

## Annexe A: New/Revised Course Content in OBTL+ Format

### Course Overview

The sections shown on this interface are based on the templates [UG OBTL+](#) or [PG OBTL+](#)

If you are revising/duplicating an existing course and do not see the pre-filled contents you expect in the subsequent sections e.g. Course Aims, Intended Learning Outcomes etc. please refer to [Data Transformation Status](#) for more information.

Expected Implementation in Academic Year	AY2024-2025
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Lim Kay Jin
Course Author Email	limkj@ntu.edu.sg
Course Title	Algebra II
Course Code	MH3220
Academic Units	4
Contact Hours	51
Research Experience Components	Not Applicable

## Course Requisites (if applicable)

Pre-requisites	MH1201 and MH2220
Co-requisites	
Pre-requisite to	
Mutually exclusive to	MH3200
Replacement course to	
Remarks (if any)	

## Course Aims

This MAS course aims to introduce ring theory that is essential for more advanced algebra courses and applications. The axiomatic concepts serve as a language to study concrete examples in broader sense and helps in developing logical thinking.

## Course's Intended Learning Outcomes (ILOs)

Upon the successful completion of this course, you (student) would be able to:

ILO 1	State basic definitions related to rings and explain them to a layman.
ILO 2	Give examples and counter-examples involving rings.
ILO 3	Categorize rings based on their properties.
ILO 4	Compute quotient rings.
ILO 5	Distinguish ideals from subrings.
ILO 6	Apply ring isomorphism theorems to prove that two rings are isomorphic.
ILO 7	Prove or disprove statements involving rings.

## Course Content

- Basic definitions from ring theory
- Examples of rings including polynomial rings, matrix rings
- Ideals and ring homomorphisms
- Maximal and prime ideals
- Quotient rings and isomorphism theorems
- the Chinese remainder theorem
- Ring of fractions
- Euclidean domains, Principal ideal domains, Unique factorization domains

## Reading and References (if applicable)

D.S. Dummit and R.M. Foote, Abstract Algebra, third edition, John Wiley & Sons, Inc., Hoboken, NJ, 2004. ISBN-10 : 0471433349

NOTE: The above readings comprise the foundational readings for the course and more up-to-date relevant readings will be provided when they are available.

## Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Basic definitions from ring theory	1	Textbook: 7.1	In-person	
2	Examples of rings including polynomial rings, matrix rings	1, 2	Textbook: 7.2	In-person	
3	Ring homomorphisms, ideals and quotient rings	1, 2, 3, 5, 7	Textbook: 7.3	In-person	
4	Isomorphism theorems	1, 2, 3, 4, 5, 6, 7	Textbook: 7.3	In-person	
5	Maximal and prime ideals	1, 2, 3, 5, 7	Textbook: 7.4	In-person	Midterm Test
6	Chinese remainder theorem	6, 7	Textbook: 7.6	In-person	
7	Ring of fractions	6, 7	Textbook: 7.5	In-person	
8	Euclidean domains, Principal ideal domains, Unique factorization domains	1, 2, 3, 5, 6, 7	Textbook: 8.1, 8.2, 8.3	In-person	
9	Euclidean domains, Principal ideal domains, Unique factorization domains	1, 2, 3, 5, 6, 7	Textbook: 8.1, 8.2, 8.3	In-person	
10	Polynomial Rings	1, 2	Textbook: 9.1, 9.2	In-person	Midterm Test

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
11	Polynomial Ring	1, 2	Textbook: 9.1, 9.2	In-person	
12	Irreducibility Criteria	6, 7	Textbook: 9.4	In-person	
13	Irreducibility Criteria	6, 7	Textbook: 9.4	In-person	

## Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	<p>Interactive Lecture:</p> <p>The suggested learning and teaching approach consists of breaking the flow of the lectures by introducing exercises to be solved by the students in small groups during the lectures themselves. A typical pattern would be: the lecturer introduces a new concept, or a new proof, and then asks you to answer a question or solve a small exercise involving the new concept/proof. The lecturer then discusses the answer with you. If the newly introduced concept is understood well enough, the lecturer can then continue to build upon it, otherwise, further explanation is given. This also ensures that you have improved your knowledge in each of the classes that they are attending. This also encourages you to attend the classes, by being more active.</p>
Tutorials	<p>Problem solving:</p> <p>Develop competence in logical thinking and problem solving especially in abstract algebra.</p>

## Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Test/Quiz(Short Answer Questions )	1,2,3,5,7	Not Applicable	25	Individual	Analytic	Not Applicable
2	Continuous Assessment (CA): Test/Quiz(Short Answer Questions )	2,3,4,5,6,7	Not Applicable	25	Individual	Analytic	Not Applicable
3	Summative Assessment (EXAM): Final exam(Short Answer Questions )	1, 2, 3, 4, 5, 6, 7	Not Applicable	50	Individual	Analytic	Not Applicable

Description of Assessment Components (if applicable)

### Formative Feedback

You will receive formative feedback for your CA. It is done by commenting on the mistakes and misunderstanding that appeared in your CA. This is possible because this course has a small number of students (typically less than 20). General feedback for your performance as part of the end of course review is done based on the final exam: the most common mistakes, as well as the questions that were best answered, are discussed in the report provided to all students.

## NTU Graduate Attributes/Competency Mapping

This course intends to develop the following graduate attributes and competencies (maximum 5 most relevant)

Attributes/Competency	Level
Curiosity	Intermediate
Problem Solving	Advanced
Sense Making	Intermediate
Information Literacy	Basic
Critical Thinking	Advanced

# Course Policy

## Policy (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.

## Policy (General)

You are expected to attend all classes punctually and take all scheduled tests by due dates. You are expected to take responsibility to follow up with course notes and course related announcements. You are expected to participate in all discussions and activities.

## Policy (Absenteeism)

You are expected to attend the midterm test. A student who is absent from midterm test without valid Leave of Absence will be given zero mark. No make-up midterm test will be arranged. In case of valid reason for absence, the total course marks would subsequently be rescaled to a base of 100%.

## Policy (Others, if applicable)

### Diversity and inclusion policy

Integrating a diverse set of experiences is important for a more comprehensive understanding of science. It is our goal to create an inclusive and collaborative learning environment that supports a diversity of perspectives and learning experiences, and that honours your identities; including ethnicity, gender, socioeconomic status, sexual orientation, religion or ability.

To help accomplish this:

- If you are neuroatypical or neurodiverse, have dyslexia or ADHD (for example), or have a social anxiety disorder or social phobia;
- If you feel like your performance in the class is being impacted by your experiences outside of class;
- If something was said in class (by anyone, including the instructor) that made you feel uncomfortable;

Please speak to your teaching team, our school pastoral officer or a peer or senior (either in-person or via email) about how we can help facilitate your learning experience.

As a participant in course discussions, you should also strive to honour the diversity of your classmates. You can do this by: using preferred pronouns and names; being respectful of others opinions and actively making sure all voices are being heard; and refraining from the use of derogatory or demeaning speech or actions.

All members of the class are expected to adhere to the NTU anti-harassment policy. if you witness something that goes against this or have any other concerns, please speak to your instructors or a faculty member.



Rubric for Mid-term Test: Short Answer Questions (25%)

Point-based marking

Rubric for Mid-term Test: Short Answer Questions (25%)

Point-based marking

Rubric for Examination: Short Answer Questions (50%)

Point-based marking