Math 501: Measure and Integration, Spring 2025; time 3-3:50 MWF; room Neckers 156

Instructor: David Olive *email:* dolive@siu.edu

Text: Royden, H.L. (1988), *Real Analysis*, 3rd ed., Macmillan Publishing Company, New York, NY. You may also use earlier and later editions.

Course Webpage: http://parker.ad.siu.edu/Olive/M501.html

Office: (J.W.) Neckers 261 (wing A) *Phone:* (618)-453-6566

(Office hours) Student Engagement: MWThF 11:45-1:15

I am also available by appointment and on a walkin basis.

The prerequisite for this class are Math 452. You should be familiar with limits, sequences, convergence, differentiation and Riemann integration at the level of Math 352 or 452.

This course covers Lebesgue measure and Lebesgue integration. Other topics include measurable functions, Fatou's lemma, monotone convergence theorem, dominated convergence theorem, Fubini's theorem, functions of bounded variation, absolutely continuous functions, L_p spaces, product measures, Radon-Nikodym theorem. This material is useful for functional analysis Math 502 and probability and measure Math 581.

Final: Tuesday, May 6, time 8-10 AM in the morning (emphasis is on the above topics).

The schedule below is tentative. (Drop day in Friday, March 25 with advisor, Sunday, March 27 online.)

2 homeworks may be turned in one class period late (ie on Monday) with no penalty. A third late will be accepted with 25% penalty. 2 quizzes may be taken late before the next class period (ie on Friday). Three sheets of notes are allowed on quizzes but **no notes are allowed for exams**. A scientific calculator is permitted. I sometimes give a $B+$ and $C+$.

Grading:

HW	300		Quizzes	100	
exam1	100	exam 2	100	exam 3	100
final	300			total	1000
min. grade	points	min. grade	points	min. grade	points
A	900-1000	B	800-899	C	700-799
D	550-699				

Week of	MON	WED	FRI
Jan 13	1.1-1.3,	1.3	1.4
Jan 20	no class	1.4, Q1	1.4, 2.7, HW1
Jan 27	2.7, sets, 1.6	1.5,1.6, Q2	2.7,2.1, HW2
Feb 3	2.1–2.5	2.5, Q3	2.5, HW3
Feb 10	2.5,2.6,2.7	2.6,3.1,3.2, Q4	3.2, HW4
Feb 17	3.2, 3.3	Exam 1	3.2, 3.3
Feb 24	3.3,	3.3, 3.4, Q5	3.3,3.4,3.5, HW5
March 3	3.5	3.5, Q6	3.5,3.6,4.1,4.2, HW6
March 10	no class	no class	no class
March 17	4.2	4.2, Q7	4.2, HW7
March 24	4.2,4.3	4.2, 4.3	Exam 2
March 31	4.3,	4.4, Q8	4.4, 5.2 HW8
April 7	4.4, 5.2, 5.4,	5.4,6.1, Q9	6.1,6.2,11.1, HW9
April 14	11.2,11.3	11.3,11.6, Q10	11.3,11.6, HW10
April 21	12.4	12.4, 5.4	Exam 3
April 28	5.1,5.4,4.5, HW11	4.5, Q11	rev

Some other references

Lorayne and Lucas (2000), *The Memory Book* is useful for **memorization**.

Math 352, Theory of Calculus, Grad Undergrad level:

Cummings, J. (2024), *Real Analysis: a Long-Form Mathematics Textbook*, 2nd ed., independently published, available from Amazon.

Gaughan, E.D. (2009), *Introduction to Analysis*, 5th ed., American Mathematical Society, Providence, RI.

Ross, K.A. (1980), *Elementary Analysis: The Theory of Calculus*, Springer–Verlag, New York, NY.

Math 452, Introduction to Analysis, Grad Undergrad level:

Abbott, S. (2001), *Understanding Analysis*, Springer Verlag, New York, NY.

Apostle, T.A., (1974), *Mathematical Analysis*, 2nd ed., Addison Wesley, Reading, MA.

Ash, R.B. (1993), *Real Variables: with Metric Space Topology*, IEEE Press, New York, NY. Available from (https://faculty.math.illinois.edu/∼r-ash/).

Math 501, Real Analysis, PhD level: Royden, H.L., and Fitzpatrick, P. (2007), *Real Analysis*, 4th ed., Prentice Hall, Englewood Cliffs, NJ.

Axler, S. (2019), *Measure, Integration, & Real Anlaysis*, Springer, New York, NY. Free pdf.

Spiegel, M.R. (1969), *Schaum's Outline of Theory and Problems of Real Variables: Lebesgue Measure and Integration With Applications to Fourier Series*, McGraw–Hill, New York, NY.

Math 502, Real and Functional Analysis, PhD level: Folland, G.B. (1984), *Real Analysis Modern Techniques and Their Application*, Wiley, New York, NY.

Friedman, A. (1982), *Foundations of Modern Analysis,* Dover, New York, NY.

Rudin, W. (1986), *Real and Complex Analysis*, 3rd ed., McGraw Hill, New York, NY.