D.S. 2001-03: Business Programming Practicum

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Northeastern University
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Class Room: West Village H 212
Class Hours: W 11:45am - 1:25pm

Contents

1 Course Description

In this practicum we will (1) learn about fundamental concepts of data science, (2) practice the skills you learn in the DS2000 lecture using applied examples drawn from business, and (3) read about how these methods are used in businesses. The practicum will meet once a week for 1 hour 40 minutes. Class time will be a combination of lecture, discussion, and hands-on exercises that practice the skills you learned in lecture. Your grade will be based on your weekly programming exercises as well as your class participation.

2 Required Materials

We will primarily use the text book that is recommended in your DS 2000 section:

Deitel, P. J., & Dietal, H. (2020). *Intro to Python for Computer Science and Data Science: Learning to Program with AI, Big Data and the Cloud*. Pearson Education, Incorporated.

You will have weekly required readings from this book. In addition, you will be required to read any additional articles, papers, and case studies that are posted in the weekly module folders.

3 Course Format

This course is the practicum to the DS 2000 course. Our topics will match topics discussed there on a weekly basis. However, we will primarily focus our attention to applications of python to solving business problems in domains including but not limited to marketing, supply chain and logistics, finance, economics, and management. The format within which you will learn comprises of virtual pre-record videos, lecture, discussion, and workshop-style assignments. Please remember to check in with the dynamic scheduler to determine who will be in person and who will be virtual for each week.

4 General Course Policies

1. Please adhere to professional behavior in class. What does this mean? No, you don't need to show up in business casual dress. This means that I ask you to respect others within the

classroom and virtually. If you are in the class, please ensure to show up with a mask on (more on this later). In addition, please refrain from talking with peers while lecture and demonstration is occurring. This is disrespectful behavior, and I will enforce this rule very strongly, which may include a severe detriment to your grade.

2. Part of this class will be virtual. To ensure proper behavior virtually, I ask that you mute your microphone when attending the class. If you do not, I will mute your microphone for you.
3. All virtual sessions will be conducted on Zoom. There is no exception to this. Attendance is mandatory, be it virtual or in person.
4. Important announcements will be made in class and on Canvas. Please ensure to check Canvas and the videos from live sessions. It is your responsibility to continually check for any announcements.
5. **Final course grades are final.** I and the teaching assistants grade on a fair basis. This means that regardless of your background, the rubrics and criteria are applied to everyone in a uniform manner.
6. Accommodating students with special learning needs should reach out to me with proper documentation immediately following the first class session.
7. It is against university policy to cheat. Please read the Northeastern University Policy on Academic Integrity at http://www.northeastern.edu/osccr/academichonesty.html. Cheating entails working in groups on individual assignments, completing others examinations and assignments, having others complete your examinations and assignments, or more generally having someone else complete the course on your behalf.
8. Extra credit opportunity is **not** offered outside of what already is offered, so please do not ask. You have every opportunity to do well in this course. Given that I grade everyone on an equal basis, offering extra credit to boost your grade will cause an inequity in the class. Hence, please do not request extra credit. More on extra credit below.
9. **It is YOUR responsibility, not mine, to keep track of your grades**. With that stated, if you are confused as to how your grade is computed, or you would like a clarification or a "what-if" analysis conducted, I will be more than happy to aid you. Please book and appointment with me to meet during my office hours.
10. All submissions in this course are digital and are to be completed via Canvas. Please do not submit hard-copy versions of assignments or exams.
11. Grades are not rounded, and if they need to be, they are rounded down. Please note that an 89.99 is not equal to 90.00. Put differently, if your grade is near the boundary points of letter grades, they will**not** be rounded up to the next letter grade. My reasoning is simple for this: you did not earn the extra grade that will move you to the next letter, and rounding down does not hurt you. For example, if you receive an 89.99, rounded down this is 89.00, either grade is still B+. Hence, nothing is "taken away" from you, since you did fail in this scenario to earn the extra 0.01 points to push you over. Arbitrary rounding creates unfair advantages, and hence, will not be practiced by this professor in this practicum.

5 Evaluation

Weekly Workshops (10, Lowest Grade Dropped)	4% each
Project Presentation	60%

Your grade is calculated according to the following formula, with each individual grade out of 100:

$$\begin{aligned} \textit{Final Grade} = (0.04) \cdot (&\textit{Workshop}_1 + \textit{Workshop}_2 + \textit{Workshop}_3 + \textit{Workshop}_4 + \textit{Workshop}_5 + \\ &\textit{Workshop}_6 + \textit{Workshop}_7 + \textit{Workshop}_8 + \textit{Workshop}_9 + \textit{Workshop}_{10}) \\ &+ (0.60) \cdot \textit{Project Presentation} \end{aligned}$$

Once your number grade is calculated, you can use the table below to determine your final letter grade in the course. I use a mathematical interval notation. So if your grade x is in the interval $[a, b)$ this is the same as saying $a \leq x < b$

Numerical Grade	Letter Grade
$[95, 100]$	A
$[90, 95)$	A-
$[87, 90)$	B+
$[83, 87)$	B
$[80, 83)$	B-
$[77, 80)$	C+
$[73, 77)$	C
$[70, 73)$	C-
$[67, 70)$	D+
$[63, 67)$	D
$[60, 63)$	D-
$[0, 60)$	F

6 Components of this Course

6.1 Attendance and General Participation

Attendance is **mandatory**, be it virtual or physical. Even though we have adopted the NU-Flex model, this does not mean you are no longer required to attend live. While I do not actively count your attendance into the final grade, I do have a three strike policy. First two strikes will not impact your grade in any way. Three or more is considered to be a pattern of lack of attendance. Short of a medical emergency that prevents you from attending live virtual or in person, three or more absences will result in an immediate 30 point reduction off your final grade. So please, ensure you are attending live!

6.2 Weekly Modules

Our Canvas course is set up in terms of weekly modules. At the start of each week (Sunday mornings at 8am), your material for the entire week will be posted, including the pre-recorded videos, required readings, and workshops. In addition, at the end of our live session, the recording of said session will be immediately posted to the module. In the event we go fully online, and that's a big if, we will continue to operate our course as normal, only 100% through Zoom. All meeting times, workshops, and projects will remain on track in such an instance.

6.3 Recitation Videos

Every week, I will be recording and posting pre-recorded videos that review through the theoretical components of DS2000 that you discussed each week. These videos will be posted along in the module for the week. I expect you to watch them to review your concepts, which I hope will aid you in your ability to follow the live and take-home workshops.

6.4 Weekly Workshops

Every class session will comprise of a single workshop. The workshop will be split into two major parts: in-class and take-home. In class, we will work together on some parts, while you will work individually on others. In some instances, you will work in groups to solve other portions of the workshop. The workshop will comprise of a PDF document with questions you need to answer using Python code. Submission of the workshop should be a .py (python file) or a python notebook. Every workshop is to be submitted on an individual basis via Canvas. These are due on every Saturday night at 11:59pm. Generally speaking the structure of the workshop and each class session is as follows:

- Zoom Quiz (via Zoom Polls) on Current Week's Reading Material
- Discussion/Monologue on Data Science and Business Analytics Concepts
- (Quick) Review of DS 2000 Python Concepts
  - Group and Individual Questions
- Business Application
  - Business Problem Explanation
  - Workshop Demonstration
  - Group and Individual Questions
  - Take-Home Assignment

Each workshop is to be submitted as a .py file (or a python notebook file), as noted above. In some instances, you may need to submit a .zip. We will inform you when this is needed. Each workshop grade is out of 100 points, with each category weighted as follows:

Criteria	Weight
Zoom Quiz	20%
Python Review Work	20%
Business Application Work	20%
Take-Home Work	40%

The Zoom Quiz and Take-Home work are themselves graded out of 100 points. The Review Work and Business Application work are graded based on the percentage of questions that have been completed. It should be easy to obtain high scores in these two categories: pay attention in class session and complete the work. For example, suppose our zoom quiz is 10 questions, then each is 10 points. Suppose you got 8 out of 10 correct. Further suppose that you completed the entire python review work, but you didn't pay attention to one question, and put the incorrect solution to the business application work. Suppose you had two questions to answer in the business application work. This means would would receive a 50% on this since you missed one question or got it incorrect. Further suppose that you answered all take-home work correctly. Your grade for the workshop would thus be:

$$
\begin{aligned}
&(0.2)(\textit{Zoom Quiz}) + (0.2)(\textit{Python Review}) + (0.2)(\textit{Business Application}) + (0.4)(\textit{Take Home}) \\
=&(0.2)(80) + (0.2)(100) + (0.2)(50) + (0.4)(100) \\
=&86
\end{aligned}
$$

I will drop the lowest workshop grade. When I say "drop", I mean that you will receive an effective 100 on the workshop. Suggestions for doing well on this component of the course: frequently attend, pay attention, think outside the box but quickly, and follow along. If you are working virtually, my recommendation would be to have two screens. One screen following along with, the other screen your laptop.

6.5 Final Project

A major component of this course is your final project. You will be required to leverage the concepts that we discussed for the business practicum and python to carry out a full on data science project. Given that we are in the business practicum, your project MUST be in a related area of business. There are three major areas of this project, namely the proposal, the report, and the final presentation. The proposal is worth 20%, the report is worth 40%, the presentation is worth 20%, and your code is worth 20%. Each portion is graded out of 100 points based on the rubrics to be provided later. Your final project grade will thus be computed as:

$$\textit{Project Grade} = (0.2)(\textit{Proposal}) + (.4)(\textit{Report}) + (.2)(\textit{Presentation}) + (.2)(\textit{Code})$$

If you decide to work in groups, this equation is slightly different since there will be a peer-group grading component. 70% of your grade will be determined by me, while 30% of your grade will be determined by your peers in the group. Hence, the equation changes in this instance to:

$$\textit{Project Grade} = (0.7)[(0.2)(\textit{Proposal}) + (.4)(\textit{Report}) + (.2)(\textit{Presentation}) + (.2)(\textit{Code})] + (0.3)(\textit{Peer Grade})$$

This is to ensure that everyone in each group is doing their part. Peer grading will work by having everyone in the group give you a grade based on a rubric. Your peer grade will be out of 100 points, and will be the average of the individual peer evaluations. For example, if your group has 4 people, including you, then three of your peers will evaluate your performance based on a rubric and will give you a score between 0 and 100. For example, suppose peer 1 gives you an 80, peer 2 gives you an 85, and peer 3 gives you a 100. Then your peer grade will be 88.33. If you received an 80 on the proposal, a 90 on the report, 80 on the code, and a 100 on the presentation, then your final grade would then be computed as:

$$\begin{aligned} \textit{Project Grade} &= (0.7)[(0.2)(\textit{Proposal}) + (.4)(\textit{Report}) + (.2)(\textit{Presentation}) + (.2)(\textit{Code})] + (0.3)(\textit{Peer Grade}) \\ &= (0.7)[(0.2)(80) + (.4)(90) + (.2)(100) + (.2)(80)] + (0.3)(83.33) \\ &= 86.599 \end{aligned}$$

7 Extra Credit

I do offer very little opportunity for extra credit. On weeks 4, 8, and 12 of this course, I will ask that you provide me feedback as to how the course is going. It is a short survey. I use these to see how I am doing as a professor in your specific section, and how I can better attend towards your needs and ability to learn. Open commentary and brutal honesty are kindly requested. Comments **will not** affect your final grade. I strictly use your comments to better the course and my teaching style. So please, if you feel there is anything that is going wrong in this course, I kindly request you be as honest with me as possible. Please do not sugarcoat any of your comments. I really do want to ensure that I am providing as many students the ability to learn in this course. Also, let me know what I am doing right in this course. This helps me better understand what is working and what is not. If you complete the survey, you will have 1 entire point appended to your final grade. If you complete all three surveys, this means that you will have the opportunity to complete 3 extra credit points. This means if you are at, say, a 92, completing the surveys will put you at a 95 (an A).

8 Software and Technology

In our course, we will be using Python 3. You will be required to download and install this on your laptops. Please consult with the TAs if you need additional assistance with installation. For the first few weeks in DS 2000, you will be using Python IDLE, which we will discuss more on the first day. In addition, you will need to download and install Anaconda, which is a package manager for Python that allows your to easily extend its ability.

As for our practicum, we will primarily be using JupyterHub. I have taken great liberty to create a Linux account for each of you. At the start of each session, I will provide all of you a link located in the module on Canvas. JuptyerHub does not require you to install anything. You can use a Chromebook, Tablet, Phone, any Laptop, etc. So long as your device has a web-browser, you can work on it.

JupyterHub has an "IDLE"-esque look, as well as Jupyter Notebook. I will be hosting this on my own cloud account. Please note that at the end of each session, you should download your

files for your own work on your own machines, since I will be shutting down this server at the end of every session. None-the-less, JupyterHub will keep all of your files organized, and will help you write code quickly without getting bogged down in installation. This is primarily what real data-scientists/business analysts use. It is cloud-based, so no installation of this on your part is needed. We will go through this on the first day.

9 Teaching Assistants

We have for this section 2 teaching assistants who are assigned to help. They will be tasked with grading your workshops, helping in the classroom, aiding students who need clarification, among other tasks. Please note the the TAs are **not** here to do your work. I ask that you reach out to them when you are stuck on a specific topic. My recommendation: first identify where you are having difficulties with the material, pinpoint what you understand and what you do not, and from there have a baseline set of topics to review through with the TA. If you feel that I or a TA has made a mistake on graded assignments, please reach out to me ASAP!

10 Office Hours

This semester, my office hours are 100% virtual so as to comply with the capacity requirements as well as social distancing protocols. With this stated, I will be holding 1-hour of hours per week, namely on Thursdays from 1:30pm - 2:30pm. Please book an appointment by going here, https://calendly.com/m-garvey/office_hours, selecting the day and time you would like to meet. Unfortunately, I am unavailable to meet any other times, but I will be around roughly before and after class. Please do not come to my office either scheduled or abruptly. Please note the following with respect to office hours:

- All office hours are recorded. There is zero exception to this, **zero**. If you prefer to not be recorded, you can ask your questions to me via email. If you want a video of our session, I will be more than happy to send it to you so that you can review through it again at some point in the future.
- Office hours are strictly held over Zoom. Please do not ask me to hold them over phone or some other technology (like Skype of Teams). I will kindly reject.
- Office hours are on strict 15 minute sessions. Failure to show up on time will cut into your scheduled 15 minute block of time if there is another appointment after you.
- I encourage "group" hours. If you and other students are struggling, my suggestion would be to (1) first reach out to the TA to see if they can help, and if they cannot, then (2) group together and we will hold a group call. Note that group calls are also recorded.

11 Communication with Professor and 48-Hour Communication Silence Period

You are free to email me at m.garvey@northeastern.edu. As mentioned earlier, you are also free to book an appointment with me to meet virtually via zoom. Please note that while I try to

remain as responsive to students as possible, I ask that you wait until Wednesdays and Fridays 12pm to hear a response. These are the days that I typically return emails to students. Please note that any emails sent within 48 hours of an assignment being due **will be ignored**. For example, if you have a workshop due at 11:59pm on Thursday, your email will not have a response from me until the earliest Friday morning and the latest Wednesday afternoon.

12 Face Mask Policy

The university, and the state of Massachusetts, has put into effect a face mask policy. This is for the safety of our community. For our in-class sessions, a properly-worn face mask is **mandatory**. Properly-worn entails the mask covering one's mouth and nose. For more information on our face mask policy, please visit https://news.northeastern.edu/coronavirus/reopening/policies-and-protocols for more details. I am going to be very clear on this next point. If any student refuses to wear a mask while attending in class, they will be academically disciplined. I will refuse to continue to lecture the class, declare class over, and walk out. You will receive an immediate F for the course, and you will be reported to higher university officials, where further discipline may be pursued. Please, for the sake and safety of our community, wear a mask as instructed.

13 Social Distancing

In addition to face masks, we are asking students to remain socially distant from each other. Please do not congregate in the halls, in the classroom, etc. If you need to ask me a question while in the classroom, please maintain a minimum of a 6ft distance from myself and others. I will kindly remind students who fail to meet this policy. Please do not take it personal, I am merely trying to ensure the safety of our classroom remains intact. A refusal to comply with this policy will result in the same consequences as indicated in the face mask policy.

14 Recording Policy

Every single one of our in-class sessions are recorded. This is for the benefit of every student. At the beginning of each session, everyone must consent to recording. If you do not consent, you will be required to complete an additional assignment in order to show your participation in the class. The assignment will entail a minimum of a 2-page, double-spaced, 12ft write up of a summary of our lecture. If you do not consent, you agree to not participate in class and agree to complete the additional assignment. If you are attending class virtually, please note that recordings on Zoom may show your name, picture, and voice. If you do not consent to recording, you agree to change your name to an unidentifiable one, to keep your camera and microphone turned off, and not to engage in the chat box. Active vocal, visual, or textual participation is assumed to be your implicit consent to recording. Put simply: consent to record if you would like to participate in class, do not consent and you will be required to complete an additional summary assignment for each class session.

15 Course Schedule and General Syllabus Changes

15.1 Policy Regarding Changes to the Syllabus

I consider this syllabus to be a de facto contract between you and I. I reserve the rights, however, to make changes as I see fit for the purpose of maintaining the integrity of this course. I do not make changes arbitrarily, and changes are not taken lightly. Typically, if a change needs to occur, it will be primarily to the schedule of topics. If any other changes need to occur, I will ensure to communicate these changes as well as announce them on Canvas and via email.

15.2 Tentative Course Schedule

Week	Date	Python Topic	Practicum Topic	Due Dates	Reading Assignments
1	9/9/2020	Introduction to Data Science & Business Analytics Installation Hello World	Discussion: Syllabus Review Python Workshop: Compound Interest	Workshop 1 Submission Due 9/12 @ 11:59pm	Syllabus Chapter 1
2	9/16/2020	Literals, Variables, Data Types, and Arithmetic Using Functions and Packages	Discussion: The Structure of an Organization Python Workshop: An Inventory Model (EOQ)	Workshop 2 Submission Due 9/19 @ 11:59pm	Chapter 2
3	9/23/2020	Logical Statements and Logical Control	Discussion: Fundamentals of Modeling in Business Discussion:Review of Probability Theory Python Workshop: Another Inventory Model (Newsvendor)	Workshop 3 Submission Due 9/26 @ 11:59pm	Chapter 3
4	9/30/2020	Writing Functions and Organizing Code Reading and Writing from/to Files	Discussion: Fundamentals of Modeling in Business (cont...) Python Workshop: The Cournot Competition Model	Workshop 4 Submission Due 10/3 @ 11:59pm Project Teams Due 9/30 @ 11:59pm	Chapter 4
5	10/7/2020	Data Structures - Lists and Tuples	Discussion:Prescriptive Analysis in Business Applications Python Workshop:A Transportation Model	Workshop 5 Submission Due 10/10 @ 11:59pm	Chapter 5
6	10/14/2020	Data Structures - Sets and Dictionaries	Discussion:The Philosophy of Explanation vs. Prediction Discussion:Fundamentals of Data Python Workshop:Working With Twitter Data	Project Proposal Due 10/15 @ 11:59pm Workshop 6 Submission Due 10/17 @ 11:59pm	Chapter 6
7	10/21/2020	The `numpy` and `pandas` packages	Discussion:A Taxonomy of Data Analysis in Business Discussion:Descriptive Analysis of Data Discussion: Review of Basic Statistics Python Workshop:Analyzing Twitter Data	Workshop 7 Submission Due 10/24 @ 11:59pm	Chapter 7
8	10/28/2020	An Introduction to Econometric Analysis in Python	Discussion:Econometrics vs. Machine Learning in Business Discussion: The Simple and Multiple Linear Regression Model Python Workshop:Keyne's Consumption Model	Workshop 8 Submission Due 10/31 @ 11:59pm	Chapter 15.1, 15.4
9	11/4/2020	Machine Learning in Python - Supervised Learning	Discussion:Training vs. Testing Discussion: Regression vs. Classification Discussion:Model Specification, Performance,Assessment, and Selection Python Workshop:Predicting Social Media Engagement Levels	Workshop 9 Submission Due 11/7 @ 11:59pm	Chapter 15.2, 15.3,15.5
10	11/11/2020	Holiday (No Class)			
11	11/18/2020	Machine Learning in Python - Unsupervised Learning	Discussion:Clustering Discussion: Dimensionality Reduction Python Workshop:Market Segmentation and Brand Personas	Workshop 10 Submission Due 11/21 @ 11:59pm	Chapter 15.6, 15.7
12	11/25/2020	Holiday (No Class)			
13	12/2/2020	Project Presentations			
14	12/9/2020	Project Presentations		Project Reports Due 12/12 @ 11:59pm	