# MATH1014-L7/L10 Calculus II
# Course Outline- Spring 2022-2023

## 1. Instructor(s)

*Name:* Prof. CHIANG, Edmund

*Contact Details:*

Office: Room 3481 Phone: 2358-7441 Email: machiang@ust.hk

## 2. Meeting Time and Venue (The lectures are to be given in LTE, plus RVC-feed)

*Lectures:*

**Date/Time/Venue:**

**L07**: Monday, 16:30 – 17:50, Venue: LTE

**L07**: Friday, 12:00 – 13:20, Venue LTE

**L10**: Monday, 15:00 – 16:20, Venue: LTE

**L10**: Friday: 10:30 - 11:50, Venue: LTE

*Tutorials:*

**Date/Time/Venue:**

- T7A: Fri. 17:00-17:50, LTF (TSANG PY Henry/mahpytsang)
- T7B: Fri. 18:00-18:50, Rm 1410 (TSANG PY Henry/mahpytsang)
- T7C: Fri.: 19:00-19:50, Rm. 1410 (CHEN Zhixian/zchencz)

- T10A: Fri. 18:00-18:50, LSK1009 (LIU Ziyun/zliueq)
- T10B: Fri. 14:00-14:50, Rm 2404 CHEN (Tianhao/tchenbb)
- T10C: Fri.: 17:00-17:50, LSK1009 (DUAN Xiuqing/xduanad)

## 3. Course Description

Credit Points: 3

Pre-requisite: MATH1012, MATH1013 or MATH1023, grade A- or above in MATH1003

Exclusion: AL Pure Mathematics, AL Applied Mathematics, MATH1020, MATH1024, any MATH course at or above 100-/2000-level.

Brief Information/synopsis:

This course is a sequel to MATH1013. Topics include applications of definite integrals, integration techniques, improper integrals, infinite sequences and infinite series, power series and Taylor series, and vectors.

## 4. Intended Learning Outcomes

On successful completion of this course, students should be able to:

| No. | ILOs |
|---|---|
| 1 | obtain basic integration skills; |
| 2 | apply the techniques of integration on formulating and solving problems; |
| 3 | solve convergence problems of infinite sequences and series; |
| 4 | apply various vector operations in dimension 2 and 3. |

**5. Assessment Scheme (tentative and subject to change amid online teaching mode)**

a. Examinations: Midterm examination approximately 2 hrs; Final exam approximately. 3 hrs

b. Percentage of coursework, examinations, etc.:

| Assessment (tentative) | Assessing Course ILOs |
|---|---|
| 0% Worksheets (Done in tutorials) | 1, 2, 3, 4 |
| 10% WebWorks | 1, 2, 3, 4 |
| 35% by Mid-semester exam | 1, 2, 3, 4 |
| 55% by final exam | 1, 2, 3, 4 |

c. The grading is assigned based on students' performance described above following University's Criteria-referencing (with appropriate adjustment): https://registry.hkust.edu.hk/resource-library/grade-descriptors-assessment-key-learning-outcomes, https://registry.hkust.edu.hk/resource-library/grading-courses

d. Rough divisions: A+/A/A- > 85.5 > B+/B/B- >70.5 > C+/C/C- > 50.5 > D > 40
(while minor adjustments on the cutoffs would be made from time to time.)

**6. Student Learning Resources**

a) Recommended Reading: Text(s): J. Stewart, "Calculus", ($8^{th}$ edition, $7^{th}$ edition are similar) Cengage Learning 2014.

b) Course notes and relevant materials will be uploaded to the CANVAS system.

c) Our Math Support Centre (MSC) has designated staffs to help your learning on a one-to-one basis. However, you are advised to seek help *early* instead of waiting until examinations.

**7. Teaching and Learning Activities**

- Scheduled activities: approx. 4 hrs (160 minutes lecture + 50 minutes tutorial)
- Tutorials: Tutors will hand out worksheets (not counted towards the final grades) that provide hands-on experience on problems discussed in the lectures.

**8. Course Schedule (tentative)**

Keyword Syllabus:

- Review of definite integrals and the Fundamental Theorem of Calculus.
- Velocity and net change, area of a region between curves, volume by slicing and cylindrical shells.
- Length of curves, surface area, and work.
- Integration by parts, trigonometric integrals, trigonometric substitutions, polar coordinates and calculus, partial fractions.
- Numerical integration, improper integrals.
- Sequences and infinite series, divergence and integral, ratio, root and comparison tests, alternating series.
- Taylor polynomials, power series and Taylor series.
- Vectors in two and three dimensions, dot products, cross products.

| Weeks | Topics to be covered (tentative)<br><br>(All topics below can be found in the textbook by Stewart) |
|---|---|
| **1 (3rd Feb.)**<br><br>**2 (6th, 10th Feb.)** | Review on differentiations, integrations and Fundamental theorem of Calculus (1). Area between curves. Volumes by cylindrical shells. (2, 3) |
| **3 (13th, 17th Feb.)** | Work (4), Averages value of a function (5) |
| **4 (20th, 24th Feb.)** | Integration-by-parts (6), Trigonometric substitution, hyperbolic functions and applications (7) |
| **4 (27th Feb. , 3th Mar.)** | Integration by Partial fractions (8), Trigonometric integrals I (9), |
| **5 (6th, 10th Mar.)** | Trigonometric integrals II (10), Arc lengths, Area of a surface of revolution, Polar coordinates (11) |
| **6 (13st, 17th Mar.)** | Polar arc lengths and areas; Parametrizations (12), Approximate integration (13) |
| **7 (20th, 24th Mar.)** | Improper integrals (14), Sequences **(**15**)** |
| **8 (26th , 27th, 31st Mar.)** | **Mid-semester examination** (26thSunday morning). Infinite series; Integral test (16); Comparison test; Alternating series (17) |
| **9 (3th, 14th Apr.)** | Absolute convergence, Ratio and Root tests (18); Power series (19) |
| **10 (17th, 21st Apr.)** | Representation of functions as power series (20); Taylor and Maclaurin series; Applications of Taylor polynomials (21); |
| **11 (24th, 28th Apr.)** | Vectors (22), Dot product (23); |
| **12 (5thMay.)** | Cross product and applications (24) |
| **13 (9th May)** | Revision (25) |

Updated on 7th February 2023