Belk College of Business Administration, University of North Carolina at Charlotte

INFO 3221-001: PROGRAMMING FOR BUSINESS ANALYTICS
Spring 2019

<u>**Class Website:**</u> Canvas will be the website for course information and primary communication channel for this class. Go to http://canvas.uncc.edu and login with your ninernet credentials.

Instructor:	Dr. C. Subramaniam
Office:	353-A Friday building
Phone:	704-687-7604
Email:	csubrama@uncc.edu

Class time: MW 2.30-3.45pm
Classroom: **339 Friday (third floor),** unless indicated otherwise by instructor
Office hours: M 1.00-2.00pm; W 4.00-4.30pm;
         By appointment at other times

<u>**Catalog Description**</u>
INFO 3221. Programming for Business Analytics. (3) Prerequisites: INFO 2130 with a grade of C or above or permission of BISOM department. A study of fundamental programming constructs and concepts required for solving data analytics problems. Emphasizes the use of widely adopted industry platforms such as Python and R to extract, transform, and make use of business data.

<u>**Learning objectives**</u>
"Business analytics" is a field which deals extensively with structured and unstructured data to build predictive models and visualizations to drive business decisions and actions. This class will focus on how to use software tools R and Python to extract, modify and prepare the data for analyses and to perform simple data analyses. The class will emphasize hands-on learning.

The specific learning objectives are as follows:
1. Learn the fundamentals of R and its programming environment
2. Learn to program in R to execute code conditionally or in loops
3. Learn to write and execute R programs to extract/read data from a variety of sources, clean and prepare data for analyses, create visualizations from data, and run simple statistical and predictive analyses
4. Learn the fundamentals of Python and it programming environment
5. Learn to program in Python to execute code conditionally or in loops
6. Learn to write and execute Python programs to extract/read data from a variety of sources, clean and prepare data for analyses, create visualizations from data, and run simple statistical and predictive analyses

Course Materials & Software

1. **Required course materials:** The following two books are required for this class. These two books are available from online sources, such as amazon.com.
   a. "Learning R" First Edition by Richard Cotton, O'Reilly, September 2013 (ISBN: 978-1-449-35710-8)
   b. "Python for Data Analysis" 2nd Edition by Wes McKinney, O'Reilly, October 2017 (ISBN: 978-1-491-95766-0)

   Other required reading materials will be posted or linked on Canvas class page as necessary. These materials include handouts, notes, power-point slides, practice problem sets, and web links to articles for class discussions. You can print the posted material and bring them to class. Please note that I will not provide printed copies of any of the posted materials.

2. **Software:** This class will use various R and Python-based software tools, including R-Studio, Anaconda Navigator, and Jupyter Notebook. The above software are installed in the computer labs in the Friday building. However, some software tools may not be available in the computer labs outside of Friday building. Please check for the availability of the relevant software if planning to work on campus computer labs outside of the Friday building. Instructions for installing the above software on your personal computers will be shared with you by the instructor and posted on Canvas.

Grading

Component	Points	Group/Individual
3 Exams @ 200 each	600	Individual
Homework	120	Group or individual
Quizzes and In-class Assignments	100	Group or individual
2 mini-projects	120	Group
Attendance & class participation	60	Individual
Total	1000	

A: >= 900; B: >= 800 and < 900; C: >= 700 and < 800; D: >= 600 and < 700; F: < 600

Exams
There will be 3 exams. All exams are closed book and closed notes, unless otherwise indicated. The exams may include multiple-choice questions, short essay-type questions and problem solving with R and Python. All exam grades will be posted on Canvas. The instructor will keep all exams after grading. However, exam reviews are available during office hours or by appointment. Students who like to review their exams should submit a request within 3 days of the posting of the exam grades and set up a time for the review. **No grade reviews or adjustments will be done beyond this 3-day period.**

Makeup exams
In the event that a student anticipates missing an exam, she/he must provide appropriate supporting documents at least 24 hours before the exam to the instructor to request a make-up exam. The instructor will review all requests and authorize, at his discretion, eligible students to take makeup exams. A student who misses an exam without prior approval, possibly due to unexpected situation on the exam day, should contact the instructor within 6 hours of the exam start date/time and provide appropriate supporting documentation to be eligible for the makeup exam. It is the student's responsibility to be aware of and follow the make-up exam policies and no special accommodations will be made for any exceptions. No makeup exam will be given after April 30, 2019.

Quiz & In-class Assignments
During the semester, the instructor will give quizzes and assignments to be completed in class. The quizzes and assignments usually cover topics which have been completed or topics to be discussed that day. The points and weights for each assignment will be announced by the instructor. There is **NO MAKE UP** for quizzes and in-class assignments, irrespective of the reason for a student missing the assignment. Instead, you will be allowed to drop ONE quiz or in-class assignment (missed or lowest grade).

Attendance
Regular attendance is necessary for doing well in this course. It has been my observation that students who miss more than 3 or 4 classes are most likely to end up with a failing grade in this class. However, when you attend class, it is important to not arrive late or leave early as it is very, very disruptive. You are responsible for completing the work from all of the class meetings. You are responsible for any material covered, announcements made, assignments distributed, and any other type of work you may miss during any absence from class. The exams may contain material discussed in the class but not posted on Canvas.

Attendance will be taken at random in class during the semester and will be counted towards your attendance and participation grade. Attendance will also be an important factor in making borderline grade decisions. Besides, there are a number of good reasons to attend all classes:
- some topics discussed in the class are not covered adequately in the posted materials and the instructor may present alternative explanations.
- **historically, those who skip the class tend to make less than their target grades.**
- **instructor may refuse to answer questions already covered in class but missed due to absenteeism.** A student who misses a class is responsible for obtaining any needed information (e.g., notes, announcements) from fellow students.

Tardiness or early departure is highly disruptive and is strongly discouraged in my class. Recurrence of such disruptive behavior will be noted and will lead to deduction of significant grade points and the student being asked to leave the class.

Class conduct
Disruptive behavior in class distracts from the ability of others to benefit from their in-class

experience. Such <u>disruptive behavior includes arriving late, leaving early, using cell-phone/smartphones in class without the instructor's explicit permission, surfing the net during the class, side conversations between two or more students during lecture, unnecessary comments that add no value to class, and any activity that negatively impacts the ability of other students to learn and/or follow in class</u>. Such behavior will be considered inappropriate and **will not be tolerated**. Since it is my responsibility to provide an environment that is conducive to learning for everyone in the class, I will deduct points from the grade of any student who chooses to repeatedly engage in disruptive behavior. In particularly egregious and/or recurrent cases, I will have the student permanently removed from the class.

Please avoid spending class time working on assignments for other classes, checking e-mail, surfing the Web, or printing out homework. Repeated engagement in such behavior will be reflected in lower grades and may lead to removal from the course.

Electronic Devices in Class
Students are permitted to use laptops or tablets during class for **note-taking and other class-related work only**, but this should be done without distracting other students and without distracting you from the topic of discussion. Those using these devices during class for work not related to this class must leave the classroom for the remainder of the class period.

Cellular phones MUST BE TURNED OFF/SILENCED DURING CLASS and students are strongly discouraged from checking their cell-phone messages when the class is in progress. Use of instant messaging, email or other communication technologies during class time is not allowed. Calculators and computers are not allowed during examinations and quizzes, unless specifically allowed by the instructor.

I will take very seriously any disruptive behavior in my class. Students in my class should feel free to let me know if any electronic device usage behavior of fellow student/s is distracting her/his learning experience. Such complaints will be treated as confidential, but will help me to take appropriate actions to make sure that such distractions are eliminated and there is a positive learning environment in the class.

Students violating the electronic devices policies will be marked for disruptive behavior and may be asked to leave the class. Their grade will also be affected according to the rules of class conduct.

Due dates for submitting work
Students are expected to complete the homework and submit by the specified deadline. Late homework submission is allowed for 24 hours beyond the scheduled deadline, but will incur a 25% penalty. After that period, your homework will not be accepted, and you will receive a 0 for that assignment. **No exceptions will be made.** If you know you will miss class, make arrangements to turn in your work ahead of time.

Quality of Work
The expectation is that all your submitted work will be of **professional quality** both in terms of **content and presentation**.

- Spelling, grammar, punctuation, clarity of expression, and presentation will count in every piece of work you do for this course. If you have trouble with spelling, grammar or punctuation, have someone proofread your package.
- Your grade will be based on what you say or write and how you present it. It becomes difficult to read for content if the mechanics are sloppy, and a superior job may not be recognized as such if presented in an error-laden package.
- Good ideas sloppily expressed will receive mediocre grades, as will flashy presentations that lack content.
- Students whose native language is not English must meet the same quality of writing and presentations expected of all students.

All work submitted for evaluation (including group and individual work) must be clearly marked with a title and names of students responsible for the work. The question being answered should be spelled out or identified so the instructor knows what is being answered. Work submitted online must have all files named appropriately so that the instructor can easily understand what the file represents. The instructor will not spend time going through all your files in order to find your submitted work. Work that does not have proper identifications as described above will automatically get a deduction of 20% of the assigned grade for that work.

Instructor's help for homework and project
As you practice various sample problems in this class, you will invariably encounter programs that do not work. It is your responsibility to pay attention to discussions in class related to debugging. If you are not able to identify the errors when practicing the sample problems, I will be happy to go through your work with you and help you identify the problems. I can provide any amount of help with the examples and practice problems. But, I cannot provide any help with your homework assignments or your project, if you face any problems. Specifically, I cannot take a look at your homework or project before the submission in order to identify/correct bugs/errors or to judge how well the work meets the requirements.

Team Work
For group activities, each team is responsible for organizing itself, dividing up the work, and deciding how relative contributions should be measured. It is your responsibility to **promptly** inform the instructor of any dysfunctional team dynamics and to solicit his help.

All team members must
- participate in all team activities,
- strive to maintain positive working relationships with their team members,
- assist team members to resolve issues relating to group work,
- freely express their ideas, thoughts, comments, and constructive criticisms to their team members, me, and the class.

It is the responsibility of the team to ensure that all team members understand all concepts related to the completed projects and presentations. The instructor may ask questions about any completed project to any team member and any incomplete or unsatisfactory answers will affect the team grade. *The instructor may announce additional measures to obtain feedback on group member contributions and institute appropriate grade penalty for lack of participation. However, this grade penalty will be limited to the course-work that is group-based.*

Extra Credit for this Class
Any extra-credit opportunities will be the instructor's decision and such opportunities will be presented to the whole class and not to individual students. It is possible that there will be no extra-credit at all for this class. In any case, no extra-credit opportunities will be given after **4/25/2019**. The total points from all the extra-credit combined will not exceed 20 points (i.e., 2%) towards the final grade. I strongly recommend that you do not depend on any extra credit opportunities to improve your grade later in the semester.

Grade Appeals
If you believe that the grade you received on an assignment, exam or other graded course component was in error or unfair, you can appeal to the professor in writing within 3 calendar days of the receipt of your grade. The appeal should clearly state the reasons why you believe the grade to be unfair or the nature of the error. Overdue appeals will not be considered late in the semester.

Incomplete grade policy
An "incomplete" is not based on a student's failure to complete a given work or as a means of raising his/her grade by doing additional work after the grade report time. An incomplete grade can be given only when a student has a serious medical problem or other extenuating circumstance that legitimately prevents completion of required work by the due date. In any case, the student's work to date, and before the interruption, should be passing, and the student should provide proper written proof (e.g., a doctor's note), in order to get an 'I' grade.

Exam Ownership
Exams take many hours to prepare and, as a form of intellectual property, belong to those who create them (your professors). Consequently, exams must remain in my possession or under my control at all times unless you are given explicit written permission to keep them.

This means that exams cannot be taken out of the room during their administration or during their review at a later class meeting.

Students are encouraged to review their exams during office hours or by appointment for study purposes. However, failure to return an exam after taking or reviewing it or removing an exam from my presence at any time will be considered theft of intellectual property. Such action will result in an exam grade of zero and may warrant further disciplinary action.

Civility

The University strives to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. We celebrate diversity that is beneficial to both employers and society at large. Students are strongly encouraged to act appropriately when sharing their views in class discussions.

Disability Accommodations

UNC Charlotte is committed to access to education. If you have a disability and need academic accommodations, please provide a letter of accommodation from Disability Services early in the semester. For more information on accommodations, contact the Office of Disability Services at 704-687-0040 or visit their office in Fretwell 230.

Academic Integrity/Honesty

Students have the responsibility to know and observe the requirements of The UNC Charlotte Code of Student Academic Integrity available online at http://legal.uncc.edu/policies/up-407. This code forbids cheating, fabrication or falsification of information, multiple submissions of academic work, plagiarism (which includes viewing others work without instructor permission), abuse of academic materials, and complicity in academic dishonesty. ***This forbidding includes sharing/copying work between individuals or teams without permission of instructors.*** Any special requirements or permission regarding academic integrity in this course will be stated by the instructor, and are binding on the students. Students who violate the code can be expelled from UNC Charlotte. The normal penalty for a first offense is zero credit on the work involving dishonesty and further substantial reduction of the course grade. In almost all cases the course grade is reduced to failing. Students are expected to report cases of academic dishonesty to the course instructor.

For this class, peer advice and interactions are allowed when discussing non-graded work. Each student, however, must develop her/his own solutions to any graded assignment or lab exercises. Students may not collaborate on graded assignments or lab exercises, unless explicitly permitted by the instructor to work in groups. Collaborations, where not explicitly permitted by instructor, constitutes cheating. A student may not use or copy (by any means) another's work (or portions of it) and represent it as his/her own. If you have questions about a graded assignment, contact your instructor or TA first, not other classmates.

If you do not have a copy of the code, you can obtain one from the Office of the Dean of Students.

The Belk College of Business strives to create an inclusive academic climate in which the dignity of all individuals is respected and maintained. Therefore, we celebrate diversity that includes, but is not limited to ability/disability, age, culture, ethnicity, gender, language, race, religion, sexual orientation, and socio-economic status.

Tentative Schedule (updated 1/8/19)

Date	Topic	Relevant readings[1]
1/9	Course Overview	
1/14	Overview of Programming for Analytics	
1/16	Introduction to R, R-Studio and Software Setup	Book 1 Chapters 1, 2
1/21	**Martin Luther King Day – No Class**	
1/23	Data Representations in R	Book 1 Chapters 3, 4, 5
1/28	Data Representations in R	
1/30	Environments and Functions in R	Book 1 Chapter 6
2/4	Strings and Factors in R	Book 1 Chapter 7
2/6	Programming Flow Control in R	Book 1 Chapters 8, 9
2/11	Reading and Preparing Data in R	Book 1 Chapters 12, 13
2/13	Reading and Preparing Data in R	Book 1 Chapters 12, 13
2/18	Exploring and Visualizing Data in R	Book 1 Chapter 14
2/20	**Exam 1**	
2/25	Introduction to Python and Software Setup	Book 2 Chapter 1, 2
2/27	Data Structures in Python	Book 2 Chapter 3
3/4 & 3/6	**Spring Recess – No classes**	
3/11	NumPy Basics	Book 2 Chapter 4

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[1] Book 1: "Learning R" First Edition by Richard Cotton
Book 2: "Python for Data Analysis" 2nd Edition by Wes McKinney

Date	Topic	Relevant readings[1]
3/13	pandas Basics	Book 2 Chapter 5
3/18	Reading and Storing Data in Python	Book 2 Chapter 6
3/20	Reading and Storing Data in Python	
3/25	**Exam 2**	
3/27	Data Cleaning and Preparation in Python	Book 2 Chapter 7
4/1	Data Cleaning and Preparation in Python	
4/3	Data Wrangling in Python	Book 2 Chapter 8
4/8	Data Wrangling in Python	
4/10	Group Operations in Python	Book 2 Chapter 10
4/15	Group Operations in Python	
4/17	Visualizing Data in Python	Book 2 Chapter 9
4/22	Visualizing Data in Python	
4/24	Introduction to Data Modeling in Python	Book 2 Chapter 13
4/29	Open Lab Day or Catchup	
5/6	**Exam 3**	

Have a great semester at UNCC.