



# MATH 512.01W – INTRODUCTION TO REAL ANALYSIS II

## (WEB BASED CLASS)

### COURSE SYLLABUS: SPRING 2020

**Instructor:** Dr. Mehmet Celik

**Office Location:** Binnion 323

**Office Hours:** Virtual (D2L) and On Campus

Mon. 11am-12pm; Tues. 11am-1pm; Wed. 11am-1pm; Thur. 11am-12pm or by appointment

**Office Phone:** 903-886-5944

**Office Fax:** 903-886-5945

**University Email Address:** [Mehmet.Celik@tamuc.edu](mailto:Mehmet.Celik@tamuc.edu)

**Preferred Form of Communication:** email

**Communication Response Time:** Student course-related questions or concerns through email are answered usually within 24 hours during week days (M-F).

**Class Meeting Time:** Regularly log into our online course

**Class Location:** D2L (under MyLeo)

## COURSE INFORMATION

### MATERIALS

**Textbook(s) Required:** The main texts are *Basic Analysis I: Introduction to Real Analysis I*, Volume I by Jiří Lebl, version 5.2, it is free online at <http://www.jirka.org/ra/> & *Basic Analysis II: Introduction to Real Analysis II*, Volume II by Jiří Lebl, version 2.2, it is free online at <https://www.jirka.org/ra/realanal2.pdf>. Another book that you may consider using is *Introduction to Real Analysis* by William Trench William F. Trench, Introduction to real analysis, Pearson Education, 2003. (Freely downloadable.) [http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH\\_REAL\\_ANALYSIS.PDF](http://ramanujan.math.trinity.edu/wtrench/texts/TRENCH_REAL_ANALYSIS.PDF).

Another book that you may consider using is Walter Rudin, *Principles of mathematical analysis*, 3rd ed., McGraw-Hill Book Co., New York, 1976. International Series in Pure and Applied Mathematics. We may occasionally cover enrichment activities not in the text.

**MathType:** This software is for typing mathematics symbols and equations. It is easy to use. The mathematics department owns a departmental license. If you want to install it on your computer, please let me know what type of your computer operating system is: Windows, or Macintosh.

## COURSE DESCRIPTION

This is the second part of a two-semester course in Introduction to Real Analysis. Topics include real number system; sequences and series; limit, continuity and differentiation; the Riemann integral; sequences and series of functions; elementary metric space theory including compactness, connectedness and completeness; differentiation and integration of functions of several variables.

## STUDENT LEARNING OUTCOMES

By the end of the course, students should be able to **determine** the Riemann integrability of a bounded function and prove a selection of theorems concerning integration; **recognize** the difference between pointwise and uniform convergence of a sequence of functions; **illustrate** the effect of uniform convergence on the limit function with respect to continuity, differentiability, and integrability; **recognize** metric spaces and **utilize** their arguments to obtain a variety of results; **extend** the ideas in differential calculus which is to approximate functions by lines and linear functions to higher real dimensions; **understand** and **use** Inverse and Implicit function theorem; **define** the Riemann integral using the Darboux upper and lower integrals; **employ** iterated integrals and Fubini theorem; **comprehend** and **make use of** outer measure, null sets, the set of Riemann Integrable Functions, and Jordan Measurable sets; **write** solutions to problems and proofs of theorems that meet rigorous standards based on content, organization and coherence, argument and support, and style and mechanics.

## COURSE REQUIREMENTS

### Course Evaluation Methods

This course will utilize the following instruments to determine student grades and proficiency of the learning outcomes for the course.

**Exam** – (proctored) There will be one in-term exam. You will have a period of 120 minutes to complete the exam.

**Mid-term exam date:** Thursday, March 5<sup>th</sup> (Week #8)

Make-up exam is possible only if there is a documented emergency.

**Final Exam:** (proctored) A Comprehensive Final Exam (120 minute).

**Final Exam Date:** Monday, May 4th

Each exam must be proctored. If you cannot take an exam on the Commerce campus, you need to let your instructor know the location where you want to take a test on or before January 19<sup>th</sup>, 2020. A location usually is a testing center at a college or university near you. Some colleges and universities may charge you a fee for using the testing center. Once an agreement with the testing center is made, you will be notified. If you have questions, discuss it with your instructor immediately.

**Attendance:** Online attendance is required. It is critical you keep up with the pace of this class. A term goes quickly. Once you are behind our pace, you can easily

get lost. I strongly suggest you to study ahead of our pace continuously review the material. Online attendance in this course is determined by your log in and participation in our course in eCollege.

Attendance means students will participate in watching posted videos, joining online discussions, and submitting required homework assignments on time.

**Homework:** There will be every two weeks one homework assignment. Each assignment will be graded. Missing questions and answers without work do not earn credit. The questions for a homework assignment will be posted on the weekly module assignment under D2L. The due date for each homework assignment will be announced with the assignment. Late homework submission won't be accepted.

You may work together and discuss homework under **Discussions** sub-module under every **Learning module** on D2L.

Submit your homework to **[Activities]→[Assignments] →[Homework # on the Assignment Submission Folders]** at D2L as *LastName\_FirstName\_HW#?\_Math512.pdf* (Example: Celik\_Mehmet\_HW#2\_Math512.pdf).  
The homework assignment you submit must be your own work. Plagiarism is strictly prohibited.

**The key to success** in this course is solo studying the concepts, regularly communicating with other students in the class through **Discussions** on D2L, doing the homework assignment early and asking questions when you have them!!! You can ask your instructor in the Virtual Office of D2L.

**Workload and Assistance:** You should expect to spend about 12 to 14 hours each week, on the course material. This includes studying the posted material, working on homework assignments, and preparing for the exams. Some weeks (those in which an exam is scheduled, for instance) may require more of your time, other weeks may require less, but on average, budget 12 to 14 hours each week. You should spend some time working with other class mates on **Discussions** or **Virtual Office** under **D2L!** Please ask questions and seek assistance as needed. You may email me at any time. Emails are answered usually within 24 hours during week days (M-F).

## GRADING

**Grading Matrix:** This class will be graded on a total points system. 400 points are possible in the class. The following grading matrix presents how your total score is going to be calculated at the end of the semester of Spring 2020 for Math 512.0W1 course. All the grading instruments are assigned between the first day of class and last day of class of Spring 2020 semester. The Final exam is the last grading instrument of the course; the date of the Final Exam is: **Monday, May 4<sup>th</sup>**. The grade is completely objective and is determined solely by student performance on each of the evaluation criteria (One Mid-term exam, HW assignments, and the final exam). *Do not expect Extra Credit assignments!*

| <b>Instrument</b> | <b>Value (points)</b>  | <b>Total</b> |
|-------------------|--|--------------|
| HW Assignments    | At the end of the semester the average of all HW assignments will be considered. | 130pts       |
| Mid-term Exam     | One mid-term exam at 135 points  | 135pts       |
| Final Exam        | One comprehensive final exam at 135 points                                       | 135pts       |
| Total:            |  | 400pts       |

Grade Determination:

A = 400 – 360 pts; i.e. 90% or better

B = 320 – 359 pts; i.e. 80 – 89 %

C = 280 – 319 pts; i.e. 70 – 79 %

D = 240 – 279 pts; i.e. 60 – 69 %

F = 239 pts or below; i.e. less than 60%

## **TECHNOLOGY REQUIREMENTS**

A computer algebra system will be used for some problem exploration, enhanced conceptual understanding, and to engage students as active participants in the learning process.

- **TI-83/84** or other calculators with similar capability is recommended.
- **Printer** to print homework and tests is recommended.
- **Scanner/digital camera/cell phone** that you can take pictures of your work and submit them to the Dropbox at the eCollege.
- **D2L:** As a student enrolled at Texas A&M University-Commerce, you have access to D2L. You will obtain course materials through D2L, (MyLe→ APPs→ D2L). The course materials are only for this course. You cannot distribute the course materials without permission of the instructor. You also have an email account via myLeo - all my emails sent from D2L (and all other university

emails) will go to this account, so please be sure to check your email regularly.

### **BROWSER SUPPORT**

D2L is committed to performing key application testing when new browser versions are released. New and updated functionality is also tested against the latest version of supported browsers. However, due to the frequency of some browser releases, D2L cannot guarantee that each browser version will perform as expected. If you encounter any issues with any of the browser versions listed in the tables below, contact D2L Support, who will determine the best course of action for resolution. Reported issues are prioritized by supported browsers and then maintenance browsers.

Supported browsers are the latest or most recent browser versions that are tested against new versions of D2L products. Customers can report problems and receive support for issues. For an optimal experience, D2L recommends using supported browsers with D2L products.

Maintenance browsers are older browser versions that are not tested extensively against new versions of D2L products. Customers can still report problems and receive support for critical issues; however, D2L does not guarantee all issues will be addressed. A maintenance browser becomes officially unsupported after one year.

Note the following:

- Ensure that your browser has JavaScript and Cookies enabled.
- For desktop systems, you must have Adobe Flash Player 10.1 or greater.
- The Brightspace Support features are now optimized for production environments when using the Google Chrome browser, Apple Safari browser, Microsoft Edge browser, Microsoft Internet Explorer browser, and Mozilla Firefox browsers.

### **DESKTOP SUPPORT**

| <b>Browser</b>                | <b>Supported Browser Version(s)</b> | <b>Maintenance Browser Version(s)</b> |
|-------------------------------|-------------------------------------|---------------------------------------|
| Microsoft® Edge               | Latest                              | N/A                                   |
| Microsoft® Internet Explorer® | N/A                                 | 11                                    |
| Mozilla® Firefox®             | Latest, ESR                         | N/A                                   |
| Google® Chrome™               | Latest                              | N/A                                   |

| <b>Browser</b>    | <b>Supported Browser Version(s)</b> | <b>Maintenance Browser Version(s)</b> |
|-------------------|-------------------------------------|---------------------------------------|
| Apple®<br>Safari® | Latest                              | N/A                                   |

### TABLET AND MOBILE SUPPORT

| <b>Device</b> | <b>Operating System</b> | <b>Browser</b>              | <b>Supported Browser Version(s)</b>   |
|---------------|-------------------------|-----------------------------|---|
| Android™      | Android 4.4+            | Chrome                      | Latest  |
| Apple         | iOS®                    | Safari,<br>Chrome           | The current major version of iOS (the latest minor or <b>point</b> release of that major version) and the previous major version of iOS (the latest minor or <b>point</b> release of that major version). For example, as of June 7, 2017, D2L supports iOS 10.3.2 and iOS 9.3.5, but not iOS 10.2.1, 9.0.2, or any other version.<br><br>Chrome: Latest version for the iOS browser. |
| Windows       | Windows 10              | Edge,<br>Chrome,<br>Firefox | Latest of all browsers, and Firefox ESR.  |

- You will need regular access to a computer with a broadband Internet connection. The minimum computer requirements are:
  - 512 MB of RAM, 1 GB or more preferred
  - Broadband connection required courses are heavily video intensive
  - Video display capable of high-color 16-bit display 1024 x 768 or higher resolution
- You must have a:
  - Sound card, which is usually integrated into your desktop or laptop computer
  - Speakers or headphones.

- \*For courses utilizing video-conferencing tools and/or an online proctoring solution, a webcam and microphone are required.
- Both versions of Java (32 bit and 64 bit) must be installed and up to date on your machine. At a minimum Java 7, update 51, is required to support the learning management system. The most current version of Java can be downloaded at: JAVA web site <http://www.java.com/en/download/manual.jsp>
- Current anti-virus software must be installed and kept up to date.

Running the browser check will ensure your internet browser is supported.

Pop-ups are allowed.  
 JavaScript is enabled.  
 Cookies are enabled.

- You will need some additional free software (plug-ins) for enhanced web browsing. Ensure that you download the free versions of the following software:
  - [Adobe Reader](https://get.adobe.com/reader/) <https://get.adobe.com/reader/>
  - [Adobe Flash Player](https://get.adobe.com/flashplayer/) (version 17 or later) <https://get.adobe.com/flashplayer/>
  - [Adobe Shockwave Player](https://get.adobe.com/shockwave/) <https://get.adobe.com/shockwave/>
  - [Apple Quick Time](http://www.apple.com/quicktime/download/) <http://www.apple.com/quicktime/download/>

At a minimum, you must have Microsoft Office 2013, 2010, 2007 or Open Office. Microsoft Office is the standard office productivity software utilized by faculty, students, and staff. Microsoft Word is the standard word processing software, Microsoft Excel is the standard spreadsheet software, and Microsoft PowerPoint is the standard presentation software. Copying and pasting, along with attaching/uploading documents for assignment submission, will also be required. If you do not have Microsoft Office, you can check with the bookstore to see if they have any student copies.

### **ACCESS AND NAVIGATION**

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or [helpdesk@tamuc.edu](mailto:helpdesk@tamuc.edu).

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## COMMUNICATION AND SUPPORT

### BRIGHTSPACE SUPPORT

#### NEED HELP?

#### STUDENT SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

#### TECHNICAL SUPPORT

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778 or click on the **Live Chat** or click on the words "click here" to submit an issue via email.



#### SYSTEM MAINTENANCE

D2L runs monthly updates during the last week of the month, usually on Wednesday. The system should remain up during this time unless otherwise specified in an announcement. You may experience minimal impacts to performance and/or look and feel of the environment.

#### INTERACTION WITH INSTRUCTOR STATEMENT

Student course-related questions or concerns through email are answered usually within 24 hours during week days (M-F). Feedback on assessments will be provided within 7 days after the assignment is submitted.

My primary form of communication with the class will be through the official university Email and Announcements. Any changes to the syllabus or other important information critical to the class will be disseminated to students in this way via your D2L Email address available to me through MyLeo and in Announcements. It will be your responsibility to check your official university Email and Announcements regularly.

**Discussions:** This space is for students to communicate with each other. I may visit Discussions and join your discussion. Please feel free to answer one another's questions. I will check answers (as well as questions) for correctness, but do not hesitate to respond to a posting if you feel you can answer the question thoroughly and directly.

#### STUDENT ACADEMIC RESOURCES

**Math Lab:** Free tutoring service offered by the Mathematics department (Binnion Hall Room 328). Please visit the web site for the hours of operation and more details.

<http://www.tamuc.edu/academics/colleges/scienceEngineeringAgriculture/departments/mathematics/students/default.aspx>



**The TAMUC One Stop Shop** - provides as many student resources as possible in one location.

<http://www.tamuc.edu/admissions/oneStopShop/>

**The TAMUC Academic Success Center** provides academic resources to help you achieve academic success.

<http://www.tamuc.edu/CampusLife/CampusServices/AcademicSuccessCenter/default.aspx>

## **COURSE AND UNIVERSITY PROCEDURES/POLICIES**

### **COURSE SPECIFIC PROCEDURES**

#### **Policy for Reporting Problems with eCollege**

If students encounter D2L-based problems while submitting assignments and assessments, the following procedures MUST be followed.

1. Students must report the problem to the help desk. You may reach the helpdesk at [helpdesk@online.tamuc.org](mailto:helpdesk@online.tamuc.org) or 1-866-656-5511
2. Students MUST file their problem with the helpdesk and obtain a helpdesk ticket number
3. Once a helpdesk ticket number is in your possession, students should email me to advise me of the problem and to provide me with the helpdesk ticket number
4. At that time I will call the helpdesk to confirm your problem and follow up with you.

PLEASE NOTE: Your personal computer/access problems are not a legitimate excuse for filing a ticket with the help desk. You are strongly encouraged to check for compatibility of your browser BEFORE the course begins and to take the eCollege tutorial offered for students who may require some extra assistance in navigating the eCollege platform. ONLY D2L-based problems are legitimate.

### **SYLLABUS CHANGE POLICY**

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

### **UNIVERSITY SPECIFIC PROCEDURES**

#### **Academic Honesty**

Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including (but not limited to) receiving a failing grade on the assignment, the possibility of failure in the course and dismissal from the University. Since dishonesty harms the individual, all students, and the integrity of the University, policies on scholastic dishonesty will be strictly enforced. In ALL instances, incidents of academic dishonesty will be reported to the Department Head. Please be aware that academic dishonesty includes (but is not limited to) cheating, plagiarism, and collusion.

*Cheating* is defined as:

- Copying another's test or assignment
- Communication with another during an exam or assignment (i.e. written, oral or otherwise)
- Giving or seeking aid from another when not permitted by the instructor
- Possessing or using unauthorized materials during the test
- Buying, using, stealing, transporting, or soliciting a test, draft of a test, or answer key

*Plagiarism* is defined as:

- Using someone else's work in your assignment without appropriate acknowledgement
- Making slight variations in the language and then failing to give credit to the source

*Collusion* is defined as:

- Collaborating with another, without authorization, when preparing an assignment

If you have any questions regarding academic dishonesty, ask. Otherwise, I will assume that you have full knowledge of the academic dishonesty policy and agree to the conditions as set forth in this syllabus.

### **ADA STATEMENT**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

#### **Office of Student Disability Resources and Services**

Texas A&M University-Commerce

Gee Library- Room 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: [studentdisabilityservices@tamuc.edu](mailto:studentdisabilityservices@tamuc.edu)

Website: [Office of Student Disability Resources and Services](#)

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

#### **Student Conduct**

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail in the [Student Guidebook](#).

<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

Students should also consult the Rules of Netiquette for more information regarding how to interact with students in an online forum:

[Netiquette http://www.albion.com/netiquette/corerules.html](http://www.albion.com/netiquette/corerules.html)

### **TAMUC Attendance**

For more information about the attendance policy please visit the [Attendance](#) webpage and [Procedure 13.99.99.R0.01](#).

<http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

### **Copyright Policy**

The handouts used in this course are copyrighted. By "handouts," I mean all materials generated for this course, which include but are not limited to syllabi, lecture notes, quizzes, exams, in-class materials, review sheets, projects, and problems sets. Because these materials are copyrighted, you do not have the right to copy and distribute the handouts.

### **NONDISCRIMINATION NOTICE**

Texas A&M University-Commerce will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

### **CAMPUS CONCEALED CARRY STATEMENT**

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in Texas A&M University-Commerce buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and A&M-Commerce Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Web url:

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all A&M-Commerce campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

## COURSE OUTLINE / CALENDAR

### WEEKLY SCHEDULE:

**(Week 1,2,&3)** *The Riemann Integral; Properties of the integral; Fundamental theorem of calculus; the logarithm and exponential; Improper integrals*

**(Weeks 3,4,&5)** *Sequence of Functions (Pointwise and uniform convergence; Interchange of limits)*

**(Week 6&7)** *Metric spaces (Open and closed sets; Sequences and convergences)*

**(Week 8) Exam**

**(Weeks 9&10)** *Metric Spaces continued (Completeness and compactness, Continuous Functions, Fixed Point theorem and Picard's Theorem)*

**(Weeks 11&12)** *Several Variables and Partial Derivatives (Vector spaces, linear mappings, and convexity; Analysis with*

*vector spaces; Inverse and Implicit function Theorem)*

**(Weeks 13,14,&15)** *Multivariable Integral (Riemann integral over rectangles; iterated integrals and Fubini theorem; outer measure and null sets; the set of Riemann Integrable Functions; Jordan Measurable sets);*

**(Week 16). Final Exam Week**

This schedule is subject to change by the instructor. Any changes to this schedule will be communicated by email and announcements on the course web page. This schedule is subject to change by the instructor. Any changes to this schedule will be communicated by email and announcements on the course web page.