# COURSE OUTLINE: MH5101

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| Course Title | **Advanced Investigations in Calculus II** | | |
| Course Code | **MH5101** | | |
| Offered | Study Year X, Semester 2 | | |
| Course Coordinator | Bernhard Schmidt (Prof) | bernhard@ntu.edu.sg | 6513 2009 |
| Pre-requisites | MH1101 OR Approval by the Division of Mathematical Sciences | | |
| Co-requisites | MH1101 | | |
| AU | 1 | | |
| Contact hours | Tutorials: 24 | | |
| Approved for delivery from | AY 2023/24 semester 2 | | |
| Last revised | 14 Dec 2023 | | |

## Course Aims

This course is a supplement to MH1101 students who want to be challenged. You will develop problem solving skills for complex and challenging problems in Calculus related to integrals, sequences and series.

## Intended Learning Outcomes

Upon successfully completing this course, you should be able to:

1. Develop deeper understanding of mathematical concepts by solving complex problems.
2. Explain the processes used to arrive at solutions rather than remembering or applying a set of procedures.
3. Investigate complex problems by trying a variety of approaches and strategies.
4. Appreciate the relevance and usefulness of the concepts and tools in Calculus beyond standard text.
5. Present (in writing and speaking) mathematical ideas logically and coherently at the appropriate level for the intended audience.

## Course Content

Fundamental Theorem of Calculus, Applications of Integrations

Techniques of integrations

Numerical Integrations

Sequences and Series, Convergence Tests

Power Series, Taylor Series, Maclaurin Series

Fourier Series

Fourier Transforms

## Assessment

| Component | Course ILOs tested | SPMS-MAS Graduate Attributes tested | Weighting | Team / Individual | Assessment Rubrics |
|---|---|---|---|---|---|
| **Continuous Assessment** | | | | | |
| **Tutorials** | | | | | |
| Test 1 | All | Communication (I), Creative Thinking (A), Decision Making (A), Problem Solving (A), Sense Making (A) | 25% | Individual | Point-based |
| Test 2 | All | Communication (I), Creative Thinking (A), Decision Making (A), Problem Solving (A), Sense Making (A) | 25% | Individual | Point-based |
| Test 3 | All | Communication (I), Creative Thinking (A), Decision Making (A), Problem Solving (A), Sense Making (A) | 25% | Individual | Point-based |
| Test 4 | All | Communication (I), Creative Thinking (A), Decision Making (A), Problem Solving (A), Sense Making (A) | 25% | Individual | Point-based |
| | | **Total** | **100%** | | |

## Formative Feedback

In-class problems: Students will receive feedback on their performance on (ungraded) problems they are solving in class.

Tests: Students will receive feedback on test performance.

## Learning and Teaching Approach

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| **Tutorials** (24 hours) | Students will be asked to work on problems before and during class and to present their work. The course instructor will facilitate the discussions, and comments on common mistakes, important ideas and tools involved, and connection with related concepts and level of difficulty. |

## Reading and References

James Stewart, Calculus (8th

edition) ISBN-13: 978-1285740621
ISBN-10: 1285740629

## Course Policies and Student Responsibilities

Absence due to medical or other reasons

If you are sick and unable to attend a midterm test or missed the deadlines for your assignments, you must:

1. Send an email to the instructor regarding the absence.
2. Submit the Medical Certificate* to your Home school.

*The Medical Certificate mentioned above should be issued in Singapore by a medical practitioner registered with the Singapore Medical Association.

In this case, the weightage of the test will be transferred to the other tests.

## Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognize your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain of the definitions of any of these terms, you should go to the Academic Integrity website for more information.

On the use of technological tools (such as Generative AI tools), different courses / assignments have different intended learning outcomes. Students should refer to the specific assignment instructions on their use and requirements and/or consult your instructors on how you can use these tools to help your learning.

Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

## Course Instructors

| Instructor | Office Location | Phone | Email |
|---|---|---|---|
| Bernhard Schmidt (Prof) | SPMS-MAS-05-24 | 6513 2009 | bernhard@ntu.edu.sg |

## Planned Weekly Schedule

| Week | Topic | Course ILO | Readings/ Activities |
|---|---|---|---|
| 1 | Differentiation and integration | 1, 2, 3, 4, 5 | In-class discussion |
| 2 | Differentiation and integration | 1, 2, 3, 4, 5 | In-class discussion |
| 3 | Differentiation and integration | 1, 2, 3, 4, 5 | In-class discussion |
| 4 | Differentiation and integration | 1, 2, 3, 4, 5 | In-class discussion, Test 1 |
| 5 | Differentiation and integration | 1, 2, 3, 4, 5 | In-class discussion |
| 6 | Differentiation and integration | 1, 2, 3, 4, 5 | In-class discussion |
| 7 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion, Test 2 |

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| 8 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion |
| 9 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion |
| 10 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion, Test 3 |
| 11 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion |
| 12 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion |
| 13 | Sequences and series | 1, 2, 3, 4, 5 | In-class discussion, Test 4 |