**MET AD 616, Enterprise Risk Analytics**

The course offers a quantitative approach to estimating and managing risk across various industries. The major risk categories of the enterprise risk management such as financial risk, strategic risk and operational risk will be discussed and risk analytics approaches for each of these risks will be covered. Students will learn how to use interlinked data-inputs, analytics models, business statistics, optimization techniques, simulation, and decision-support tools. The course extensively utilizes statistical concepts along with an in-depth treatment of Risk using R Programming language. Specifically, the course will focus on covering Input Modeling techniques with uncertainty, Stochastic Optimization, Decision Trees with uncertainty and Bayesian Inference in determining causality and input processes. The course also covers introductory level Stochastic Programming concepts associated with 2-stage stochastic decision problems. Finally, the course has a final team project where each team will take up a real business case with data across industries ranging from Private Equity, Healthcare, Venture Capital and Supply Chain and solve the case as a team and make a presentation on the decisions made taking uncertainty and risk into consideration.

[4 cr.]

**Prerequisite**

MWAM, SWAM, ADR100, ADR200, AD571

**Learning Objectives**

During this course you will be able to:

* learn to use interlinked data-inputs
* learn about different analytics models
* model decisions
* learn about optimization techniques
* extensively work in R to include Uncertainty in Decision making
* Build your own decision support tools

By successfully completing this course you will be able to:

* use interlinked data-inputs
* discuss different analytics models
* explain business statistics
* Use optimization techniques over uncertainty
* recognize different simulations
* Build your own quantitative repertoire

**Course Instructor:**

David Ritt

Lecturer

Metropolitan College, Boston University

1010 Commonwealth Avenue

Boston, MA 02215

**Email:** [dmritt@bu.edu](mailto:dmritt@bu.edu)

**Course Resources**

**Recommended Textbooks**

Wickham, H. and Grolemund, G. (2017). R for Data Science. O'Reilly Media. An online e-book is available for free at [R for Data Science's site.](https://r4ds.had.co.nz/)

Students shall purchase one of [these business cases](https://hbsp.harvard.edu/import/669671) directly from HBP.

**Materials on Library e-Reserves**

This course requires additional readings provided through library eReserves. To access the

reading list through eReserves, click “Course Reserves” in the left-side course menu. The list

will open on a new page.

These are not required readings but may be useful in your studies during this course and are

recommended:

Note: These materials cover what we cover in the entire class. Therefore, it will be more efficient if you start looking at them after a certain week in the class.

*Essentials of Business Analytics*, Camm et al., *2015*, Cengage Learning

* Chapter 11: Monte-Carlo Simulation (Browse after Module 3)
* Chapter 12: Decision Analysis (Browse after Module 6)

*Business Analytics: Methods, Models, and Decisions*, 2e, Evans, James, *2016*, Pearson

* Chapter 12: Monte Carlo Simulation and Risk Analysis (Browse after Module 3)
* Chapter 16: Decision Analysis (Browse after Module 6)

*Spreadsheet Modeling & Decision Analysis: A Practical Introduction to Business Analytics*, 7e,

Ragsdale, Cliff T., *2016*, Cengage Learning

* Chapter 12: Introduction to Simulation Using Analytic Solver Platform (Browse after

Module 3)

* Chapter 14: Decision Analysis (Browse after Module 6)

*Business Analytics: Data Analysis and Decision Making*, Albright, S. C. and W. L. Winston,

*2015*, Cengage Learning

* Chapter 6: Decision Making Under Uncertainty (Browse after Module 6)
* Chapter 15: Introduction to Simulation Modeling (Browse after Module 3)

**Boston University Library Information**

Boston University has created a set of videos to help orient you to the online resources at your

disposal.

All of the videos in the series are available on the [Online Library Resources](https://onlinecampus.bu.edu/bbcswebdav/courses/00cwr_odeelements/library/library_videos/ode_elements_library.html) page, which is also accessible from the Campus Bookmarks section of your Online Campus Dashboard. Please feel free to make use of them.

As Boston University students, you have full access to the BU Library. From any computer, you can gain access to anything at the library that is electronically formatted. To connect to the library, use the link <http://www.bu.edu/library>. You may use the library's content whether you are connected through your online course or not, by confirming your status as a BU community member using your Kerberos password.

Once in the library system, you can use the links under “Resources” and “Collections” to find databases, eJournals, and eBooks, as well as search the library by subject. Some other useful links follow:

Go to [Collections](http://www.bu.edu/library/research/collections/) to access eBooks and eJournals directly.

If you have questions about library resources, go to [Ask a Librarian](http://www.bu.edu/library/help/ask-a-librarian) to email the library or use the live-chat feature.

To locate course eReserves, go to [Reserves](http://www.bu.edu/library/services/reserves/).

**Study Guide**

**Module 1 Study Guide and Deliverables**

Topics:

**Lectures 1:** Introduction to Enterprise Risk Analytics

**Lectures 2:** Analyzing Risk in the Enterprise

**Readings:** Lectures 1 and 2 online content

**Discussions:** Module 1 Discussion: Introduce Yourself (non-graded)

**Assignments:** Assignment 1: Individual Assignment covering Lecture 1 and Lecture 2

Assessments: Quiz 1

**Module 2 Study Guide and Deliverables**

**Topics**:

**Lectures 3:** Analyzing Risk: An Introduction to Modeling Uncertain Inputs

**Lectures 4:** Analyzing Risk: incorporating Uncertainty into the Decisions of the Enterprise

**Readings:** Lectures 3 and 4 online content

**Discussions:** Module 2 Discussion,Team and case assignments

**Assignments:** Assignment 2: Individual Assignment covering Lecture 3 and Lecture 4.

**Assessments:** Quiz 2

**Module 3 Study Guide and Deliverables**

**Topics:**

**Lectures 5:** Analyzing Risk: Modeling Input Data

**Lectures 6:** Analyzing Risk: Dealing with Correlated Data

**Readings:** Lectures 5 and 6 online content

**Discussions:** No discussion.

**Assignments:**

**Assignment 3:** Individual Assignment covering Lecture 5 and Lecture 6.

**Assessments:** Midterm

**Module 4 Study Guide and Deliverables**

**Topics:**

**Lectures 7:** Enterprise Decision Making under Uncertainty – I

**Lectures 8:** Enterprise Decision Making under Uncertainty – II

**Readings:** Lectures 7 and 8 online content

**Discussions:** Module 4 Discussion

**Assignments:**

**Tutorial:** Optimization libraries in R

**Assignment 4:** Individual Assignment covering Lecture 7 and Lecture 8.

**Assessments:** Quiz 3

**Module 5 Study Guide and Deliverables**

**Topics:**

**Lectures 9:** Decision Analysis in the Enterprise – I

**Lectures 10:** Decision Analysis in the Enterprise -II

**Readings:** Lectures 9 and 10 online content

**Discussions:** Module 5 Discussion

**Assignments:** Assignment 5: Individual Assignment covering Lecture 9 and Lecture 10.

**Tutorial:** Understanding the AD616 Package for Decision Trees

**Assessments:** Quiz 4

**Module 6 Study Guide and Deliverables**

**Topics:**

**Lectures 11:** Risk Analytics in Practice

**Lectures 12:** Course Summary & Lessons Learned

**Readings:** Lectures 11 and 12 online content, cases

**Discussions:** Module 6 Discussion

**Assignments:** None this week

**Assessments:** Quiz 5

**Module 7 Study Guide and Deliverables**

**Final Presentation:** The final presentation will be a team presentation with presentations and document submissions due on the week beginning of Lecture 12.

**Grading Structure and Distribution**

Your performance in the course will be graded in the following areas:

Group Discussion Forums 4 graded discussions @ max. 2 pts/discussion: 8%

Quizzes: 5 quizzes @ max. 3 pts/quiz: 15%

Assignments: 5 assignments @ max 7 pt/assignment: 35%

Midterm: 21%

Team Project 21%

**Grade Converter Table**

% Points Grade

96-100 4.00 A

91-95.99 3.67 A-

86-90.99 3.33 B+

81-85.99 3.00 B

76-80.99 2.67 B-

71-75.99 2.33 C+

66-70.99 2.00 C

61-65.99 1.67 C-

51-60.99 1.33 D

Under 50.99 0 F

**Timely Presentation of Materials Due**

All work requests from the teaching team (quizzes, assignments, contributions in the team work, etc.) have due dates. These are the LAST DATES that stated material is due. This means that it is a good idea to personally target dates before that date as your personal completion date to avoid difficulties. Please consider this a fact and not a subject for discussion. Dates are often viewed by students as the date to turn in an assignment. We view assignment due dates as the LAST DATE in which to turn in an assignment. With this warning please note that we are not inclined to accept late work and if late work should be accepted it will only be done only after considerable weighting of rationale and with penalty.

**Discussion Participation**

­­Over the course of the semester, you will be assigned 4 discussion topics. Some of them require you to respond to classmates. On these topics, your initial posts are due the end of the Monday before discussion is due. Your replies are due by the end of Wednesday (i.e. when the discussion is due).

Discussion topics can be found in the Discussion section of the Blackboard website.

**Quizzes**

There are five quizzes (the dates are given in the Study Guide). Quizzes will be available from Monday, starting at 9:00 AM ET, until Wednesday at 11:59 PM EST. You are expected to complete the quiz in 60 minutes. Each quiz will consist of 10 multiple choice and/or true/false questions. The questions in the quizzes will be derived from the online modules and readings. The quizzes are open-book and open notes.

Access quizzes from the "Assessments" section in the left-hand course menu.

**Assignments**

There are 5 Assignments each covering topics in module 1 to module 5. The assignments are due every week for online version of the class. All the assignments require you to use R to complete the assignments even though some of the initial assignments might be easier to complete in Excel. This is done to familiarize the approach using R for more complex cases as we navigate the course where Excel will not be sufficient. Each of the assignments require you to submit the R code along with a simple explanation of the approach you have taken. Please explain your answers as clearly as you can since the grading will devote a significant proportion to the approach even the final answer is incorrect.

**Final Project**

The final project is a case based decision making problem that needs to be solved as a team. The class will be split into teams of 4-5 and you will work together to solve an assigned case to you. The Case will be assigned to you before the 2nd week of the class. You will take the role of a management consultant team that will solve this problem with a quantitative background while making business sense. The case will be from one of the industry verticals typically a Harvard Business Case study. You will work with your team and treat it like a professional task and you will be able to use the elements you will learn in the course to solve the case. The case will require you to research additional information and look for sources of data if required beyond what is provided. This is done to mimic a realistic scenario given the applied nature of this course.

There are two deliverables for the final project. A presentation that you will present as a team and a case document that details your analysis and recommendation.

**Presentation**

You will deliver a presentation deck as a team that should contain the following

* A description of the business problem and the business situation
* A trivial solution or the obvious solution that does not take uncertainty into account
* Your modeling of the problem
* The Solution and what is the additional payoff or reduction of risk

**Case Document**

A document that summarizes your solution should be submitted along with the presentation. The document will have the form of a managerial report. You are welcome to be creative on how you present your case, but it should take the form of a convincing pitch from a consultant team who has been tasked to solve this problem.

**Grading**

The final project accounts for a large part of your evaluation of your performance in this course. Your grade will be an aggregate of two components.

**Team Grade**

The quality of the presentation and how convincing is it to the listener that your solution is comprehensive and delivers significant savings or risk reduction over a base case or deterministic decisions. This will be an overall team grade.

**Individual Grade**

The second part is the individual grading, which will be a peer reviewed grading. You will receive an anonymous survey link where you will rate each one of your team mates on their contribution including yourself on a total of 100 based on the % contribution towards the project. The % contribution will linear scale (interpolate) your team grade to your individual grade.

E.g. If your team of 5 has a team grade of 20/21, assuming equal contribution each member of your team (20% each) will be graded as 20\*5\*20/100 = 20.

**An Important Letter From Your Program Chairperson**

Dear Administrative Science Graduate Students:

A top priority of the Administrative Sciences Department is to protect the integrity of our Boston University master's degree programs. By formally pledging to uphold high standards of academic conduct each semester, you will help to protect the value of your hard work and your degree. Your agreement to uphold these standards provides you access to course content. We are certain that you share our values of academic honesty and integrity and understand the importance to your degree prestige that you help us to enforce them. To review Boston University's Metropolitan College Academic Code of Conduct Code, [click here](http://www.bu.edu/met/for-students/met-policies-procedures-resources/academic-conduct-code/).

On behalf of the Administrative Sciences faculty,

Irena Vodenska, Ph.D.

Professor, Chair of the Department of Administrative Sciences

**Academic Conduct Policy**

Please visit Metropolitan College's website for the full text of the department's [Academic Conduct Code](http://www.bu.edu/met/for-students/met-policies-procedures-resources/academic-conduct-code/).

**A Definition of Plagiarism**

"The academic counterpart of the bank embezzler and of the manufacturer who mislabels products is the plagiarist: the student or scholar who leads readers to believe that what they are reading is the original work of the writer when it is not. If it could be assumed that the distinction between plagiarism and honest use of sources is perfectly clear in everyone’s mind, there would be no need for the explanation that follows; merely the warning with which this definition concludes would be enough. But it is apparent that sometimes people of goodwill draw the suspicion of guilt upon themselves (and, indeed, are guilty) simply because they are not aware of the illegitimacy of certain kinds of "borrowing" and of the procedures for correct identification of materials other than those gained through independent research and reflection."

"The spectrum is a wide one. At one end there is a word-for-word copying of another’s writing without enclosing the copied passage in quotation marks and identifying it in a footnote, both of which are necessary. (This includes, of course, the copying of all or any part of another student’s paper.) It hardly seems possible that anyone of college age or more could do that without clear intent to deceive. At the other end there is the almost casual slipping in of a particularly apt term which one has come across in reading and which so aptly expresses one’s opinion that one is tempted to make it personal property."

"Between these poles there are degrees and degrees, but they may be roughly placed in two groups. Close to outright and blatant deceit-but more the result, perhaps, of laziness than of bad intent-is the patching together of random jottings made in the course of reading, generally without careful identification of their source, and then woven into the text, so that the result is a mosaic of other people’s ideas and words, the writer’s sole contribution being the cement to hold the pieces together. Indicative of more effort and, for that reason, somewhat closer to honest, though still dishonest, is the paraphrase, and abbreviated (and often skillfully prepared) restatement of someone else’s analysis or conclusion, without acknowledgment that another person’s text has been the basis for the recapitulation."

The paragraphs above are from H. Martin and R. Ohmann, *The Logic and Rhetoric of Exposition, Revised Edition*. Copyright 1963, Holt, Rinehart and Winston.

**Academic Conduct Code**

1. Philosophy of Discipline

The objective of Boston University in enforcing academic rules is to promote a community atmosphere in which learning can best take place. Such an atmosphere can be maintained only so long as every student believes that his or her academic competence is being judged fairly and that he or she will not be put at a disadvantage because of someone else’s dishonesty. Penalties should be carefully determined so as to be no more and no less than required to maintain the desired atmosphere. In defining violations of this code, the intent is to protect the integrity of the educational process.

1. Academic Misconduct

Academic misconduct is conduct by which a student misrepresents his or her academic accomplishments, or impedes other students’ opportunities of being judged fairly for their academic work. Knowingly allowing others to represent your work as their own is as serious an offense as submitting another’s work as your own.

1. Violations of this Code

Violations of this code comprise attempts to be dishonest or deceptive in the performance of academic work in or out of the classroom, alterations of academic records, alterations of official data on paper or electronic resumes, or unauthorized collaboration with another student or students. Violations include, but are not limited to:

* 1. Cheating on examination. Any attempt by a student to alter his or her performance on an examination in violation of that examination’s stated or commonly understood ground rules.
  2. Plagiarism. Representing the work of another as one’s own. Plagiarism includes but is not limited to the following: copying the answers of another student on an examination, copying or restating the work or ideas of another person or persons in any oral or written work (printed or electronic) without citing the appropriate source, and collaborating with someone else in an academic endeavor without acknowledging his or her contribution. Plagiarism can consist of acts of commission-appropriating the words or ideas of another-or omission failing to acknowledge/document/credit the source or creator of words or ideas (see below for a detailed definition of plagiarism). It also includes colluding with someone else in an academic endeavor without acknowledging his or her contribution, using audio or video footage that comes from another source (including work done by another student) without permission and acknowledgement of that source.
  3. Misrepresentation or falsification of data presented for surveys, experiments, reports, etc., which includes but is not limited to: citing authors that do not exist; citing interviews that never took place, or field work that was not completed.
  4. Theft of an examination. Stealing or otherwise discovering and/or making known to others the contents of an examination that has not yet been administered.
  5. Unauthorized communication during examinations. Any unauthorized communication may be considered prima facie evidence of cheating.
  6. Knowingly allowing another student to represent your work as his or her own. This includes providing a copy of your paper or laboratory report to another student without the explicit permission of the instructor(s).
  7. Forgery, alteration, or knowing misuse of graded examinations, quizzes, grade lists, or official records of documents, including but not limited to transcripts from any institution, letters of recommendation, degree certificates, examinations, quizzes, or other work after submission.
  8. Theft or destruction of examinations or papers after submission.
  9. Submitting the same work in more than one course without the consent of instructors.
  10. Altering or destroying another student’s work or records, altering records of any kind, removing materials from libraries or offices without consent, or in any way interfering with the work of others so as to impede their academic performance.
  11. Violation of the rules governing teamwork. Unless the instructor of a course otherwise specifically provides instructions to the contrary, the following rules apply to teamwork: 1. No team member shall intentionally restrict or inhibit another team member’s access to team meetings, team work-in-progress, or other team activities without the express authorization of the instructor. 2. All team members shall be held responsible for the content of all teamwork submitted for evaluation as if each team member had individually submitted the entire work product of their team as their own work.
  12. Failure to sit in a specifically assigned seat during examinations.
  13. Conduct in a professional field assignment that violates the policies and regulations of the host school or agency.
  14. Conduct in violation of public law occurring outside the University that directly affects the academic and professional status of the student, after civil authorities have imposed sanctions.
  15. Attempting improperly to influence the award of any credit, grade, or honor.
  16. Intentionally making false statements to the Academic Conduct Committee or intentionally presenting false information to the Committee.
  17. Failure to comply with the sanctions imposed under the authority of this code.

**Disability Services**

In accordance with University policy, every effort will be made to accommodate unique and special needs of students with respect to speech, hearing, vision, or other disabilities. Any student who feels he or she may need an accommodation for a documented disability should contact [Disability & Access Services](http://www.bu.edu/disability) at (617) 353-3658 or at access@bu.edu for review and approval of accommodation requests.

**Technical Support**

**Experiencing Issues with BU Websites or Blackboard?**

It may be a system-wide problem. Check the BU Information Services & Technology (IS&T) [news page](http://www.bu.edu/tech/news/) for announcements.

Boston University technical support is available via email (ithelp@bu.edu), the [support form](http://www.bu.edu/help/tech/learn), and phone (617-353-4357). Please note that the IT Help Center has multiple locations. All locations can be reached through the previously mentioned methods. For IT Help Center hours of operation, please visit their [contact page](http://www.bu.edu/tech/contact/). For other times, you may still submit a support request via email, phone, or the support form, but your question won't receive a response until the following day. If you aren't calling, it is highly recommended that you submit your support request via the technical-support form, as this provides the IS&T Help Center with the best information in order to resolve your issue as quickly as possible.

Examples of issues you might want to request support for include the following:

* Problems viewing or listening to sound or video files
* Problems accessing internal messages
* Problems viewing or posting comments
* Problems attaching or uploading files for assignments or discussions
* Problems accessing or submitting an assessment

To ensure the fastest possible response, please fill out the online form using the link below:

IT Help Center Support

617-353-4357 or [Web](http://www.bu.edu/help/tech/learn)

Check your open tickets using [BU’s ticketing system](http://bu.service-now.com/tech/)