengths and weaknesses; reflect on what you are learning; set goals for your learning.
- **Critical and Creative Thinking** – Be responsive while engaging in the variable subject areas. Have an independence of thought while maintaining intellectual humility, intellectual courage, sympathetically entering into another's point of view and willingness to see objections to your point of view.
- **Professionalism** – Meet deadlines, check emails and Moodle for class communication prior to coming to class, follow-through with agreements with partner sites, be flexible in response to changing circumstances without complaining
- **Collaboration** – Be prepared to cooperate with others in accomplishing the work; communicate your needs and listen to the needs of others; be respectful towards other students' ideas.

METHOD OF INSTRUCTION:

The method of instruction will be lecture with class discussion. The class is very interactive. The professor will use Power Point slides and Handouts for lectures. Students will be asked to work on problems at their respective desktop or laptop during class. In addition, students will be required to complete exercises assigned from the text and other sources. Students are expected to complete such assignments on a timely manner and be prepared to lead and/or participate in class discussion related to these exercises.

SOFTWARE:

We will primarily use Microsoft Excel 2016 and Python in class. Excel is available on all computers in the lab. You must make sure that you are able to access XL Miner. You may do this through the course code and by obtaining a book. Further instructions will be provided on how to access XL miner. It is strongly recommended that you obtain XL

Miner for your person laptop for homework and project purposes. We will also use Python as it is a programming language commonly used by Data Scientists. Python is a free software and can be downloaded to your laptop. This will be accessible on the computers we will use in the lab.

DATA STORAGE:

Given all computers are "wiped clean" everyday within the computer labs, it is imperative that you bring a USB drive every class session to save the files and work done in class. You may also save your work in a cloud storage such as Google Drive or Dropbox.

HOMEWORK ASSIGNMENTS AND PROJECTS

You will be assigned at least 8 homework projects/assignments. Each project consists of employing the methods of data science you learned in class that week. You will use Excel or Python the projects. The average of your homework assignments/projects will be used for your "Homework Project/Assignment" grade. You should allocate an average of 5 to 6 hours for your homework projects. Please note that this is an average. Thus, you may spend 3 hours on an assignment or you may spend 9 hours on an assignment, depending on the complexity of the method you will employ.

For late assignments, your grade will be deducted by 10 points for each day. Homework will not be accepted after 36 hours.

ATTENDANCE:

Participation is a part of your overall grade. Therefore, you must attend all class sessions and all lab sessions and actively participate to receive full credit. Roll will be taken at each session. If you are late, I am not responsible for the learning that occurred before your arrival. You are also not allowed to interfere with your classmates learning process to "catch up". You may ask questions during my office hours**. Please turn off your cell phone when you are in class.** Any cell phone that rings in class, the call is for me and I will answer it. For excused absences, you must obtain an excuse from the Dean's office.

CLASS ADMINISTRATION

Updates:

Class updates will be sent through Moodle. You should regularly check the course Moodle website page, especially before classes. Slides will be posted AFTER the lectures. Assignments and readings will be posted via Moodle at the discretion of the

instructor.

Communication:

- The primary method of communication during the semester will be Moodle. You can email my Spelman account, however Moodle will have sufficient space for this class and I can be assured that I will receive your correspondence. Not checking email is not an acceptable reason for missing deadlines and important news.
- If you use regular email, start the subject line of your email with the following term: "ECON 374" (if you do not use "ECON 374" at the start of the subject line, it is likely that your message will be filtered out as spam and will not be received)
- Include your name in the content of your email.
- Use complete sentences and proper grammar in your email (these are not text messages to your friends).

ACADEMIC INTEGRITY:

- At the heart of Spelman College's mission is academic excellence, along with the development of intellectual, ethical and leadership qualities. These goals can only flourish in an institutional environment where every member of the College affirms honesty, trust, and mutual respect. All members of the academic community of Spelman College are expected to understand and follow the basic standards of honesty and integrity, upholding a commitment to high ethical standards. Students are expected to read and abide by the Spelman College Code of Conduct (see the Spelman College Student Handbook) and are expected to behave as mature and responsible members of the Spelman College academic community. Students are expected to follow ethical standards in their personal conduct and in their behavior towards other members of the community. They are expected to observe basic honesty in their work, words, ideas, and actions. Failure to do so is a violation of the Spelman College Academic Integrity Policy. (Taken from Spelman's academic integrity policy statement with permission)
- Violators of Spelman's Academic Integrity Policy will be subject to the sanctions outlined in the Spelman College Bulletin. E.g., Cheating on any assignment may result in a failing grade for exams and other assignments, a failing grade for the entire course, or suspension or expulsion from the College. Violations include cheating, fabrication, and dishonesty on exams, assignments, as well as plagiarism on written assignments.
    - Plagiarism: presenting another person's work as your own, whether or not doing so was intentional.
    - Cheating on examinations: giving or receiving unauthorized help before, during, or after an examination. You cannot talk during an exam. If a

student talks I will take their exam and they will receive a zero for the exam.
- Unauthorized collaboration: submitting academic work, whole or in part, as your individual effort when it has been developed in collaboration with another person or source
- Falsification: misrepresenting material or fabricating information in order to gain an unfair advantage over others

- To guard against academic dishonesty, you will be asked to turn in selected assignments to Turnitin Assignments on Moodle.

DISABILITY POLICY:

- Spelman College is committed to ensuring the full participation of all students in its programs. If you have a documented disability (or think you may have a disability) and, as a result, need a reasonable accommodation to participate in class, complete course requirements, or benefit from the College's programs or services, you should contact the Office of Disability Services (ODS) as soon as possible. To receive any academic accommodation, you must be appropriately registered with ODS. The ODS works with students confidentially and does not disclose any disability-related information without their permission. ODS serves as a clearinghouse on disability issues and works in partnership with faculty and all other student service offices. For further information about services for students with disabilities, please contact the ODS at 404-270-5289, located in MacVicar Hall, Room 106.
- Also, please communicate your specific issue(s) and need(s) within the first two weeks of class to the instructor, preferably via the information sheet distributed in the first day of class with the syllabus

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GRADE:

Examination scores based on the following weights will determine your grade in the course:

Mid Semester Project	20%
Homework assignments	15%
Quizzes	10%
Attendance, Class participation	20%
Final project	35%

Letter grade	Numerical % Score	Qualitative Assessment	Grading Criteria
A	95+	Exceptional Quality	Student demonstrates mastery of the content and methods of the course as well as originality, depth, and distinctive insights.
A-	90-94	High Quality	Student demonstrates some original thought, application, and mastery of the content and methods of the course.
B+	87-89	Very good	Student demonstrates a good understanding of the content and methods of the course, reflects clear comprehension, and achieves all the stated objectives.
B	84-86	Good	Student demonstrates a good command of the content and methods of the course, reflects comprehension, and achieves the stated objectives.
B-	80-83	Significantly above Average	Student demonstrates a general command of the content and methods of the course and reflects and achieves the stated objectives.
C+	77-79	Above Average	Student demonstrates a general competence in the content and methods of the course.
C	74-76	Average	Student demonstrates average competence in the content and methods of the course.
C-	70-73	Below Average	Student demonstrates less than average competence in the content and methods of the course.
D+	67-69	Less than	Student demonstrates a partial knowledge of the content and

		Satisfactory	methods of the course.
D	60-66	Marginal	Student demonstrates minimal knowledge of the content and methods of the course.
F	<60	Unacceptable	Student fails to demonstrate knowledge of the methods and content of the course.

Course Topics

1. Introduction:
- What is Data Science?
- What is Data Mining?
- What is the difference between Predictive Analytics and Statistical Modeling?
- What do Data Scientists do?
- What are the phases of Data Science

2. Python
- How do you write code in Python?
- How do you use Jupyter notebooks?

3. Exploratory Data Analysis and working with data
- Basic tools (plots, graphs and summary statistics) of EDA
- Know how to clean and manipulate data
- Know how to create new variables

4. Basic Machine Learning Algorithms
- Supervised machine learning
- Unsupervised machine learning
- Linear Regression
- Logistic Regression
- k-Nearest Neighbors (k-NN)
- k-means (clustering)
- Data mining

5. Digital Humanities
- Text analysis - Voyant

6. Design your life Module
- Application of design thinking to find your vocational path in data science.