

Spring 2022

CHE 365-102: Chemical Engineering Computing

Roman Voronov

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ChE365 – Chemical Engineering Computing
Spring 2022
Otto H. York Department of Chemical, Biological & Pharmaceutical Engineering
New Jersey Institute of Technology

Course Schedule: W6:00 PM - 10:05 PM, TIER411

Web-Ex/Office Hours: Wednesday 3:00-5:00 PM. <https://njit.webex.com/meet/rvoronov> Other times by appointment.

Instructor: Dr. Roman S. Voronov, Associate Professor

Instructor Contact: Tiernan Hall 378, 1.973.642.4762 (voicemail=slow), rvoronov@njit.edu (fast). **Please include the course number and problem number your question is about in the subject of your email.**

Note, please **avoid sending internal messages through 3rd party platforms like Moodle or Canvas.**

Instructor Webpage: <http://chemicaleng.njit.edu/people/rvoronov.php>

Join the Department's Linked in Profile and Group for networking opportunities:

<https://www.linkedin.com/in/njiticme/>

<https://www.linkedin.com/groups/8907579/>

Teaching Assistant: Tong, Anh

TA Contact: anh.tong@njit.edu

Please add ChE365 in the subject of your emails

Catalog Description: <https://catalog.njit.edu/search/?P=CHE%20365>

Specific goals for the course

- a. The student will be able to
 1. Master basic programming proficiency
 2. Describe and interpret error and convergence
 3. Solve Root searching problems using Bracketing and Open Methods, while assessing the trade-offs between them
 4. Apply Optimization methods in order to search for maxima or minima of a function.
 5. Represent and solve a system of linear equations in matrix form
 6. Fit data using Linear Regression
 7. Integrate functions Numerically
 8. Differentiate functions Numerically
 9. Solve Ordinary Differential Equations Numerically
 10. Utilize advanced engineering software packages

11. Work on group exercises and apply a range of numerical methods to evaluate solutions to chemical engineering problems

12. Self-acquire Advanced Engineering Software Skills

13. Communicate Project Results in a Technical Writing Report Format

b. This course explicitly addresses the following student ABET outcomes: 1, 3, 5, 7

Textbooks: Required –

1) Applied Numerical Methods with MATLAB for Engineers and Scientists / Edition 4 by Steven Chapra. ISBN-13: 978-0073397962; ISBN-10: 0073397962. Alternatively, you may be able to get away with using the cheaper international or 3rd editions, at your own risk.

Note: Students may optionally purchase the electronic version of this book:

Connect Access Card for Applied Numerical Methods with MATLAB for Engineers and Scientists by Chapra, 4th edition, ISBN: 9781259547669

Recommended/Alternative Resources

1) free MATLAB textbook (see video description) about numerical methods in chemical engineering with supporting YouTube lecture videos: https://www.youtube.com/watch?v=OUPgLw56-p0&list=PLRihodfxzBsVb_xaas2pufgNCxt8oOjSs

2) You already have the electronic copy of this book through NJIT libraries, so do NOT need to buy the hard copy (unless you really want to). Introduction to Chemical Engineering Computing 2nd Edition by Bruce A. Finlayson. ISBN-13: 978-1118888315; ISBN-10: 1118888316.

3) Numerical Methods for Chemical Engineers Using Excel, VBA, and MATLAB by Victor J. Law. ISBN-13: 9781466575349; 2) Numerical Methods for Engineers - 7th edition ISBN13: 9780073397924; ISBN10: 007339792X

4) Website with lots of Matlab examples: <http://matlab.cheme.cmu.edu/>

Required Software: Latest versions of **Matlab (must be installed prior to the first-class period!)**, COMSOL, MS Office, Adobe Reader (all can be downloaded from NJIT IST webpage). Student Mall labs and ChE department PC lab have most of the software. Please see Highlander Pipeline for Matlab tutorial and example programs.

iClickers Software: Students are Required to purchase – we will use them to take some of the quizzes. However, please hold off on this, as NJIT is trying to buy a campus-wide license.

<https://www.iclicker.com/pricing#student-pricing>

Mathworks Grader: Students are required to create a free account at <https://grader.mathworks.com/> and register for the Che365 course there.

Grading (curved at the end of the course, if needed):

HOMEWORK (HW) — 5%

LABORATORY* – 15%
QUIZES – 20%
MIDTERM – 20%
PROJECT – 10%
FINAL – 30%

***This course will implement an “active learning” environment. Therefore, a significant portion of the grade will depend on interactive assignments during class. Hence, your participation in the group work will be graded. Furthermore, the Laboratory grade for each chapter will depend on the homework grade as follows: LAB GRADE = IN-CLASS ASSIGNMENT GRADE * CORRESPONDING HOMEWORK GRADE. In other words, if you don’t turn in a homework, you will get a zero for the corresponding lab as well; if you get a 50% on the homework, your lab grade will be divided by half; and so on. Additionally, a portion of your lab grade will also depend on how your groupmates grade your contribution. The groups will be up to the instructor.**

Grade Cut-offs

Percent	Grades
Above 90%	A
Above 80%	B+
Above 75%	B
Above 70%	C+
Above 65%	C
Above 55%	D
Equal or Below 55%	F

Homework and exams will be assigned through Canvas: <https://canvas.njit.edu/> – Please check this site and your email often. Most of the homework, quizzes and solutions will be on this site, as well important course announcements.

There may be a gray area between each two letter grades in the final distribution, so that two students getting similar weighted average, at the border of grade categories, could get different letter grades. If you are in one of these gray areas, whether you get the higher or lower grade depends on whether your performance has been improving or declining over the course period and on your overall class participation (attendance/discussion etc.).

Important University Dates (Add/Drop/Refund/Last Day to Withdraw/Recess/Finals):

<http://www.njit.edu/registrar/calendars/>

<http://www.njit.edu/registrar/exams/finalexams.php>

Make-up sessions — If classes are cancelled due to inclement weather, students will be asked to attend make-up session(s) on a Saturday (TBA).

Class Attendance: Students must be present in class to receive any credit on the quizzes, labs, assignments or tests that occurred during it. Also, experience shows that students who do not regularly attend class typically perform poorly in the course. In addition, examples are worked out during the lectures. These examples are may not be posted online. Students are responsible for all material covered in class.

Online Synchronous Delivery: The class will meet via video conferencing (e.g., Webex, Zoom, or similar) software. Students must keep their webcams ON at all times. NO audio or video recording is allowed. Nonoffending virtual backgrounds are allowed to maintain privacy. The use of offending backgrounds is not allowed and will be punished.

Cell phones and other electronic devices: must be turned off during both lectures and exams, unless specifically permitted by the instructor. For example, the use of personal computers or tablet devices for attending the video conferencing lectures is allowed.

Office Hours Attendance: This time is for you to come and seek help in case: you don't understand the material, have an English problem, or are concerned about your grade. Coming to office hours shows that you care about learning and positively affects both your performance and evaluation. Do not wait until the very end to do this!

Seating Chart: The instructor reserves the right to assign seating during the class lecture.

NJIT Honor Code: The NJIT honor code is being upheld on all issues related to the course. Students are expected to be familiar with the code and conduct themselves accordingly. Any violations will be brought to the immediate attention of the Dean of Students.

Academic integrity: Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at: <http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. **Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university.** If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

A VERY *ROUGH* AND *PRELIMINARY* SCHEDULE FOR THE SEMESTER:

Class #	Computing Method
1	INTRO TO COMPUTERS & CHE MODELING
2	CH 2-3: CHE COMPUTING FUNDAMENTALS
3	CH 4: ROUND OFF AND TRUNCATION ERRORS, CONVERGENCE
4	CH 5: ROOTS BRACKETTING METHODS
5	CH 6: ROOTS OPEN METHODS
6	CH 7: OPTIMIZATION
7	CH8-9: LINEAR SYSTEMS
8	MIDTERM (NOTE THAT THE EXACT DATE MAY CHANGE)
9	CH14: CURVE FITTING
10	CH17: INTERPOLATION

11	CH 19-20: NUMERICAL INTEGRATION
12	CH 21: NUMERICAL DIFFERENTIATION
13	CH 22: ORDINARY DIFFERENTIAL EQUATIONS – INITIAL VALUE PROBLEMS
14	ADVANCED SOFTWARE / PROJECTS
15	FINAL

Policies and Expectations about Exams/Grades

- The course letter grade will be assigned and **rounded** automatically by Excel (no emotions attached). The assigned letter grade is FINAL without subject to negotiation!
- Any excuses used to drop missed assignments or exams must first be documented with the Dean of Students.
- Students have to plan, study and do well in exams/HW if they want to get a good grade in this class. Instructor will NOT change letter grades to accommodate any special circumstances (unless excused by the Dean of Students). The student will get the letter grade he/she deserves.
- Students can dispute the assignment and exam scores within a week following the announcement of the score. Students **cannot** dispute their prior exams or assignments after one week or at the end of the semester! Furthermore, upon requesting grade review the student accepts the possibility of instructor both **removing points**, as well as giving points, in case grading mistakes are found.
- **Student handwriting must be legible in order to receive points.**
- **The graded exams must be returned within a week to be saved for the department course assessment initiative.**
- Students will get 0 for not showing up to quizzes, laboratory, exams, or any other course activity. If a student misses an exam due to extreme circumstances (such as a medical problem or a death in the family), he/she needs to notify the instructor via email **before** the beginning of the exam, and provide proof of the circumstance to the Dean of Student's office. Only in this case of official approval from the Dean of Student's office, may a make-up be given. When a student invokes extenuating circumstances for any reason (late withdrawal from a course, request for a make-up exam, request for an Incomplete grade) the student will be sent to the Dean of Students Office. The Dean of Students will be making the determination of whether extenuating circumstances exist or not and will be notifying the instructor accordingly. Instructors will never request or accept medical or other documents from students; such documents need to be submitted by the student to the Dean of Students. Except for cases determined by law, an instructor is not required to accommodate student requests even when extenuating circumstances are certified by the Dean of Students; however, all efforts should be made to ensure a student-friendly environment.
- Extra credit may be assigned during the semester, at the discretion of the instructor. There will be no make-ups, extra credit, or any additional projects/assignments given beyond the semester's completion.
- **If cheat sheets are allowed on the exam, these must be hand-written (not typed or photocopied). They also cannot contain computer code, or homework solutions.**
- **When writing code, you may not "simplify" your assignment if all of your input data happens to fall within a single case scenario. Your code should be general enough to handle ALL possible input.**
- **Even though labs are due after class, students must be present during the entire class of the lab in order to receive any credit on it.**

- Even though homeworks are assigned through Canvas, students must still bring a hard copy to class and show it to the TA to receive credit.
- Computer codes submitted for both labs and exams must be free of errors to receive partial credit.
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- During laboratory exercises, students may not leave if finished early. Instead, they are to assume TA roles and walk around (without computers) to help their classmates complete the assignment.
- During laboratory exercises, students may not communicate with anyone outside of their group.
- Students may NOT seek help from someone outside of the class on any of the in class laboratory exercises, homework assignments, quizzes tests or projects.
- Students may NOT use course materials from the previous semesters, unless such materials have been explicitly shared with them by the instructor.
- Students may NOT post course materials to external resources, such as Chegg.com and others.
- Students may NOT share course materials with other students or persons, even after course completion. Doing so may result in penalties to the grade that has already been earned.
- If multiple students turn in identical (or very similar) code/assignment/exam, this is considered to be a violation and the case will be turned over to the Dean of Students for further examination. In class group labs do not fall under this policy.
- **Any homeworks, labs not finished in class, and take-home exams must be done *individually*.**
- If you need accommodations due to a disability please contact the Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.
- *NJIT policy requires that all midterm and final exams must be proctored, regardless of delivery mode, in order to increase academic integrity. Note that this does not apply to essay or authentic based assessments. Effective beginning Fall semester 2019, students registered for a fully online course section (e.g., online or Hyflex mode) must be given the option to take their exam in a completely online format, with appropriate proctoring.*
- **Class Recordings:** Class sessions may be recorded by the instructor. These recordings shall only be used as an educational resource and are not to be distributed or used outside of this class. Information on how to access recorded lectures will be made available by your instructor. Any recordings that contain identifiable information about students will not be used beyond this semester.

Class Recording Etiquette: Students are expected to respect their fellow students' privacy and freedom to learn without disruption. Students are not allowed to capture or reproduce anyone's name, image, or voice without permission. They must be polite and respectful in the online chat. Informal chat is okay, but typing is restricted to things that one would say out loud in front of the entire class. Students must always conduct themselves on their webcam video as they would in person in a classroom.

In this course you will be required to use the following proctoring method to ensure academic integrity for exams. Please see NJIT's response to questions about online

proctoring [here](#). See below for more information about how exams will be proctored in this course.

Respondus LockDown Browser and Monitor

Respondus LockDown Browser is a locked browser for taking assessments or quizzes in Canvas. It prevents students from printing, copying, going to another URL, or accessing other applications during a quiz. If a Canvas quiz requires that LockDown Browser be used, students will not be able to take the assessment or quiz with a standard web browser. Students may be required to use LockDown Browser with a webcam (Respondus Monitor), which will record students during an online exam.

The webcam can be built into your computer or can be the type that plugs in with a USB cable. Watch this [short video](#) to get a basic understanding of LockDown Browser and the webcam feature. A student [Quick Start Guide \(PDF\)](#) is also available.

Respondus Lockdown Browser and Monitor does not work with Linux and Chromebooks at this time. Please visit the [Respondus Knowledge Base article on computer requirements](#) for additional information.

There are two quizzing engines currently available in Canvas, “classic” quizzes and “new” quizzes. Respondus works with both.

For “Classic” Quizzes in Canvas:

The LockDown Browser integration with *Classic Quizzes* still requires students to (1) manually start LockDown Browser, (2) log into Canvas, and (3) navigate to the quiz that requires LockDown Browser.

1. Download and install LockDown Browser from this link:
<http://www.respondus.com/lockdown/download.php?id=264548414>
2. Once your download and installation has finished, locate the “LockDown Browser” shortcut on your desktop and double-click it. (For Mac users, launch “LockDown Browser” from the Applications folder.)
3. You will be brought to the Webauth Authentication Service page, where you can log in with your NJIT UCID and password.
4. From your Dashboard or under “Courses”, click on the course in which you have to take the exam that requires LockDown Browser.

5. After you enter the course, find the exam and click on it.

6. Click the “Take the Quiz” button. Once a quiz has been started with LockDown Browser, you cannot exit until the “Submit Quiz” button is clicked.

7. If you are required to use a webcam (Respondus Monitor), you will be prompted to complete a Webcam Check and other Startup Sequence steps.

For “New” Quizzes in Canvas:

If a *New Quizzes* assessment requires the use of LockDown Browser, it will automatically launch from the student’s regular browser session. At the end of the quiz, LockDown Browser will close, allowing the student to continue with their standard browser. To be clear, the LockDown Browser application must first be installed to the computer or device. But once installed, it will automatically launch (and close) as needed with New Quizzes.

1. Download and install LockDown Browser from this link:
<http://www.respondus.com/lockdown/download.php?id=264548414>

2. Once your download and installation has finished, log into Canvas using your standard browser.

3. From your Dashboard or under “Courses”, click on the course in which you have to take the exam that requires LockDown Browser.

4. After you enter the course, find the exam and click on it.

5. A new tab will open with a message stating “Assessment Loading”. You will also see a pop-up window asking you to open Lockdown Browser. Click “Open Lockdown Browser”.

6. Lockdown Browser will automatically launch and your quiz will be loaded into Lockdown Browser. Click “Begin” to take the quiz. Once a quiz has been started with LockDown Browser, you cannot exit until the “Submit Quiz” button is clicked.

7. If you are required to use a webcam (Respondus Monitor), you will be prompted to complete a Webcam Check and other Startup Sequence steps.

Students: If information is not posted about whether quizzes will be created using “Classic” or “New” quizzes, contact your instructor.

Questions or problems can be submitted via web form by going to: <https://servicedesk.njit.edu> and clicking on the "Report your issue online" link. You may also call the IST Service Desk with any questions at 973-596-2900.

[More information and Tips for Ensuring a Smooth Experience](#)

ProctorU Live+

ProctorU works by connecting you to a proctor who will watch (and listen to) you **live**, via webcam, while you take your exam. ProctorU is a live online proctoring service that allows you to take your exam from the comfort of your home. ProctorU is available 24/7, however, you will need to **schedule your proctoring sessions at least 72 hours in advance** to avoid any on-demand scheduling fees.

Creating a ProctorU account is simple. You can do so by visiting go.proctoru.com.

In order to use ProctorU, you will need the following:

- High-speed internet connection
- Webcam (internal or external)
- Microphone and Audio (internal or external)
- Windows or Apple Operating System
- NJIT ID or Photo-Issued ID
- Reflective surface such as a small mirror

For more information on preparing for a proctored exam using ProctorU, please click [here](#).

Be sure to review the full, step-by-step instructions on creating an account, scheduling an exam, connecting to the proctor, and how you will take your exam using ProctorU. Please click [here](#).

If you do not receive an “invitation” to take a specific exam, you can sign up for an appointment by logging in and searching for the exam by your instructor/course name.

Important: ProctorU recommends that you visit <https://test-it-out.proctoru.com> to test your equipment prior to your proctoring session. We recommend you click on the button that says "Connect to a Live Person" to **fully** test out your equipment.

You should expect the startup process with the proctor to take about 10-15 minutes. However, this time will **not** affect your exam time.

Important Notice for OSX Users: You will need to [enable screen sharing in your browser](#) prior to taking the exam.

Please feel free to direct any questions to the student support team via the **live chat** within your account. ProctorU Student Support can be contacted via the **LiveChat** feature location with any ProctorU account, at the Help Center at ProctorU.com, by email (help@proctoru.com), or by calling 855-772-8678. Additionally, please review the test-taker resource center [here](#).

[More Information and Tips for Ensuring a Smooth Experience](#)

ProctorU Record+ (formerly called Review+) (Auto)

ProctorU Record+ (formerly called Review+), uses an automated proctoring solution via AI during the exam, followed by a full review from a ProctorU proctor. Similar to Respondus Monitor, you will be recorded during the exam. After completing their review, a proctor sends an incident report to the instructor if any potential academic integrity violations occur. You will access your exam by installing the ProctorU browser extension in either Chrome or Firefox. After logging into the browser, you can access your exam and proceed to the ProctorU startup sequences. [Instructions are available for students](#) (including link to a practice quiz).

Students will need to make a test-taker account at proctoru.com.

In order to use this ProctorU service, you will need the following:

- High-speed internet connection
- Webcam (internal or external)
- Microphone and Audio (internal or external)
- Windows or Apple Operating System
- NJIT ID or Photo-Issued ID

After making your ProctorU account, download the browser extension for either [Chrome](#) or [Firefox](#) and log into your account via the browser extension. After logging into the browser, you can access your exam in your course and proceed to the ProctorU startup sequences. As long as you are logged into the browser with your ProctorU account, you will not need an exam password or access code; the browser extension will automatically enter that information to open the exam for you.

Important: ProctorU recommends that you visit <https://test-it-out.proctoru.com/> to test your equipment prior to your proctoring session. We recommend you click on the button that says "Connect to a Live Person" to fully test out your equipment.

Important Notice for OSX Users: You will need to [enable screen sharing in your browser](#) prior to taking the exam.

If you encounter technical difficulties with your exam, you should contact ProctorU's 24/7 technical support via [Live Chat](#) or call 855-772-8678.

[More Information and Tips on Ensuring a Smooth Experience](#)

Webex

Webex can be used to allow instructors to proctor exams themselves. Your instructor will schedule a Webex exam session and share the meeting information with you ahead of time. The exam in Canvas will be password-protected. You can connect to the Webex session with either your phone or computer. You can find links to download the mobile app from the App Store or Google Play Store at the bottom of njit.webex.com.

When your instructor is ready to start the exam, they will provide the exam password in the meeting so all students can begin the Canvas quiz. Your instructor will then watch you, via the

web camera, as you take the exam. Students are expected to remain connected to the Webex session until their exam is submitted. The session may also be recorded by your instructor.

In order to use Webex for proctored exams, you will need the following:

- High-speed internet connection
- Webcam (internal or external) and/or smartphone with camera (instructor's preference)
- The process for connecting to Webex will be the same as when you connect for a class.

Tips for ensuring a smooth experience while using Webex:

- Connect to your Webex session before class starts.
- Log into Canvas before connecting to Webex.

Questions or problems can be submitted via web form by going to:

<https://servicedesk.njit.edu> and clicking on the "Report your issue online" link. You may also call the IST Service Desk with any questions at 973-596-2900.

Most important: Have lots of fun!