**IST 3420 - Introduction to Data Science and Management**

**Course Syllabus - Spring 2021**

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| ***Department Mission:***  “Capitalizing on the strong technological emphasis of Missouri S&T, the Department of Business and Information Technology educates individuals for careers in modern business organizations. The Department emphasizes management through technology, with particular focus on information systems and their application in a fast-changing, global, and competitive environment, to serve the economic interests of industry and the evolving needs of society.” |

# INSTRUCTOR INFORMATION

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| *Instructor:*  *Office:* | Tracy Cui Zou  G8 Fulton Hall | *Class:* MWF: 10 a.m. – 10:50 a.m.  *Classroom: Virtual classroom via Zoom* |
| *Phone:* | 573-341-4776 | *Office Hours:* Wed: 1:00 p.m. – 2:00 p.m. |
| *E-Mail:* | [tracyzou@mst.edu](mailto:tracyzou@mst.edu) |  |
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# COURSE DESCRIPTION

This course introduces students to increasing business success through analyses of large-scale data collections. Topics include data import/export, summary statistics, cross-tabulation, data transformations (subsetting, merging, sorting and aggregation), modeling methods, and visualization. Significant programming in R is expected.

Prerequisite: IS&T 1552 or Comp Sci 1510.

# LEARNING MANAGEMENT SYSTEM

Access Canvas (<http://canvas.mst.edu/>) for course materials, grades, course schedule, and submission deadlines etc.

# TOOLS

## R

R is a free software environment for statistical computing and graphics.

Obtain R from <https://www.r-project.org/>

## RStudio

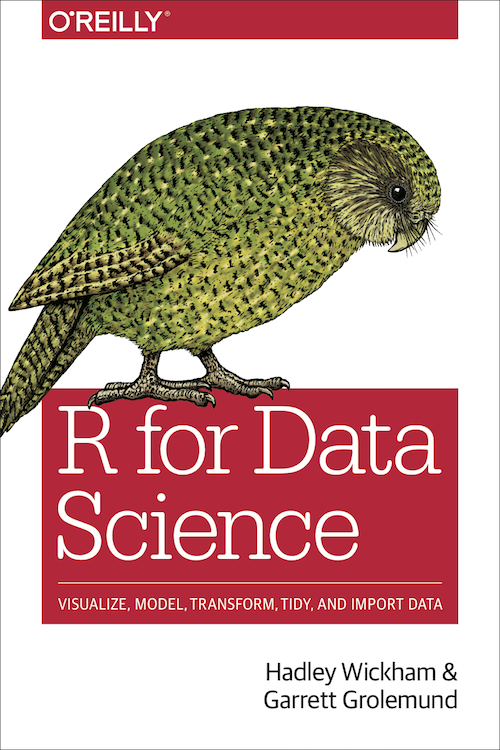
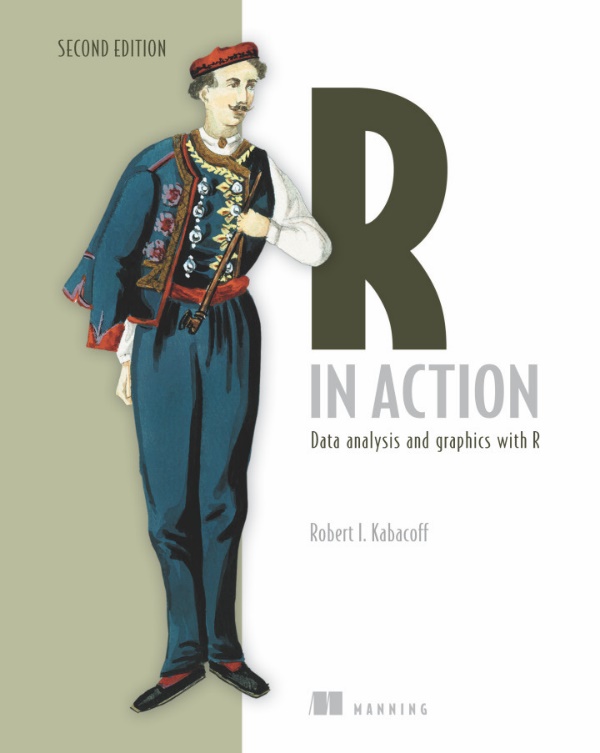
RStudio is a powerful integrated development environment (IDE) for R.

Get RStudio Desktop (open source edition) from <https://www.rstudio.com/products/rstudio/download/>

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| **R** is a widely used language for analytics, data science, and machine learning. | Top Analytics Data Science Machine Learning Software, 2015-2017 |
| Source: <http://www.kdnuggets.com/2017/05/poll-analytics-data-science-machine-learning-software-leaders.html> | |

# READINGS

The instructor will provide reading materials (including but not limited to slides, R codes, textbooks). Those reading materials provide a basis for understanding course content and participating in class discussion. Thus, those materials must be read prior the class. Some in-classes quizzes based on reading materials might also be given prior lecturing.

While there are no required textbooks for this class, the following references--particularly the Grolemund and Wickham text, which is freely available at the link provided---are highly recommended.

1. “R for Data Science by Hadley Wickham and Garrett Grolemund”. Only selected chapters will be covered. You can use your campus ID and password to access this book for free (may need S&T VPN) by visiting <https://proquest.safaribooksonline.com/9781491910382>
2. “R in Action, Second Edition: Data analysis and graphics with R by Robert Kabacoff”. Only selected chapters will be covered. You can use your campus ID and password to access this book for free (may need S&T VPN) by visiting <https://proquest.safaribooksonline.com/9781617291388>
3. Other materials

The instructor will provide other reading materials (refer to Canvas for more details).

# GRADING

Course grading is composed of evaluations of the following components:

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| --- | --- |
| ***Grading Component*** | ***Weight*** |
| Lab Assignments | 30% |
| Exam 1 | 20% |
| Exam 2 | 20% |
| Exam 3 | 20% |
| Participation | 10% |
| Total | 100% |

The weighted percentage students have earned for all components will be rounded to the nearest hundredth. For example, 79.49% would be 79%, and 89.51% would be 90%. Then the final letter grade will be assigned as follows:

|  |  |
| --- | --- |
| ***Grade*** | ***Percentage*** |
| A | >= 90% |
| B | < 90% |
| C | < 80% |
| D | < 70% |
| F | < 60% |

I do NOT curve grades. Students must be fully prepared to earn points as many as possible through the semester.

# LEARNING OBJECTIVES

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| --- | --- | --- | --- | --- |
| **Course Objectives** | **Program Learning Objectives** | | | |
| **Communication** | **Critical Thinking** | **Teamwork** | **Technology Proficiency** |
| To obtain an overview of data science and data management | X |  |  |  |
| To learn R programming language for data management and analysis |  | X |  | X |
| To obtain a set of basic methods and skills used to collect and manipulate data |  | X |  | X |
| To develop an understanding of descriptive and predictive analytics |  | X |  | X |
| Be able to build and evaluate linear and nonlinear regression models for prediction |  | X |  | X |
| Be able to build and evaluate simple classification models |  | X |  | X |
| Be able to apply various techniques and skills to solve real business cases | X | X | X | X |

# TENTATIVE SCHEDULE (Subject to changes).

# Be sure to check Canvas for updates.

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| --- | --- | --- |
| **Week** | **Topic** | **Important Dates** |
| W1: Jan 20, 22 | Course Introduction: syllabus  1. Intro to Data Science |  |
| W2: Jan 25, 27, 29 | 2. Intro to R Programming |  |
| W3: Feb 1, 3, 5 | 2. Intro to R Programming |  |
| W4: Feb 8, 10, 12 | 3. Data Basics |  |
| W5: Feb 15, 17, 19 | 3. Data Basics |  |
| W6: Feb 22, 24, 26 | Review of Ch 1-3, Exam 1, exam review | **Exam 1 on Feb 24** |
| W7: Mar 1, 3, 5 | 4. Cleansing and Manipulating Data |  |
| W8: Mar 8, 10 | No class on Mar 12 (Spring Recess)  4. Cleansing and Manipulating Data | Mar 11-12 (Spring Recess) |
| W9: Mar 15, 17, 19 | 5. Data Summarization and Visualization |  |
| W10: Mar 22, 24, 26 | No Class on Mar 22, 24, 26 (Spring Break) | Mar 22-26 (Spring Break) |
| W11: Mar 29, 31, Apr 2 | 5. Data Summarization and Visualization |  |
| W12: Apr 5, 7, 9 | Review of Ch 4-5, Exam 2, exam review | **Exam 2 on Apr 7** |
| W13: Apr 12, 14, 16 | 6. Data Exploration | Apr 16: Last day to drop a class |
| W14: Apr 19, 21, 23 | 6. Data Exploration |  |
| W15: Apr 26, 28, 30 | 7. Regression Analysis |  |
| W16: May 3, 5, 7 | 7. Regression Analysis | **Exam 3 on May 7** |

# POLICIES

## Lab Assignment Policy and Lab Survival Guide

**1.1 Lab activities**

The Lab session is scheduled for Fridays. All scheduled lectures (usually on Mondays and Wednesday s) will have an associated lab component. Lab attendance is mandatory, and counts toward your course grade. During the lab sessions, students will get hands-on practice with the week's material by working on assigned lab activities. Tasks may include but are not limited to: running or modifying code from the lecture, or completing coding exercises. During weeks where Friday sessions are cancelled due to holidays, you are still expected to attempt and submit the labs.

It is to your benefit to come to lab having already gone through at least a portion of the lab guide, just like it is beneficial to come into lecture having read all the course readings assigned for that day. I will assign study groups and you are encouraged to discuss lab assignments with your fellow students in the same group. However, the work you submit must be your own. You must acknowledge in your submission any help received on your assignments. That is, you must include a comment in your homework submission that clearly states the name of the student, book, or online reference from which you received assistance. **Copied work will receive no credit.**

Instruction for lab assignments will be posted on Canvas. Each assignment must be submitted by the due time. The assignment must be submitted through Canvas unless the instructor requests another channel. Students who fail to submit an assignment before the deadline will be given additional 24 hours to submit the assignment to the instructor for legitimate reasons (e.g., documented illness). Late submissions will receive a penalty of 40% of the points assigned to that specific assignment. No credit will be given for assignments submitted more than 24 hours after their original due time. It is your responsibility to make sure that you properly submit the correct files.

**1.2 Lab Survival Guide (Written by David G. Kay, and revised by Dan Frost, Norman Jacobson, and Tracy Zou)**

To make your and your study group’s time in the IST 3420 as productive and pleasant as possible, we strongly recommend that you

**Prepare before coming to the lab session.** Read the assignment beforehand, think about how to do it, talk it over with your peers and ask questions about it. Then, when you get to the lab, you’ll be your most productive.

**Start early on each assignment.** Lab assignments in data science, more than in most disciplines, are time-consuming. You should start a lab as soon as it’s posted on Canvas; you can’t do a week-long lab in just a couple of hours. *Do not wait and begin a lab assignment only a few hours before the deadline!* Starting promptly reduces your frustration, since you’ll have time to ask questions when difficulties arise, and will have sufficient time to finish the lab.

**Pay close attention to detail.** Data science, more than many other disciplines, requires precise, literal attention to detail. Take things slowly and deliberately. Wring every bit of information you can out of the assignment description; read the lab assignment questions carefully to know what they require of you.

**Remember you’re not alone.** As you work on your assignments, we encourage you to seek assistance from your study group (obviously!) and from me during office hours. Be careful, though: if you receive so much help that, in effect, others did the assignment for you, it’s very likely that you will not have learned enough to pass the exams. To solve this issue, you’d better read the demo codes and slides first, search online (e.g. stackoverflow.com, rseek.org) as many people may have the same questions.

**Feel free to experiment**. Much of data science is learned by trial and error, trying things out to see what works. You will understand the syntax and models better and deeper by trial and error.

**Don’t lose it**. Computers can be frustrating; it’s challenging to communicate with a dumb machine. If you feel like losing your temper (and nearly everyone who works with computers occasionally does), take a deep breath and remember: It’s only a machine. It’s only an assignment. It’s only a class. Someone is available who can help you find a way out of your difficulty (especially if you’ve started early and left adequate time).

## Exams

Exams are closed book and closed note. No make-up exam allowed unless you ask in advance (and the instructor agrees) that a significant life-event prevents you from attending the exam.

We will use Proctorio for remote proctoring for our online exams. Google Chrome on a laptop or desktop computer, a microphone, webcam, and a stable internet connection will be needed to take Proctorio exams. More details are available at <https://keeplearning.umsystem.edu/students/learning-remotely/taking-proctorio-tests>

## Attendance and Participation

Participation and in-class activity points cannot be made up if the student is absent. The instructor will check attendance during the semester. Four missing classes will be ignored in calculating your final grade at the end of the semester. Because students are given a leeway of four missing classes, doctor’s notes and other excuses are not accepted for absences. Missing one more additional class will lower your final grade by 1%. For example, if you miss 6 classes in the semester for whatever reason, your final grade will be lowered by 2%.

Attendance is a prerequisite, not a substitute for class participation. Students should be fully prepared for each class. The instructor will ask students questions in the class. Your participation points obtained will reflect the quality of your answers and your motivation for class participation.

In-class activities such as exercises and unannounced quizzes should be submitted before the class session ends if not specified otherwise. Late submissions will not be accepted.

## Readings

Reading materials will be assigned for corresponding sessions. Readings provide the basis for lecture and class discussions. Thus, corresponding materials **must** be read prior each class.

Check Canvas for reading assignments.

## Zoom

NOTE: Class meetings on Zoom (including video, audio, and chat text) will be recorded. You are expected to be professional and respectful when attending class on Zoom.

Sign in with your full first name and last name as listed on the class roster. Turn on your video when possible. It is helpful to be able to see each other, just as in an in-person class. If you have limited internet bandwidth or no webcam, it is ok to not use video. If you're unable to find an environment without a lot of visual distractions, it is also ok to turn off your video. Mute your microphone when you are not talking. This helps eliminate background noise. Find a quiet, distraction-free spot to log in. Turn off any music, videos, etc. in the background.

## Title IX

Missouri University of Science and Technology is committed to the safety and well-being of all members of its community. US Federal Law Title IX states that no member of the university community shall, on the basis of sex, be excluded from participation in, or be denied benefits of, or be subjected to discrimination under any education program or activity. Furthermore, in accordance with Title IX guidelines from the US Office of Civil Rights, Missouri S&T requires that all faculty and staff members report, to the Missouri S&T Title IX Coordinator, any notice of sexual harassment, abuse, and/or violence (including personal relational abuse, relational/domestic violence, and stalking) disclosed through communication including but not limited to direct conversation, email, social media, classroom papers and homework exercises.

Missouri S&T’s Title IX Coordinator is Neil Outar. Contact him directly ([naoutar@mst.edu](mailto:naoutar@mst.edu); (573) 341-6038; 605 W. 11th St.) to report Title IX violations. To learn more about Title IX resources and reporting options (confidential and non-confidential) available to Missouri S&T students, staff, and faculty, please visit <http://titleix.mst.edu>.

## Student Honor Code and Academic Integrity:

Please take a few minutes to stress the importance of academic integrity in class. Discuss why it should matter to the student, why it matters to you and your discipline, why it matters to Missouri S&T, and why it matters to future employers. Include a statement on your syllabus about the Honor Code developed and endorsed by the Missouri S&T Student Council: the Honor Code can be found at this link: <http://stuco.mst.edu/honor-code/>. Encourage students to read and reflect upon the Honor code and its emphasis on HONESTY and RESPECT.

Page 30 of the Student Academic Regulations handbook describes the student standard of conduct relative to the University of Missouri System's Collected Rules and Regulations section 200.010, and offers descriptions of academic dishonesty including cheating, plagiarism or sabotage (<http://registrar.mst.edu/academicregs/index.html>). Additional guidance for faculty, including the University’s Academic Dishonesty Procedures, is available on-line at <http://ugs.mst.edu>. Other informational resources for students regarding ethics and integrity can be found online at <http://ugs.mst.edu/academicintegrity/studentresources-ai>.

## S&Tconnect: <https://canvas.mst.edu/> (S&Tconnect icon on left toolbar)

S&Tconnect provides an enhanced system that allows students to request appointments with their instructors and advisors via the S&Tconnect calendar, which syncs with the faculty or staff member’s Outlook Exchange calendar. S&Tconnect will also facilitate better communication overall to help build student academic success and increase student retention. S&Tconnect Early Alert has replaced the Academic Alert system used by Missouri S&T. If training is needed, please contact Rachel Morris at rachelm@mst.edu or 341-7600.

## Classroom Egress Maps

Faculty should explain where the classroom emergency exits are located. Please include a statement in your course syllabus asking the students to familiarize themselves with the classroom egress maps posted on-line at: <http://designconstruction.mst.edu/floorplan/>.

## Accessibility and Accommodations

It is the university’s goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, please contact Disability Support Services at (573) 341-6655, [dss@mst.edu](mailto:dss@mst.edu), or visit <http://dss.mst.edu/> for information, or go to [mineraccess.mst.edu](file:///C:\Users\cz87c\Desktop\mineraccess.mst.edu) to initiate the accommodation process.

*\*Please be aware that any accessible tables and chairs in this room should remain available for students who find that standard classroom seating is not usable.*

## LEAD Learning Assistance <http://lead.mst.edu>

The Learning Enhancement Across Disciplines Program (LEAD) sponsors free learning assistance in a wide range of courses for students who wish to increase their understanding, improve their skills, and validate their mastery of concepts and content in order to achieve their full potential. LEAD assistance starts no later than the third week of classes. Check out the online schedule at <http://lead.mst.edu/assist>, using zoom buttons to enlarge the view. Look to see what courses you are taking have collaborative LEAD learning centers (bottom half of schedule) and/or Individualized LEAD tutoring (top half of the schedule). For more information, contact the LEAD office at 341-7276 or email lead@mst.edu.

## The Burns & McDonnell Student Success Center

The Student Success Center is a centralized location designed for students to visit and feel comfortable about utilizing the campus resources available. The Student Success Center was developed as a campus wide initiative to foster a sense of responsibility and self-directedness to all S&T students by providing peer mentors, caring staff, and approachable faculty and administrators who are student centered and supportive of student success. Visit the B&MSSC at 198 Toomey Hall; 573-341-7596; success@mst.edu; facebook: [www.facebook.com/SandTssc](http://www.facebook.com/SandTssc); web: <http://studentsuccess.mst.edu/>

If you have any questions about the information listed above, please contact the Office of Undergraduate Studies at 573-341-7276.