

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

Course Overview

Expected Implementation in Academic Year	AY2026-2027
Semester/Trimester/Others (specify approx. Start/End date)	Special Term
Course Author * Faculty proposing/revising the course	Hoang Viet Ha
Course Author Email	vhhoang@ntu.edu.sg
Course Title	UNDERGRADUATE RESEARCH EXPERIENCE IN MATHEMATICAL SCIENCES I
Course Code	MH5910
Academic Units	4
Contact Hours	25
Research Experience Components	Research Defined Course (at least 50% of deliverables involve practical research activities: problem identification, hypothesis forming, data collection/analysis/interpretation, result communication)

Course Requisites (if applicable)

Pre-requisites	Approval by Division of Mathematical Sciences
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This module is offered to undergraduate students and aims to develop your love for research at the undergraduate level. It provides you with the opportunity to work with a supervisor in a specific topic in mathematics. You will have the chance to be exposed to mathematical research during your undergraduate studies. It allows you to develop your mathematical maturity and to sharpen your analytical skills. It also provides you with the platform to develop research competencies that can lead to a final year project, and to provide invaluable practical research skills that can support your future career.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Perform literature review in a selected mathematical research topic; summarize and link together different research findings
ILO 2	Apply knowledge from the findings to solve problems in a research setting, and develop creative and novel approaches
ILO 3	Identify and determine the requirements and demands of mathematical research
ILO 4	Develop methodologies and plans to achieve research objectives and outcomes
ILO 5	Work independently to solve research problems
ILO 6	Use the appropriate tools (including mathematical software and programming skills) to analyse and solve problems
ILO 7	Deal confidently with the ambiguity and anxiety that often comes with original research

Course Content

In this research module, you (as a student) will experience independent supervised research work in a selected field of study. You will be supervised by a faculty from the Division of Mathematical Sciences to achieve the intended learning outcomes listed above. The specific content is dependent on the selected field of study.

Reading and References (if applicable)

Reading materials are dependent on the selected field of study and specific to each project. Faculty Supervisor will recommend reading materials, and you will conduct a comprehensive literature review as well.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Weeks 1-10: Student will experience independent supervised research work in a selected field of study. Student will be supervised by the faculty from the Division of Mathematical Sciences to achieve the intended learning outcomes listed above. The specific content is dependent on the selection field of study.	1, 2, 3, 4, 5, 6, 7	assigned by the supervisor	In-person	assigned by the supervisor

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Project work	This course is an opportunity for you to experience first-hand mathematics research done in a professional setting. You are expected to be independent, disciplined and motivated. You will have to acquire the necessary background by conducting a literature review and undertaking reading of relevant materials. You will also be trained in developing problem-solving skills and creative methods to solve the problems given to you. You are expected to explore an advanced topic in mathematics and learn about the various problems, results and techniques in that area. The MAS Faculty Supervisor will be the key person working with and interacting with you on a regular basis. You are expected to take the initiative to approach your supervisor for discussions and resolve issues when you encounter difficulties.

Assessment Structure

Assessment Components (includes both continuous and summative assessment)

No.	Component	ILO	Related PLO or Accreditation	Weightage	Description of Assessment Component	Team/Individual	Rubrics	Level of Understanding
1	Continuous Assessment (CA): Presentation(Final Oral Presentation)	1, 2, 3, 4, 5, 6,7		40		Individual	Analytic	Extended Abstract
2	Continuous Assessment (CA): Others(Lectures - Continuous Assessment)	1, 2, 3, 4, 5, 6,7		10		Individual	Analytic	Extended Abstract
3	Continuous Assessment (CA): Assignment(Lectures - Final Report)	1, 2, 3, 4, 5, 6,7		50		Individual	Analytic	Extended Abstract

Description of Assessment Components (if applicable)

This course is Pass/Fail graded.

Formative Feedback

Continuous feedback on progress and performance will be given by your supervisor throughout the semester.

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Communication	Intermediate
Creative Thinking	Intermediate
Curiosity	Intermediate
Learning Agility	Intermediate
Self-Management	Intermediate

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 complete all assigned readings, activities, attend all research meetings punctually and complete all scheduled tasks by the due dates. You are expected to take responsibility to follow up with research activities. You are expected to participate in all project critiques, research group discussions and other research related activities

Policy (Absenteeism)

As this is a research course, you are expected to participate in all research meetings and activities as required by your supervisor. Absence without a valid reason or without informing your supervisor will affect your grade.

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.

Appendix 1: Assessment Rubrics

Rubric for Lectures: Final Oral Presentation (40%)

Grading Criteria	Exceptional (9-10)	Effective (7-8)	Acceptable (5-6)	Developing (0-4)
Accuracy	The interpretation is highly accurate, concise and precise.	The interpretation is mostly accurate. Some parts can be better explained or more succinct.	The interpretation is somewhat accurate. However, it contains some inaccuracies, missing points or ideas that are not related to the interpretation.	The interpretation are mostly inaccurate.
Visual and Oral delivery	Slides are informative, good clear voice and constant eye contact	Slides are adequate, oral delivery is satisfactory and frequent eye contact	Slides are bare and somewhat disorganized, voice is sometimes inaudible and little eye contact	Slides are disorganized, voice it too soft, and no eye contact
Presentation	Very clear and organized. It is easy to follow your train of thought	Mostly clear and organized. Some parts can have better transitions.	Somewhat clear. It requires some careful reading to understand what you are writing.	Mostly unclear and messy. It is difficult to understand what you are writing as there is no clear flow of ideas.
Question and Answer (for each individual student)	Very clear and precise answers to all problems. Explain the problems from various different perspectives logically.	Correct answers to most of the problems. Explain the problems in an organized way.	Partially-correct answers to most of the problems. Explain the some of the problems .	Unclear and messy answers. Difficult to understand.

Rubric for Lectures: Continuous Assessment (10%)

Category	Scoring Criteria	Exceptional (8-10)	Satisfactory (5-7)	Developing (0-4)
Initiative and Motivation	Did the student appear motivated to complete the tasks assigned to him/her?	Very Motivated	Occasional display of enthusiasm	Disinterested in tasks and often procrastinates
	Did the student proactively clarify doubts with	Often clarifies	Sometimes clarifies	Seldom clarifies

	his/her supervisor?)			
Practical Ability and Creativity	Did the student complete his/her assigned tasks satisfactorily?	Completes all tasks well	Completes some tasks	Does not complete most tasks
	Did the student expect supervisor input for simple problems?	Works independently	Occasionally expects supervisor input	Relies excessively on supervisor even for simple tasks
Personal Discipline and Professionalism	Did the student have integrity and a good management scheme for the data and calculations done for the project?	Well organized with handling data and is careful with quoting sources	Sometimes gets data mixed up	Disorganised and does not keep track of data. Copies from other sources without giving proper credit
	Is the student neat, responsible and focused to complete his/her work professionally?	Upholds strict professionalism	Satisfactory	Is often sloppy and does not display responsibility

Rubric for Lectures: Final Report (50%)

Category	Scoring Criteria	Exceptional (8-10)	Satisfactory (5-7)	Developing (0-4)
Organization	Materials are organized and presented in a clear, coherent and logical sequence. Sharp sense of beginning and end	Well - organised	Some parts of the report are disorganised	Disorganised and incoherent
	Correct use of referencing throughout, formatted in the correct scientific specification.	Most references are used correctly	Some missing references or incorrectly used	Many missing references and incorrect usage
Content	Clear description of project's objectives, motivations, interpretation and explanation of	Good, succinct and clear descriptions	Satisfactory descriptions	Unclear descriptions, missing interpretations or

	research approach, process and findings.			confusing presentation
	Technical terms are well-defined in language appropriate for the area.	Well-defined	Mostly welldefined	Poorly defined or many missing definitions
	Material included is accurate and relevant to the overall message/purpose.	Accurate and relevant	Some inaccuracies or redundant materials	Many inaccurate and irrelevant material
	Discussion and conclusions tie well with the problem statement and results obtained.	Good relation between discussion and conclusions	Some missing connections between discussion and conclusions	Missing or weak links between discussion, conclusions and results obtained
	Shows clear understanding of key concepts/theories.	Good understanding	Mostly demonstrates good understanding	Weak understanding of concepts
	Strong links made between problem statement, claims made, tools used and results.	Good links	Some missing links	Mostly missing links
Originality	Is the project a new initiative, or is it similar to a previous or ongoing project?	Mostly original	Some original parts	Little or no original material
	Does the project involve very sophisticated theory or does it require heavy and challenging code development?	Technically challenging	Satisfactory level of difficulty	Project is too easy with little original contributions
	Did the report contain original models or original results, novel and creative application of existing techniques/discovery of new principles?	Many novelties and original approaches	Some ingenuity can be observed	Little or no creativity