UF Sergei Pilyugin
Department of Mathematics

Sergei S. Pilyugin
Courses
MAP 6327 Applied Differential Equations
MAA 5104/4102 Advanced Calculus (E and PS) 1
Publications
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Schedule

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MAA 5104/4102 Advanced Calculus (E and PS) 1

MAA 5104 & 4102 Introduction to Advanced Calculus E&PS 1 (Sections 3049 & 3044)

Instructor: Sergei S. Pilyugin http://people.clas.ufl.edu/pilyugin/courses/maa5104_f2015/

- Announcements:
  The (take home) midterms are scheduled as follows: M1 10/01–10/03, M2 11/19–11/21.
- Prerequisites: MAC 2313 (Calculus 3).
- Time and Room: MWF 5 (11:45 a.m – 12:35 p.m.), LIT 127.
- Final Exam Time and Room: Dec. 17, 3:00-5:00 p.m., LIT 127.
- Literature: Witold A. J. Kosmala, *A Friendly Introduction to Analysis* , Pearson, Prentice Hall, Upper Saddle River, NJ 07458.
- Critical dates: Aug. 24 (classes begin), Dec. 9 (classes end). Quizzes: TBA. Midterms: TBA.
- Holidays: Sep. 07 (Labor Day), Nov. 6-7 Homecoming, Nov. 11 (Veterans Day), Nov. 25-28 (Thanksgiving).
- Office Hours: MWF4 (10:40-11:30 a.m.) in LIT 458, or by appointment. Please, call me at 352-392-0281 X296 or use e-mail: pilyugin@ufl.edu for communication. For more details, see my schedule.
- Description and Objectives of the Course:

What is the difference between the advanced calculus and the calculus courses that you have taken? In the current course, we will revisit the same concepts as before (real numbers, sequences, functions, limits, continuity, differentiation and integration, etc), but we will treat them in a more accurate and rigorous way. So, the main difference is that we have PROOFS here.

Weekly Schedule:

W1: Proof techniques, mathematical induction;
W2: Ordered fields and the real number system, basic inequalities;
W3: Sequences, convergence, finite limits; monotone sequences;
W4: Cauchy sequences, subsequences;
W5: Applications of limits, transcendental number e;
W6: Limits of functions, sided limits;
W7: Continuity, properties of continuous functions;
W8: Uniform continuity;
W9: Applications of continuity, compact sets;
W10: Derivatives, properties of differentiable functions;
W11: Mean value theorems;
W12: Higher-order derivatives, L'Hopital's rule;
W13: Taylor's theorem and applications;
W14: Approximation of derivatives, convex functions.

- Grading System:
  Exams: 2 midterms (20 points each, possibly take-home); 1 (cumulative) final (30 points). Four quizzes based on homework assignments. You get maximum 10 points for each quiz, the best 3 count towards the grade. So, 30 points for Quizzes, 20 points for each Midterm Exam, 30 points for Final Exam, and 100 points altogether. Note: students that have scores in excess of 63 by the time the classes end, will be excused from taking the final and receive an automatic A.
  The resulting score determines the letter grade according to the following table

Letter Grade	A	A-	B+	B	B-	C+	C	C–	D+	D
Score	100 – 93	92 – 88	87 – 83	82 – 74	73 – 69	68 – 64	63 – 59	58 – 54	53 – 49	48 – 40

- Course policies:
- Closed-book policy: No use of calculators, or books will be allowed during any in-class tests/quizzes.
- Policy related to make-up exams or other work: There will be no opportunities to make up for work not submitted. However, if a student provides a legitimate excuse well in advance, scores will be prorated. Work with due date should be turned in at the beginning of class on the stated due date. Late work will not be accepted and will be deemed work not submitted.
- Policy on class attendance: Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.
- University's honesty policy: UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code". On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.
- For students with disabilities: Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.
- Students' evaluations of the course: Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results.
- Disclaimer: I reserve the right to change the above policies if situations warrant.

Homework problems for Advanced Calculus I Fall 2014

Section 1.3: 2, 3, 5;
Section 1.4: 1, 2, 4, 5;
Section 1.7: 1, 2, 3, 5, 11, 13--16;
Section 1.9: 13--17, 28--29, 32--34;

Section 2.1: 2,3, 5, 7, 10, 12, 14--17, 19--21;
Section 2.2: 3, 5, 8, 11, 15--17, 19, 21;
Section 2.3: 2, 3, 5, 7, 10, 11, 14, 16;
Section 2.4: 4--7, 9, 11, 13, 16, 17;
Section 2.5: 2, 3, 5--7, 11, 13, 15, 17--19;
Section 2.6: 2, 4, 5, 7, 9;
Section 2.7: 1--4, 6--8, 12--19, 22, 27, 28, 30--32, 35, 39,
42, 43, 45, 48, 50;

Section 3.1: 4, 5, 7, 8, 10, 11, 15;
Section 3.2: 1, 3, 8, 9, 13, 15;

Section 3.3: 4, 5, 8, 9, 10, 12, 13, 15;
Section 3.4: 1--7, 15, 17, 23, 24, 26, 41--43;

Section 4.1: 1, 2, 3, 5, 6, 9, 10;
Section 4.3: 1, 3, 7, 13, 14, 17, 18;
Section 4.4: 1, 2, 5, 10, 12, 13;
Section 4.5: 1, 2, 6, 9, 10--13, 20, 23, 27, 32, 43, 44;

Section 5.1: 2, 3, 6, 7, 9--12, 15;
Section 5.2: 1, 3, 6, 7, 12, 13;
Section 5.3: 1, 2, 4, 6, 7, 9--11, 15, 17, 19, 21, 27, 29;
Section 5.4: 2, 5, 8--10, 21--23, 27, 29, 30;
Section 5.6: 2, 4, 7, 9, 10, 15, 19, 22, 25, 35, 41, 51, 52;

For the final exam (Chapters 1-5):

Theorems to know (with proof):
Binomial theorem 1.3.7
Theorem 1.7.10 (sets Q and I are dense in R)
Theorem 2.1.11 (convergent sequences are bounded)
Theorem 2.2.6 (squeeze for sequences)
Theorem 2.3.7 (ratio test)
Theorem 2.4.4 (monotone sequences)
Theorem 2.5.4 (Bolzano-Weierstrass for sets)
Theorem 2.5.9 (Cauchy=convergent)
Theorem 2.6.4 (Bolzano-Weierstrass for sequences)
Theorem 4.3.5 (extreme value)
Theorem 4.3.6 (Intermediate value)
Theorem 4.4.6 (continuous on closed bdd set=> unif. continuous)
Theorem 5.3.1 (Rolle's theorem)
Theorem 5.3.3 (Lagrange's Mean Value theorem)

Definitions:
Limit of a sequence
Inf/Sup/Min/Max of a set
Accumulation point
Limit of a function
Sided limits
Limits at infinity
Infinite limits
Continuity
Uniform continuity
Derivative of a function

Homework problems for Advanced Calculus II Spring 2015

Section 5.3: 1, 2, 4, 6, 7, 9--11, 15, 17, 19, 21, 27, 29;
Section 5.4: 2, 5, 8--10, 21--23, 27, 29, 30;
Section 5.5: 1,6--8, 12, 13, 15;
Section 5.6: 2, 4, 7, 9, 10, 15, 19, 22, 25, 35, 41, 51, 52;

Section 6.1: 3, 4, 6, 8, 10;
Section 6.2: 1, 2, 5--8, 10, 11, 13, 14;
Section 6.3: 2, 4, 8, 11, 13, 14;
Section 6.4: 7, 10, 11, 13, 14, 18, 22;
Section 6.5: 9, 10, 16, 17, 20, 24;
Section 6.7: 1, 2, 3, 6, 11, 21, 22, 28, 29, 31;

Section 7.1: 1--5, 9, 10, 14, 16, 18;
Section 7.2: 1, 2, 5, 6, 9, 11, 13--15;
Section 7.3: 1, 2, 4, 7, 9, 13, 16, 19;
Section 7.4: 1, 2, 4, 5--8, 10, 11, 16, 20;
Section 7.5: 1--7, 9--16, 19, 21, 23--28, 34, 36--38, 41;

Section 8.1: 1, 2, 4, 5;
Section 8.2: 1--5, 8;
Section 8.3: 1, 5, 8--11;
Section 8.4: 1, 2, 5, 6, 8, 11, 12, 15, 18, 21;
Section 8.5: 2, 3, 6, 10, 13;

For the final exam, you will need to review the following
Theorems/Lemmas (statements and proofs): 5.3.1, 5.3.3, 5.4.8,
6.1.5, 6.2.2, 6.2.4, 6.3.3, 6.3.8, 6.3.10, 6.4.2, 6.4.4, 7.2.1,
7.2.10, 7.3.3, 7.4.2, 8.3.1, 8.3.5, 8.5.8;
(statements only): 6.5.16, 6.5.17, 7.6.2, 7.6.10, 8.3.6, 8.3.7,
8.4.6, 8.4.11, 8.4.13, 8.4.14, 8.4.15;
Definitions (with examples and counterexamples): Taylor's polynomial, Riemann integrable functions, Riemann integral, improper Riemann integral, absolute and conditional convergence of series, pointwise and uniform convergence, power series, radius and interval of convergence.