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	AY2019-2020
Semester/Trimester/Others (specify approx. Start/End date)	Semester 1
Course Author * Faculty proposing/revising the course	Lee-Chua Lee Hong
Course Author Email	clhlee@ntu.edu.sg
Course Title	Mathematics I for Maritime Studies
Course Code	MT1001
Academic Units	3
Contact Hours	39
Research Experience Components	Not Applicable

Course Requisites (if applicable)

Pre-requisites	
Co-requisites	
Pre-requisite to	
Mutually exclusive to	
Replacement course to	
Remarks (if any)	

Course Aims

This course aims to:

i) Introduce the basic mathematical theories and techniques as listed in the course contents;

ii) Provide the students essential mathematics used in finance, business, management, as well as maritime technology and maritime sciences.

Course's Intended Learning Outcomes (ILOs)

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

ILO 1	Understand commonly used functions in maritime studies and their graphs.
ILO 2	Understand and evaluate limits to analyze the behaviors of functions (asymptote, tangent line, continuity and smooth).
ILO 3	Understand and evaluate derivatives to carry out marginal analysis and elasticity analysis and to solve nonlinear equations.
ILO 4	Use derivatives to analyze the behaviors of functions (stationery points, peak and bottom points, inflection points, and points of diminishing return) related to maritime studies.
ILO 5	Use arithmetic and geometric progressions to calculate the present and accumulated values of investment with different interests.
ILO 6	Appraise an annuity plan (ordinary annuity, annuity due and deferred annuity).
ILO 7	Understand indefinite integration and its basic formulas.
ILO 8	Analyze indefinite integrals using different techniques (integration by substitution, integration by parts, integration by partial fraction, and integration using a table of integrals).
ILO 9	Evaluate definite integrals using Newton-Leibniz formula; estimate definite integrals with numerical integration; and apply definite integrals related maritime studies.
ILO 10	Understand multivariable functions in maritime studies; evaluate limits and partial derivatives, and carry out marginal analysis.
ILO 11	Use partial derivatives to analyze the behaviors of functions (continuity and smooth; tangent plane, extrema and saddle points).
ILO 12	Find maxima and minima of multivariable functions with or without constraints related maritime studies.
ILO 13	Understand and evaluate double integrals using iterated integrals related to maritime studies.

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1	Function and graph. Limits and continuity.	4	2
2	Differentiation. Optimization of business functions.	5	3
3	Mathematics of finance: interest, geometric series, investment appraisal.	4	2
4	Indefinite and definite integrations. Applications of integrals in business and economics.	5	2
5	Partial and total differentiation. Production function analysis & applications.	4	2
6	Double integrals. Applications of double integrals in ship technology.	4	2
	Total:	26	13

Reading and References (if applicable)

1. Haeussler, E.F., Paul, R.S. & Wood, R.J. (2011). “Introductory Mathematical Analysis.” 13th Edition. Prentice Hall.

2. Barnett R.A., Ziegler M.R. and Byleen K.E. (2011). “Calculus for Business, Economics, Life Sciences, and Social Sciences.” 13th Edition. Prentice Hall.

Planned Schedule

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
1	Equations and graphs of functions; Transformation of functions; Commonly used functions in maritime studies.	1		In-person	Lectures & Tutorial
2	Limits and evaluation; Asymptotes and limit of difference quotient; Continuity and differentiability; Introduction to marginal analysis.	2		In-person	Lectures & Tutorial
3	Derivatives and evaluation; Marginal analysis; Newton's method; Elasticity of demand / supply functions.	3		In-person	Lectures & Tutorial
4	Application of differentiation: Stationery points; Extrema; Inflection points; and, Points of diminishing return.	4		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
5	Arithmetic and geometric progressions; Simple and compound interests; Present and accumulated values.	5		In-person	Lectures & Tutorial
6	Appraisal of investment; Ordinary annuity; Annuity due and Deferred annuity.	6		In-person	Lectures & Tutorial
7	Introduction to indefinite integration.	7		In-person	Lectures & Tutorial
8	Techniques of indefinite integration: Integration by substitution; Integration by parts; Integration by partial fraction; and, Integration using a table of integrals.	8		In-person	Lectures & Tutorial
9	Evaluation of definite integrals; Applications of definite integrals in maritime studies; Improper integrals; and Numerical integration.	9		In-person	Lectures & Tutorial

Week or Session	Topics or Themes	ILO	Readings	Delivery Mode	Activities
10	Use of multivariable functions in maritime studies; Limits and partial derivatives; Continuity and differentiability; Linear approximation and total differentials.	10, 11		In-person	Lectures & Tutorial
11	Chain rule; Extrema of multivariable functions with or without constrains; Lagrange multiplier method; Global maxima / minima and applications in maritime studies..	11, 12		In-person	Lectures & Tutorial
12	Partial anti-differentiation and iterated integrals; Double integrals; Evaluate double integrals using iterated integrals	13		In-person	Lectures & Tutorial
13	Reverse the order of iterated integral; and Applications of double integrals.	13		In-person	Lectures & Tutorial

Learning and Teaching Approach

Approach	How does this approach support you in achieving the learning outcomes?
Lectures	Weekly lectures to provide you with the specific knowledge and techniques to achieve the learning outcome stated above.
Tutorials	Weekly tutorials to enable you to apply the knowledge to solve structured problems. We encourage you to explore alternative approaches and techniques.

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	Summative Assessment (EXAM): Final exam(Final Examination)	All	SLOs A, G	60	Individual	Holistic	Relational
2	Continuous Assessment (CA): Test/Quiz(Quiz 1)	1,2,3	SLOs A, G	20	Individual	Analytic	Multistructural
3	Continuous Assessment (CA): Test/Quiz(Quiz 2)	7,8,9	SLOs A, G	20	Individual	Analytic	Multistructural

Description of Assessment Components (if applicable)

*SLOs = Student Learning Outcomes - NTU Maritime Studies

Related Programme SLO or Graduate Attributes

B. Describe and apply concepts and theories in sub-fields as contributing to the maritime industry and integrate various related themes, skills and knowledge

G. Approach and solve basic maritime problems, through both strategic and research methods, and put theoretical knowledge into practical applications in related industrieshttp://www.ntu.edu.sg/tlpd/tlr/obtl/4/Pages/41.aspx

Formative Feedback

1. Feedback will be through dissemination of your performance in quizzes as well as review of the quiz questions in class. Follow-up consultation will be arranged as needed.
2. Besides having interactive discussion during tutorial, we encourage you to initiate individual consultation sessions on your particular learning needs

NTU Graduate Attributes/Competency Mapping

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

Attributes/Competency	Level
Decision Making	Basic

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)

The standing university policy governing student responsibilities shall apply.
No special policy for this course.

Policy (Absenteeism)

Policy (Others, if applicable)

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