**Rensselaer Polytechnic Institute**  
**Department of Mathematical Sciences**  
*Syllabus (January 9, 2010) Math 4600 (Advanced Calculus)*  
*Advanced Calculus* by G. B. Folland, 2001, Prentice Hall (*recommended*)

<table>
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<th>Week</th>
<th>Dates</th>
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| 1    | 1/25 – 29 | 2.3      | Introduction to $\mathbb{R}^n$. Differentiation of functions $f: \mathbb{R}^n \rightarrow \mathbb{R}^n$  
HW 2.3 # 1, 3, 5, 9, 11, 14, 20, 21, 23, 47ac, 51 |
| 2    | 2/01 – 05 | 2.4      | Properties  
HW 2.4 # 1, 5, 10, 11, 15, 17, 21bc, 22bc |
| 3    | 2/08 – 12 | 2.5, 2.6 | Chain rule. Directional derivative  
HW 2.5 # 2, 4, 9, 14, 20, 22, 24;  
2.6 # 2, 4, 10ab, 16, 19, 34; 2.8 # 33a, 36a, 43 |
| 4    | 2/19      | 3.4      | Gradient, Divergence and Curl  
HW 3.4 # 1, 4, 6, 10, 14, 15, 20, 26, 28, 29, 34 |
|      |           |          | Taylor Formula. Extrema.  
HW 4.1 # 9, 11, 14, 16, 22, 34a  
4.2 # 1, 4, 5, 7, 10, 17, 19, 23ab, 33, 36, 37 |
| 5    | 2/22 -26  | 4.1, 4.2 | Inversion Theorem |
| 6    | 3/01      |          | Implicit Function Theorem  
HW # 2.6 # 48, 49; 2.6 # 41ab, 42, 43, 46 |
|      |           |          | Lagrange Multipliers. HW 4.3 # 4, 5, 6, 7, 17, 19, 28 |
|      |           |          | Integrals depending on a parameter  
This section on multiple integration is recommended for personal reading |
| 7    | 3/15 – 19 |          | The Principle of uniform Convergence for integrals and series; its properties and applications.  
Fundamental Lemma of the Calculus of Variations. Euler Equation.  
Curves and line integrals. Green’s Theorem  
HW 6.1 # 2, 4, 7, 10, 12, 13, 18, 20  
6.2 # 1, 2, 4, 6, 7, 14, 19, 21, 25 |
| 8    | 3/22 – 26 | 4.3      | Independence of path. HW 6.3 # 1, 3, 4, 9, 11, 14, 19, 21 |
|      |           | 5.5      | Surfaces. Surface integrals  
HW7.1 # 1, 3, 4, 7, 22, 24, 25; 7.2 #2, 7, 9, 10, 14, 17, 20 |
| 9    | 3/29 – 4/2|          | Stokes Theorem  
HW 7.3 # 1, 2, 3, 10, 13, 17 |
| 10   | 4/05 – 09 | 6.1, 6.2 | Gauss Divergence Theorem and its applications  
HW 7.3 # 6, 7, 9, 14, 18, 19 |
| 11   | 4/12 - 16 | 6.3      | Exam # 2 is on Friday, April 23 |
| 12   | 4/19 – 23 | 7.1, 7.2 | Exam # 3 is on Friday, May 07 |
| 13   | 4/26 - 30 | 7.3      | May 11 is the last day of classes. |
| 14   | 5/3 - 7   | 7.3      | |

**Grading System:** Exam #1 25%, exam # 2 25%, Exam #3 20%, Homework 25%,  
Attendance and Participation 5%. No Final  
**Instructor:** Dr. Mohamed T. Boudjelkha  
Office: 404 Amos Eaton Hall. Office Hours: M, W, and TH from 10:00 to 10:50. Phone: 2725.  
E-mail: boudjm@rpi.edu

**Note:** The homework problems to be handed in and graded will be posted almost every week on RPI Mathematical Sciences website. These problems are a subset of the problems on this syllabus.
Learning outcomes for Math 4600 (Mohamed Boudjelkha)

Students who successfully complete the course at the end of the semester will be able to demonstrate the following:

- Solve problems on differentiation of functions of several variables.
- Be able to demonstrate and use Taylor formula for functions of several variables.
- Be able to explain and use the concepts of gradient, divergence and curl.
- Be able to demonstrate and apply the Inversion Theorem, as well as the Implicit Function Theorem.
- Be able to solve problems of the maximum and minimum of functions of several variables.
- Be able to explain and apply the Lagrange multipliers method to find the extremum of functions of several variables with constraints.
- Be able to solve problems with integrals and series depending on a parameter and apply the principle of uniform convergence and its properties to solve problems in heat conduction and the wave equation.
- Explain and apply Green’s Theorem.
- Be able to explain and use the concept of independence of path.
- Explain and apply Stokes Theorem.
- Be able to explain and use Gauss Divergence Theorem in computing surface integrals, and solving boundary value problems by Green’s identities.

Academic Integrity

Student–teacher relationship are built on trust. For example, students must trust that teachers have made appropriate decisions about the structure and content of the course they teach, and teachers must trust that the assignments that students turn in are their own. Acts which violate this trust, undermine the educational process. The Rensselaer Handbook of Students Rights and Responsibilities define various forms of Academic Dishonesty and you should be familiar with these. In this class, all assignments that are turned in for a grade must represent the student’s own work. If you have any question concerning this policy, please ask before submitting an assignment.