Syllabus
OPER/STAT 649, Spring 2019
Statistical Quality Control

Instructor:
Dr. Yanjun Qian

Office hours: TR 4:30 – 5:30 pm
Or by 4134 Harris Hall appointment: 828-1316
It’s best to reach me via email: yqian3@vcu.edu

Course Basics:
Meets TR 5:30 – 6:45 pm in Harris Hall 3142
3 credit hours

Course Description:
Fundamental methods about anomaly and change detection in a process or an environment. Methods covered include the univariate and multivariate analysis for continuous and discrete data, risk adjustments, data pre-analyses (such as dimension reduction), and scan statistics.

This course is designed for graduate students in the statistics, business and engineering fields to learn about the basic concepts and practical tools for performing anomaly and change detections. It will help doctoral students in both fields broaden their knowledge base and get exposed to new applications. But theoretical analysis is NOT the focus of this course.

Textbook:
None. Class notes will be posted on the course website.

Reference Book:


Prerequisites:
1. Linear Algebra or Matrix Algebra (MATH 310, or equivalent).
2. Knowledge on hypothesis test and linear regression (STAT 310, or equivalent).
**Course Objectives:**

(1) Understand basic principles of change and anomaly detection;
(2) Learn to use the basic data analysis tools for detection;
(3) Comprehend the applications of change and anomaly detection methods to manufacturing quality control, medical error detection, and bio-surveillance.

**Course Topics:**

1. Statistical background: confidence intervals and hypothesis tests;
2. Shewhart control chart: method and evaluation using ARL;
3. Control charts with memory: CUSUM and EWMA;
4. Control charts for attribute data;
5. Univariate analysis: risk adjustments;
6. Multivariate statistics;
7. Hotelling T2 charts;
8. Multivariate CUSUM and EWMA;
9. Handling the high-dimension data;
10. Multivariate control charts for attribute data;

**BlackBoard:**

All course information will be maintained on Blackboard (https://blackboard.vcu.edu/), including course announcements, lecture notes, homework assignments due dates, etc. If you are not using your VCU email, please be sure to have it rerouted to your current email provider.

**Grading Information:**

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
<th>Weight</th>
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<tbody>
<tr>
<td>In-Class Quizzes (5-6)</td>
<td>10%</td>
<td>10%</td>
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<tr>
<td>In-Class Exams (4)</td>
<td>80%</td>
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<tr>
<td>Course Project</td>
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<td><strong>Total</strong></td>
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**The tentative grading scale for this course is:**

- 90 – 100          A
- 80 – 89.99        B
- 70 – 79.99        C
- 60 – 69.99        D
- 0 – 59.99         F

All assessment grades will count towards the final course grade.

**Homework**

Homework will be assigned periodically but may not be collected for grading. Popup quizzes related to homework questions will be assigned during the class and graded.

**Exams**

There will be **four in-class Exams**. Absolutely no make-up exams will be allowed unless a university-approved excuse is provided. Whenever possible, excuses should be provided at least two weeks in advance. More information will be provided about the exams later in the course. These exams will be given on the following dates (subject to possible changes).
All tests will be closed notes and closed book. I do not expect you to memorize formulas for this course; so, a 1-page formula sheet will be permitted during the tests.

Software

We will use in this class so we can look at real data—not all calculations can be done by hand. Software I recommend: Excel, MATLAB, R, SAS and Minitab. I will demonstrate examples in class with MATLAB or R.

Guidelines

- Attend all classes and arrive at class on time. If you miss class, you are responsible for any material covered in class that you missed, including information not included in your textbook. Please talk with me if something prevents you from arriving to class on time.
- Regularly check your email and BlackBoard (at least every other day) for announcements.
- Readings should be completed before class.
- While I check my own email frequently during the week and at least once on weekends, a situation may arise where this is not possible. Do not wait until the last day before an assignment is due to contact me if you have questions!
- I value integrity. Cheating in any form will not be tolerated. The documented policies of the department, college, and university related to academic integrity will be enforced. Any violation of these regulations, including acts of plagiarism or cheating, will be dealt with according to those policies.
- The course syllabus is a general plan for the course; deviations announced to the class by the instructor may be necessary.

Additional guidelines:

- Turn off cell phones and pagers while in the classroom.
- Be familiar with the policies in the Resource Guide (http://www.policy.vcu.edu/).
- University policy states that students not enrolled in this course cannot attend this course.
- Possession of all firearms, weapons, and explosives of any kind is absolutely prohibited without written authorization of the President of the University.
- If you foresee any problems with adhering to the guidelines set in this syllabus, please discuss them with me as soon as possible.
- Class will not meet on Tuesday, March 5 and Thursday, March 7 (spring break).
- Last day to withdraw from the class: Friday, March 22.

Campus emergency information

What to know and do to be prepared for emergencies at VCU:

- Sign up to receive VCU text messaging alerts. Keep your information up-to-date. Within the classroom, the professor will keep his or her phone on to receive any emergency transmissions.
- Know the safe evacuation route from each of your classrooms. Emergency evacuation routes are posted in on campus classrooms.
Listen for and follow instructions from VCU or other designated authorities. Within the classroom, follow your professor's instructions.
Know where to go for additional emergency information.
Know the emergency phone number for the VCU Police (828-1234).
Report suspicious activities and objects.
Keep your permanent address and emergency contact information current in eServices.

Class registration required for attendance
Students may attend only those classes for which they have registered. Faculty may not add students to class rosters or Blackboard. Therefore, if students are attending a class for which they have not registered, they must stop attending.

Honor System: upholding academic integrity
The VCU Honor System policy describes the responsibilities of students, faculty and administration in upholding academic integrity, while at the same time respecting the rights of individuals to the due process offered by administrative hearings and appeals. According to this policy, "Members of the academic community are required to conduct themselves in accordance with the highest standards of academic honesty, ethics and integrity at all times." In addition, “To support a commitment to the Honor System, all members of the VCU community are required to:
- Adhere to the Honor System policy and its procedures;
- Report any suspicion or knowledge of possible violations of the Honor System;
- Answer truthfully when called upon to do so regarding Honor System matters;
- Maintain appropriate confidentiality regarding related to Honor System matters.”

More information can be found at the VCU policy library.

Important dates
You can view important dates for the semester in the academic calendar.

Managing stress
Students may experience situations or challenges that can interfere with learning and interpersonal functioning including stress, anxiety, depression, alcohol and/or other drug use, concern for a friend or family member, loss, sleep difficulties, feeling hopeless or relationship problems. There are numerous campus resources available to students including University Counseling Services (804-828-6200 MPC Campus, 804-828-3964 MCV Campus), University Student Health Services (MPC 804 828-8828, MCV Campus 804 828-9220) and the Wellness Resource Center (804-828-9355). 24 hour emergency mental health support is available by calling 828-1234 and asking to speak to the on-call therapist or utilizing the National Suicide Prevention Lifeline (1-800-784-2433).

Mandatory responsibility of faculty members to report incidents of sexual misconduct
It is important for students to know that all faculty members are mandated reporters of any incidents of sexual misconduct/violence (e.g., sexual assault, sexual exploitation and partner or relationship violence). This means that faculty cannot keep information about sexual misconduct/violence confidential if you share that information with them and they must report this information immediately to the university's Title IX Coordinator. In addition, department chairs, deans, and other unit administrators are required to report incidents of sex or gender-based discrimination to the university's Title IX Coordinator. Once a report is made, you will receive important information on your reporting options, on campus and off campus resources and remedial measures such as no-contact directives, residence modifications, and academic modifications. If you would prefer to speak with someone confidentially for support and to discuss your options for reporting, contact:
VCU's Wellness Resource Center 804.828.9355 | myoptions@vcu.edu | thewell.vcu.edu
Greater Richmond Regional Hotline (Community program) 804.612.6126 | 24-hour hotline
VCU’s Counseling Services 804-828-6200

For more information on how to help, please click here. The Policy on Sexual Misconduct/Violence and Sex/Gender Discrimination, can be found in the VCU policy library. For more information about the University's Title IX process, please visit equity.vcu.edu.
Military short-term training or deployment

If military students receive orders for short-term training or for deployment/mobilization, they should inform and present their orders to Military Student Services and to their professor(s). For further information on policies and procedures contact Military Student Services at 828-5993 or access the corresponding policies.

Student conduct in the classroom

According to the Faculty Guide to Student Conduct in Instructional Settings, "The university is a community of learners. Students, as well as faculty, have a responsibility for creating and maintaining an environment that supports effective instruction. In order for faculty members (including graduate teaching assistants) to provide and students to receive effective instruction in classrooms, laboratories, studios, online courses, and other learning areas, the university expects students to conduct themselves in an orderly and cooperative manner." Among other things, cell phones should be turned off while in the classroom. The Student Code of Conduct also prohibits the possession of or carrying of any weapon. For more information see http://register.dls.virginia.gov/details.aspx?id=3436.

Student email policy

Email is considered an official method for communication at VCU because it delivers information in a convenient, timely, cost-effective, and environmentally aware manner. Students are expected to check their official VCU email on a frequent and consistent basis in order to remain informed of university-related communications. The university recommends checking email daily. Students are responsible for the consequences of not reading, in a timely fashion, university-related communications sent to their official VCU student email account. This policy ensures that all students have access to this important form of communication. It ensures students can be reached through a standardized channel by faculty and other staff of the university as needed. Mail sent to the VCU email address may include notification of university-related actions, including disciplinary action. Please read the policy in its entirety at the VCU Policy Library.

Student financial responsibility

Students assume the responsibility of full payment of tuition and fees generated from their registration and all charges for housing and dining services, and other applicable miscellaneous charges. Students are ultimately responsible for any unpaid balance on their account as a result of the University Financial Aid Office or their third party sponsor canceling or reducing their award(s).

Students representing the university – excused absences

Students who represent the university (athletes and others) do not choose their schedules. Student athletes are required to attend games and/or meets. All student athletes should provide their schedules to their instructors at the beginning of the semester. The Intercollegiate Athletic Council strongly encourages faculty to treat missed classes or exams (because of a scheduling conflict) as excused absences and urges faculty to work with the students to make up the work or exam.

Students with disabilities

Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, as amended, require that VCU provide "academic adjustments" or "reasonable accommodations" to any student who has a physical or mental impairment that substantially limits a major life activity. To receive accommodations, students must register with the Office of Student Accessibility and Educational Opportunity on the Monroe Park Campus (828-2253) or the Division for Academic Success on the MCV campus (828-9782). Please also visit the Student Accessibility and Educational Opportunity website and/or the Division for Academic Success website for additional information.

Once students have completed the registration process, they should schedule a meeting with their instructor(s) and provide their instructor(s) with an official accommodation letter. Accommodation letters will outline the required classroom accommodations. Additionally, if coursework requires the student to work in a lab environment, the student should advise the instructor or a department chairperson of any concerns that the student may have regarding safety issues related to a disability. Students should follow this procedure for all courses in the academic semester.
Withdrawal from classes
Before withdrawing from classes, students should consult their instructor as well as other appropriate university offices. Withdrawing from classes may negatively impact a student’s financial aid award and his or her semester charges. To discuss financial aid and the student bill, visit the Student Services Center at 1015 Floyd Avenue (Harris Hall) and/or contact your financial aid counselor regarding the impact on your financial aid.

Faculty communication about students
VCU instructional faculty, administrators and staff maintain confidentiality of student records and disclose information in accordance with the Family Educational Rights and Privacy Act (FERPA). This means that VCU officials may disclose student record information without the consent of the student in certain situations. To support university operations, for example, VCU officials share information about students with other educational officials as necessary to perform their job duties. FERPA permits this disclosure to school officials who have a legitimate educational interest in the student information. In addition, VCU officials have obligations to report information shared by a student depending on the content of that information, for example, in compliance with VCU’s policy on the duty to report (policy.vcu.edu). Unless FERPA permits a certain disclosure, VCU generally requires consent from a student to disclose information from their education record to another individual. This now includes sharing of the student’s mailing address or email address with other VCU students or any entities outside of VCU. You may find additional information on the VCU FERPA website: http://rar.vcu.edu/records/family-educational-rights-and-privacy-act/.

More detailed University policies can be found at Online Syllabus Statement.