New York City College of Technology, CUNY

CURRICULUM MODIFICATION PROPOSAL FORM

This form is used for all curriculum modification proposals. See the Proposal Classification Chart for information about what types of modifications are major or minor. Completed proposals should be emailed to the Curriculum Committee chair.

Title of Proposal	**Taking Multiple MAT 4800 Topics Courses**
Date	**09/14/22**
Major or Minor	**Minor**
Proposer's Name	**Satyanand Singh**
Department	**Mathematics**
Date of Departmental Meeting in which proposal was approved	**11/03/22**
Department Chair Name	**Jonathan Natov**
Department Chair Signature and Date	Jonathan Natov
Academic Dean Name	**Justin Vazquez-Poritz**
Academic Dean Signature and Date	Justin Vazquez-Poritz **3/2/23**
Brief Description of Proposal (Describe the modifications contained within this proposal in a succinct summary. More detailed content will be provided in the proposal body.	**The topics in MAT 4800 change each year. This would allow our students to take the course up to two times for a maximum of 6 credit with Mathematics Department approval.**
Brief Rationale for Proposal (Provide a concise summary of why this proposed change is important to the department. More detailed content will be provided in the proposal body).	**As a project-based course with different topics each year, students can benefit by repeating this course with different projects to further practice with and expand their data science skill set.**
Proposal History (Please provide history of this proposal: is this a resubmission? An updated version? This may most easily be expressed as a list).	**This is a new proposal.**

Please include all appropriate documentation as indicated in the Curriculum Modification Checklist.

For each new course, please also complete the New Course Proposal and submit in this document.

Please submit this document as a single .doc or .rtf format. If some documents are unable to be converted to .doc, then please provide all documents archived into a single .zip file.

ALL PROPOSAL CHECK LIST

Completed CURRICULUM MODIFICATION FORM including:	
• Brief description of proposal	X
• Rationale for proposal	X
• Date of department meeting approving the modification	X
• Chair's Signature	X
• Dean's Signature	X
Evidence of consultation with affected departments List of the programs that use this course as required or elective, and courses that use this as a prerequisite.	
Documentation of Advisory Commission views (if applicable).	
Completed Chancellor's Report Form.	

EXISTING PROGRAM MODIFICATION PROPOSALS

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Documentation indicating core curriculum requirements have been met for new programs/options or program changes.	
Detailed rationale for each modification (this includes minor modifications)	

RATIONALE

Since this is a project-based course, students are able to benefit from repeating it. Namely, each year students will be able to choose projects from a different set of topics, thereby having the opportunity to further practice as well as expand their data science skill set.

This proposal would allow our students to take the course up to two times for a maximum of 6 credits with Mathematics Department approval. Some possible projects might include:

1. Provide a statistical analysis to determine if the 2016 presidential election was rigged.
2. Using CDC data on the reported cases on influenza in the USA, determine a range for the likely number of actual cases for 2018.
3. Create a mathematical model to study the economic impact of moving from traditional hospitals to more numerous and smaller specialized centers such as: outpatient, emergency rooms, and overnight.
4. Provide statistical analysis of treatment patterns and outcomes among the major cancer types.
5. Perform a comparison analysis (cost and treatment effectiveness) between FlexPen injection versus syringe injection of insulin in diabetic patients.
6. Create mathematical model to study the diffusion of toxins in a water channel.
7. Create mathematical model to study the diffusion of air pollution emitted from a smokestack.
8. Create a simple model of an ecological system with three components: a plant, a small mammal called the Murat which eats the plant, and a carnivorous predator called the Vekton which eats the

mammal. Use the model to test our belief that we can control this ecosystem by controlling the plant population. The goal is to maintain both species at healthy numbers.

9. Can one hear the shape of a drum? By Mark Kac, *The American Mathematical Monthly*, Vol. 73, No. 4, pp. 1-23, (1966).
10. In order to avoid resonance (when the frequency of rotation of the disc matches with the natural frequencies of vibration of the disc) in an annular disk design it in such a way so that the natural frequencies of vibration of the disk are increased considerably. Consequently, the permeable range of angular rotation of the disk will be much wider.
11. Study the impact of AI (Artificial Intelligence), adaptive learning software and Machine learning to strengthen and enhance student engagement by way of simulations. Examples will be simulated in software such as CHAT GPT.

CHANCELLOR'S REPORT FORM

Section AV: Changes in Existing Courses

AV.1. Mathematics

Existing Course Number and Course Title

MAT 4800 Topics in Applied Mathematics

From:		To:	
Course Number	MAT 4800	**Course Number**	MAT 4800
Course Title	Topics in Applied Mathematics	Course Title	Topics in Applied Mathematics
Description	Topics are selected to reflect current industrial applications and may vary from semester to semester. This project-based course allows an in-depth exploration of current and emerging trends. Students synthesize mathematics from prior mathematics courses. The projects are based on practical problems, and students present solutions in verbal and written form, using current presentation formats and practices.	**Description**	Topics are selected to reflect current industrial applications and may vary from semester to semester. This project-based course allows an in-depth exploration of current and emerging trends. Students synthesize mathematics from prior mathematics courses. The projects are based on practical problems, and students present solutions in verbal and written form, using current presentation formats and practices. <u>Students may take the course up to two times for a maximum of 6 credit with Mathematics Department approval.</u>

Credits	3 credits	**Credits**	3 Credits
Lab Hours		**Lab Hours**	
Prerequisite:		**Prerequisite**:	
Corequisite:		**Corequisite:**	
Pre/Corequisite:	*Pre- or corequisite: MAT 3000-level course or higher or department approval*	**Pre/Corequisite:**	Pre- or corequisite: MAT 3000-level course or higher or department approval.

Prof. Boyan Kostadinov, City Tech

Fall 2022

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Office Hours: MW 4:00-5:00 PM Class Hours: MW 1:00-2:15 PM
Office: N602B, 718-260-5195 Class Room: Namm 723

Course Description

Use of data science tools to summarize, visualize, and analyze data. Sensible workflows and clear interpretations are emphasized, using R in Quarto notebooks in RStudio.

In recent years, virtually all areas of inquiry have seen an uptake in the use of data science tools. Skills in the areas of assembling, analyzing, and interpreting data are more critical than ever. This course is designed as a first experience in honing such skills. Students who have completed this course will be able to implement a data science workflow in the R programming language, by "scraping" (downloading) data from the internet, "wrangling" (managing) the data intelligently, and creating tables and/or figures that convey a justifiable story based on the data. They will be adept at using tools for finding patterns in data and making predictions about future data. There will be an emphasis on intelligent and reproducible workflow, and clear communications of findings. No previous programming skills necessary; beginners are welcome!

Students can take this course up to 2 times with different topics for additional credit with department approval.

Texts

This course uses the **freely available online textbook**, recently published by CRC Press:

- Data Science: A First Introduction, by Tiffany Timbers, Trevor Campbell, and Melissa Lee, University of British Columbia.
- This textbook is open source and will always be freely available on the web.
- In addition, course notes, workshops and tutorials will be posted on Blackboard.

Software

Students will learn to implement basic data science workflows, including data analysis and visualizations, using the R programming language. Worksheets and tutorials as well as all project reports will be done using Quarto Notebooks, which we will run in locally installed RStudio, or RStudio Cloud, where you can get free accounts. We plan to use DataCamp as an online learning platform for the best online interactive introduction to R, and for doing data science with R.

Pre/Co-requisites

Departmental approval.

Learning Outcomes

By the end of the course, students will be able to:

- Read data using computation from various sources (local and remote plain text files, spread- sheets and databases)
- Wrangle data from their original format into a fit-for-purpose format.
- Identify the most common types of research questions and map them to the appropriate type of data analysis.
- Create, and interpret, meaningful tables from wrangled data.
- Create, and interpret, impactful figures from wrangled data.
- Collaborate with others using Quarto notebooks in RStudio Cloud.
- Apply, and interpret the output of simple classifier and regression models.
- Make and evaluate predictions using a simple classifier and a regression model.
- Apply, and interpret the output of, a simple clustering algorithm.
- Distinguish between in-sample prediction, out-of-sample prediction, and cross-validation.
- Calculate a point estimate in the context of statistical inference and explain how that relates to the population quantity being estimated.
- Accomplish all of the above using workflows and communication strategies that are sensi- ble, clear, reproducible, and publishable.

Blackboard

This will be the main online learning platform we will use. I will be posting on Blackboard all teaching materials and your grades during the semester, including the final letter grades, before I post them on *CUNYFirst*. Make sure that you check your City Tech email on a regular basis since you will be receiving many emails from me regarding the class.

Grading Policy

All graded categories are out of 100 points. The *Final Score* is computed as the weighted average percentage of all graded categories:

$$\textit{Final Score} = 0.55 \times \textit{Projects} + 0.25 \times \textit{Final Exam} + 0.20 \times \textit{Midterm}$$

- **Projects** (55% of final grade): Students will work individually or in groups on projects as- signed by the instructor. Projects will be assigned throughout the semester. These assign- ments will involve turning in an individual project report, generated from a Quarto Note- book in RStudio. The final project may include a short 5-10 minute presentation.
- **Final Exam** (25% of final grade): The final exam will take place during the last class of the semester and it will be comprehensive. You must take the final exam in order to pass the course. There is no make-up final exam, unless there is a legitimate reason.
- **Midterm** (20% of final grade): A midterm exam will be given in mid or late October. No make-up exams will be given unless there is a legitimate reason.

The Grading Scheme below should serve as a guideline for your Final Letter Grades based on the Final Score percentage obtained from the formula above:

Grade	FinalScore
A	93-100
A-	90-92.99
B+	87-89.99
B	83-86.99
B-	80-82.99
C+	77-79.99
C	70-76.99
D	60-69.99
F	0-59.99

Important Dates:

- September 14, Wednesday: Last day to drop for 25% tuition refund; Last day to drop a course without the grade of **W**.
- September 24, Saturday: **WA** grades assigned for immunization non-compliance.
- December 14, Wednesday: Last day to drop a class with a grade of **W**.

Attendance Policy

You are expected to attend all class meetings. Active participation in class will be taken into consideration in computing the final grades. Attendance will be taken at the beginning of each class. Lateness and students leaving before the end of the class period will be recorded. If you arrive late, you are responsible for letting me know at the end of the class. The official Mathematics Department policy is that two lateness (this includes arriving late or leaving early) is equivalent to one absence. Students are responsible for obtaining all the information from classes that they miss with classmates as soon as possible. Attendance alone does not guarantee a passing grade.

In general, there is a strong positive correlation between the percentage of classes a student has attended in the course and the student's final grade for the semester, see Figure 1.

Academic Calendar

For more information about important dates, please refer to the Fall 2022 Academic Calendar:

- http://www.citytech.cuny.edu/registrar/docs/fall_2022.pdf

Class Participation

I encourage you to interact with the others, to actively participate, to ask questions, to contribute your ideas and insights, to work in groups. Active participation in class may result in extra credit (at the instructor's discretion).

Extra Help with Course Material and Time Management

- I strongly encourage you to seek help if you feel you need it by attending my office hours or by sending me an e-mail with questions or concerns you may have.

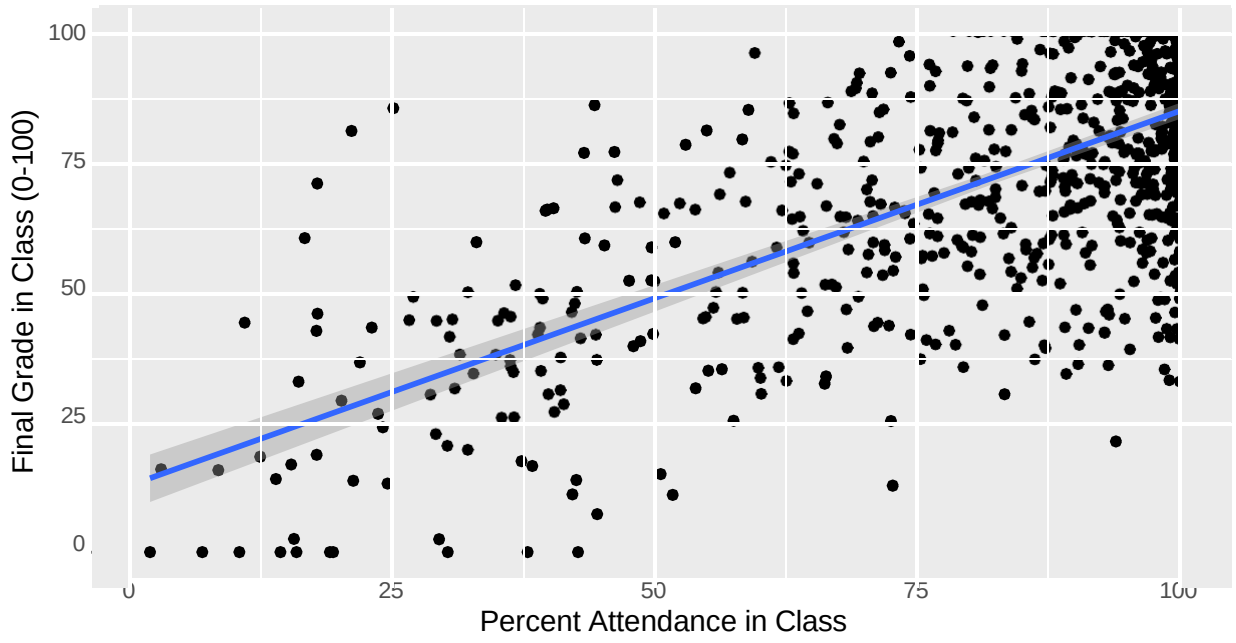

Figure 1: A Scatterplot of the Relationship between Class Attendance and Final Grade

- Set enough time aside each week. You are expected to spend 4-6 hours outside the classroom each week reading the text, working on projects, doing homework and preparing for exams.
- Read the material prior to the class in which it is covered. This will facilitate your under- standing and participation in class.
- Attempt at least some of the homework problems immediately after class, so that you know how much of the class you understood.
- Take advantage of office hours. If you are unable to attend the scheduled hours, then make an appointment.
- The Math Department also offers free tutoring for many courses.

Course Syllabus on Blackboard

The Course Syllabus is posted on Bb under *Information* and it will remain there for your reference until the end of the semester. Please check Bb frequently as I will be posting there all teaching materials and your grades, including your final letter grades, before they are posted on *CUNYFirst*.

Make-Up Exam Policy

Make-Up Exams: There will be no "make–up" exams and a missed exam will receive a score of 0, unless a valid excuse is presented and documented before the exam. Valid excuse may be related to medical, family or other emergencies. Personal travel is not a valid excuse. If a student misses an exam for a valid reason and provides documentation to support his/her claim then the missed exam's weight may be added to the final exam's weight. No extra time will be given for students who show up late for exams and no student is allowed to take the final exam earlier than the rest of the students.

New York City College of Technology Policy on Academic Integrity

Students and all others who work with information, ideas, texts, images, music, inventions, and other intellectual property owe their audience and sources accuracy and honesty in using, crediting, and citing sources. As a community of intellectual and professional workers, the College recognizes its responsibility for providing instruction in information literacy and academic integrity, offering models of good practice, and responding vigilantly and appropriately to infractions of academic integrity. Accordingly, academic dishonesty is prohibited in The City University of New York and at New York City College of Technology and is punishable by penalties, including failing grades, suspension, and expulsion.

The complete text of the policy on Academic Integrity may be found in the catalog on page 57.

Disabilities Policy

Federal law mandates the provision of services at the university-level to qualified students with disabilities.