Syllabus for MATH 2321, Calculus 3 for Science and Engineering
Northeastern University, Fall 2016

INSTRUCTOR: **Dr. Maxim Braverman**
CONTACT INFO: office: 457 Lake, e-mail: maximbraverman@neu.edu
OFFICE HOURS: Monday and Thursday: 11:45-12:45 or by appointment
TEXTBOOK: *Worldwide Multivariable Calculus,* by David B. Massey
PDF and printed versions available at: http://www.centerofmath.org/textbooks/multicalc/index.html
The PDF is priced at $9.95, while the black and white (grayscale) soft-back printed version is $29.95. The PDF textbook contains a link, at the beginning of each section, to one or more free video lectures, by Prof. Massey, on the contents of that section. To use the textbook on an iPad, we recommend the free Adobe Reader app. It is absolutely **NOT** required that you purchase a printed textbook.

WEB MATERIALS: Some of the material will be found at http://www.northeastern.edu/braverman/teaching.html - MTH2321
All the materials will be on blackboard.

HOMEWORK AND QUIZZES: Homework will be assigned daily, but <u>will not be collected</u>. Each Thursday, there will be a short quiz. Most problems on the quiz will be taken verbatim from homework.

MIDST-TERMS AND FINAL EXAMS: There will be a midst-term exams, and a final exam in this course. The midst-term exam is 65-minute in-class exams; it will be on Thursday, Nov. 3. On the midst-term exams and final exam, you may use one 8.5x11" one-sided sheet of notes.
The final exam date is to be determined. **Check for exam schedule conflicts before Sept. 30**.

GRADING: The course grade will be determined as follows:
Final exam: 40%
Midst-term exams: 30.
Quizzes: 30%. I will drop two of your worst quiz grades.

RECITATION SESSIONS:
Mondays, 5-6:40pm, 415 Shillman
Tuesdays, 1:35-3:15pm, 220 Behrakis
Wednesdays, 2:50-4:30pm, 150 Forsyth

ADDITIONAL RESOURCES:
The Mathematics Department Tutoring Center is in Room 540B, Nightingale Hall. This peer tutoring is free. Peer Tutoring appointments can be booked via MyNEU under TUTORING. Although you can walk in, it is really best to sign up in advance. Tutoring requests are scheduled by students in real-time and confirmed by email. Next-day appointments must be booked by 9:00 pm the previous day. It is expected that tutoring services in the Mathematics Department Tutoring Center will begin shortly after the start of classes. See http://www.northeastern.edu/csastutoring/setting-up-appointments/ For more information about peer tutoring. The College of Engineering also provides tutoring for Calculus. See http://www.coe.neu.edu/coe/undergraduate/studentservices/tutoringinCOE.html for details.
 The PDF textbook contains links at the beginning of each section to online full-length, free, video lectures on the contents of that section. These videos can also be accessed directly by going to: http://www.centerofmath.org/videos/index.html - subject5.

ISSUES WITH THE COURSE/INSTRUCTOR: If you have issues with this course and/or instructor which you are not comfortable discussing with your instructor, you should contact the Undergraduate Director, Prof. D. King, at d.king@neu.edu .

Schedule of Topics and Suggested Homework Exercises

Week 1 (partial): Sept. 7-9
Review §1.2 R^n as a vector space #1, 3, 5, 7, 9, 10, 13-16, 19-21, 23-24, 27, 29, 33, 36, 41-43, 45, 46 + §1.3 Dot product, angles, and orthogonal projection #1-4, 9-12, 17-19, 22, 23, 27-30, 33-35, 45-48
Review §1.4 Lines, planes, and hyperplanes #1-4, 9-12, 13-17, 19, 21-23, 27-30 + §1.5 Cross product #1-4, 9-12, 17-20, 27-29, 31, 35, 37, 41

Week 2: Sept. 12-16
Review §1.6 Functions of a single variable #1, 4, 5, 7, 9, 10, 18, 19, 21-25, 29, 33-35
§1.7 Multivariable functions #1, 2, 4, 7-10, 15, 17-19, 21, 27, 28
§1.8 Graphing surfaces #1-10, 11-15, 19, 20, 23, 25

Week 3: Sept. 19-23
§2.1 Partial derivatives #1, 2, 5, 7, 13, 16, 18, 19, 22, 27, 29, 32, 34
§2.3 Linear approximation, tangent planes, and the differential   #1, 3, 5, 6, 11, 12, 15, 17, 22, 23
§2.4 Differentiation rules #1-4, 8, 19, 20, 23, 25, 27, 31, 32

Week 4: Sept. 26-30
§2.5 Directional derivatives #1, 3, 5-7, 11-13, 19-21, 25-27, 33-35, 37
Tuesday, Sept. 27: last day to withdraw without a W
§2.7 Level sets and gradient vectors #1-3, 7-13, 17, 18, 21, 24
Friday, Sept. 30: last day to file a final exam conflict form
§2.8 Parameterizing surfaces #1-3, 5, 9-11, 17-19, 21, 29, 30

Week 5: Oct. 3-7
§2.9 Local extrema #1-6, 9-14, 17-20, 35
§2.10 Optimization #1, 2, 7, 8, 9, 10, 13, 17, 19, 20
§2.11 Lagrange multipliers #1, 3, 12, 13, 15, 19, 23, 27, 29

Week 6 (partial): Oct. 11-14
Monday, Oct. 10: Columbus Day - no classes
§3.1 Iterated integrals #1, 3, 4, 5, 9, 16, 17-24, 27, 28
§3.2 Integration in R^2 #1-3, 6-8, 17, 18, 23, 24, 27-29, 31-33

Week 7: Oct. 17-21
§3.3 Polar coordinates #1-7, 17
§3.4 Integration in R^3 and R^n #1, 3, 6, 7, 9, 11, 13, 14, 16-18, 20
§3.5 Volume #1-3, 9-11, 17, 18

Week 8: Oct. 24-28
§3.6 Cylindrical and spherical coordinates #1-3, 7-9, 13-15, 19-21, 25-27, 31, 32, 35, 36
§3.8 Density and mass #1, 2, 7-10
§3.11 Surfaces and area #1-3, 9, 11-13, 15-17, 19-21

Week 9: Oct.31-Nov. 4
Review before the midst-term exam
Midst-term exam on Thursday, November 3

Week 10: Nov. 7-10
Solutions of the midst-term problems
§4.1 Vector fields #1, 3, 7, 8-14, 17, 18, 21, 22, 26-28
§4.2 Line integrals #1-3, 7, 8, 15, 16, 18-20, 23, 25, 27
Friday, Nov. 11: Veterans' Day - no classes

Week 11: Nov. 14-18
§4.3 Conservative vector fields (1st day) #1-3, 7-9, 15-17, 23, 24, 27, 33, 35, 41, 43
§4.3 Conservative vector fields (2nd day) #1-3, 7-9, 15-17, 23, 24, 27, 33, 35, 41, 43
§4.4 Green's Theorem #1, 3, 5, 7-9, 13, 15

Week 12 (partial): Nov. 21-22
Wednesday, Nov. 25-27: Thanksgiving break - no classes
§4.5 Flux through a surface #1, 2, 7, 9, 10, 11, 15, 19, 20

Week 13: Nov. 28 - Dec. 2
§4.6 The Divergence Theorem   #1-4, 6-11
§4.7 Stokes' Theorem   #1, 2, 5, 6, 9, 10, 17
Review

Week 14 (partial): Dec. 7-9
Review

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Thursday, Dec. 10: last day to withdraw with a W
Thursday, Dec. 8: reading day
Friday, Dec. 9- Friday, Dec 16: final exams

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