University of Texas at Dallas

# Course Syllabus

## Math 6301: Real Analysis I, Fall 2022

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| **Time and Location:** | Tues & Thurs 5:30–6:45 pm | FO 2.208 |
| **Instructor:** | Wieslaw Krawcewicz | Professor |
| **Contact Information:** | | |
| • Office: | FO 2.602F | |
| • Phone: | 214-708-3076 (private) | text only |
| • Email: | wieslaw@utdallas.edu | |
| • Office hours: | Tues & Thurs 4:00–5:00 pm | send me a message before coming |
| **Prerequisites:** | MATH 5302 | |

## Course Description:

**MATH 6301 – Real Analysis** (3 semester credit hours) Lebesgue measure in finite-dimensional spaces, Abstract measures, measurable functions, convergence a.e., Egorov's Theorem, convergence in measure, Lebesgue integral, Lebesgue's bounded convergence theorem, Levi's monotone convergence theorem, Fatou's Lemma, Fubini's theorem, $L^p$-spaces. Prerequisite: MATH 5302. (3-0) Y

## Textbook:

- **Textbook #1:** *Introduction to Mathematical Analysis*, by W. Krawcewicz *et al*, Lecture Notes, UTD, (2015)
- **Textbook #2:** *An Introduction to Theory of Real Functions* by Stanisław Łojasiewicz„ Willey-Interscience, 1988.
- **Textbook #3:** *Introductory Real Analysis* by A.N. Kolmogorov and S.V. Fomin, Dover Publications, Inc (1975).

## Homework Assignments:

There will be about 10 mandatory graded assignments. Assignments will contribute 20% to

your final grade. The homework assignments will be published at our website and you will be given approximately 7 days to complete your solutions. You will be required to hand your homework to your instructor in class on the due-dates.

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# Grading Policy:

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| • Homework assignments: | 20% |
| • Midterm Exam 1: | 25% |
| • Midterm Exam 2: | 25% |
| • Final Exam: | 30% |
| • Total: | 100% |

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# Grade Scale:

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|---|---|---|---|---|---|
| A | [95…100] | A - | [88…94] | B+ | [78…87] |
| B | [73…77] | B- | [66…72] | C+ | [60…65] |
| C- | [55…59] | D+ | [50…54] | D | [47…49] |
| D- | [45…46] | F | [0…44] | | |

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# Midterm Exams:

| | **Date** | **Time** | **Location** |
|---|---|---|---|
| **Midterm Exam 1:** | Oct. 4, 2022 | 5:30–6:45 pm | FO 2.208 |
| **Midterm Exam 2:** | Nov. 3, 2022 | 5:30–6:45 pm | FO 2.208 |

**Exams Rules:** Textbooks, notes, mobile phones, iPhones, scientific calculators or other electronic devises won't be allowed during examination. Rules governing the proper academic conduct and student's integrity will be strictly observed. Cheating and plagiarism won't be tolerated.

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# Student Learning Objectives:

- Students will demonstrate their well-preparedness for this course by reviewing the related parts of Math 5301 (metric spaces and compactness) and Math 5302.
- Students will learn the fundamental concepts and the fundamental results of measure theory and integration.

- Students will learn several proofs of classical results in measure theory and Lebesgue integration.
- Students will learn how to use the learned results to solve problems related to the measure theory and integration.

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# Detailed Description of the Course

1. **Review:** *Metric spaces*, *compactness* and functions on metric spaces.
2. **Review:** *Infima* and *suprema*, *limits* and *principle of choice*.
3. Upper and lower *semicontinuous* functions and their properties.
4. **Review:** *Jordan measure* and *Riemann integral* existence and computations.
5. *Algebras* and $\sigma$*-algebras* of sets and *measurable* functions.
6. *Measure* and *measurable* sets, intervals in $\mathbb{R}^n$, Lebesgue measure and fundamental theorems.
7. Integration with respect to a measure, Lebesgue integral.
8. Fundamental theorems for Lebesgue integral: Egorov's Theorem, convergence in measure, Lebesgue integral, Lebesgue's bounded convergence theorem, Levi's monotone convergence theorem, Fatou's Lemma, Fubini's theorem.
9. $L^p$- spaces.
10. Differentiation

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# Additional Information

**Technical Support:** If you experience any problems with your UTD account you may send an email to: assist@utdallas.edu or call the UTD Helpdesk at 972 883-2911.

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# Detailed UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the UniversityÕs policies and procedures segment of the course syllabus. Please go to `http://go.utdallas.edu/syllabus-policies` for these policies. These descriptions and timelines are subject to change at the discretion of the Professor.