Instruction for MTH 101 Semester 1/2022 (International Program)

1. General Information

Course Title: MTH 101 Mathematics I

Credits: 3 Credits

Course Management

MTH 101 consists of 4 Modules, namely, M1 - M4.

Sections, Instructors, and Online Class Channel

Students in all (international) sections must join the facebook group:

https://www.facebook.com/groups/327804836139546

Course Instructors	Section	Online Class Channel (Zoom)
Dr. Anuwat Tangthanawatsakul E-mail: anuwat.sae@kmutt.ac.th	31	https://kmutt-ac-th.zoom.us/j/2365234469
Assoc. Prof. Dr. Pawaton Kaemawichanurat E-mail: pawaton.kae@kmutt.ac.th	32	https://kmutt-ac-th.zoom.us/j/94230107217
Assoc. Prof. Dr. Pawaton Kaemawichanurat E-mail: pawaton.kae@kmutt.ac.th	34	https://kmutt-ac-th.zoom.us/j/98816475356

2. Course Description

Module 1

Limits and Continuity: The concept of limit, Computation of limits, Limits involving infinity, Continuity, Limits and continuity of trigonometric functions

Module 2

The Derivatives: Slopes and rates of change, The derivative, The chain rule, Higher order derivatives, Derivatives of transcendental functions (Trigonometric, Inverse trigonometric, Logarithmic, Exponential, and Hyperbolic functions), Implicit differentiation, Differentials, Linear approximation, The mean value theorem

Applications of Differentiation: Maximum and minimum values, Applied maximum and minimum problems, Increasing and decreasing functions, Concavity and inflection points, Overview of curve sketching, Related rates, Indeterminate forms and L'Hopital's rule

Module 3

Integration: Antiderivatives and indefinite integrals, the definite integrals, Average values and the fundamental theorem of calculus, Integration by substitution, Techniques of integration (Integration by parts, Integration of rational functions using partial fractions)

Applications of the Definite Integral: Area between curves

Improper Integrals: Improper integrals with infinite intervals of integration, Improper integrals with infinite discontinuities in the interval of integration, Improper integrals with infinite discontinuities over infinite intervals of integration

Numerical Integration: Trapezoidal rule and Simpson's rule

Module 4

Function of several variables: Graph of Surfaces, Partial derivatives, Total differentials, Chain rule, Critical points, Second order partial derivatives, Local extrema, Maxima and minima, Saddle points

3.Objectives

1. Solve problems and express mathematical ideas coherently in written form based on mathematical logic
2. Explain concepts in functions of one or more variables and calculate inverse functions, limits, derivatives, maxima and minima, and linear approximation

3. Explain concepts and how to use the theorems that apply specifically to continuous functions (intermediate value theorem, extreme value theorem) and to differentiable functions (chain rule, Rolle's theorem, mean value theorem, L'Hopital's rule)
4. Explain the concepts of differential calculus of functions of two or more variables, continuity, partial differentiation, chain rule, Implicit differentiation
5. Find anti-derivatives by using standard techniques
6. Describe how the Fundamental Theorem of Calculus can be used both to evaluate integrals and to define new functions, and determine their basic properties
7. Apply calculus concepts in related rates, minimum and maximum problems, graph sketching, area, and volume

4. Schedule/Homework Submission/Online Examinations

Module	Week No.	Synopsis of Lecture Planned	Scoring / Exam dates
M1 **0.25 Credit**	**No.1** 8-12 Aug 2022	Orientation and course introduction, Review function and their properties, Euler constant, Logarithm Function, Inverse Function.	Classmarker 70% Writing 30% **M1 Exam date:** **13 Sep 2022**
	No.2 15-19 Aug 2022	Limit of Function, Computation of Limits, Continuous Function.	

M2 **1 Credit**	**No.3** 22-26 Aug 2022	Basic Concepts of Derivative, Derivative of Algebraic Function, The Chain Rule, Derivative of Transcendental Functions, Derivative of Inverse Function.	Classmarker 70% Writing 30% **M2 Exam date:** **24 Oct 2022**
	No.4 29 Aug – 2 Sep 2022	Implicit Differentiation, Higher derivatives, Indeterminate Form and L'Hopital's Rule.	
	No.5 5-9 Sep 2022	Differentials, Linear Approximation, The Max-Min Value Theorem, Rolle's Theorem and Mean-Value Theorem, Increasing and Decreasing Functions.	
	No.6 12 - 16 Sep 22	**University Exam week – No class** **Our M1 Exam will be held on Tuesday 13 September 2022**	
	No.7 19 - 23 Sep 22	Concavity, Using Derivative and limits in sketching Graph.	
	No.8 26-30 Sep 2022	Applied Max-Min Problem, Related Rates.	

M3 **1 Credit**	**No.9** 3-7 Oct 2022	Basic Concepts of Integrals, Fundamental Theorem of calculus,	Classmarker 70% Writing 30% **M3 Exam date:** **6 Dec 2022**
	No.10 10-14 Oct 2022	Properties of Antiderivatives and Definite Integrals. Indefinite Integral, Integration by Substitution.	
	No.11 17-21 Oct. 2022	Integration by Parts, Integration by Partial Fractions.	
	No.12 24-28 Oct 2022	**University Exam week – No class** **Our M2 Exam will be held on Monday 24 October 2022**	
	No.13 31 Oct – 4 Nov 2022	Areas under Curve and Areas between Curves.	
M4 **0.75 Credit**	**No.14** 7-11 Nov 2022	Improper Integral, Numerical Integration	Classmarker 70% Writing 30% **M4 Exam date:** **13 Dec 2022**
	No.15 14-18 Nov 2022	Function of Several Variable, Limit and Continuity, Graph of Equations	
	No.16 21-25 Nov 2022	Partial Derivative, Differentials, The Chain Rule	

	No.17 28 Nov – 2 Dec 2022	Critical Points, Second Order Partial Derivative, Relative Extreme, Maxima, Minima and Saddle Points	
	No.18 5-9 Dec 2022	**University Exam week – No class** **Our M3 Exam will be held on** **Tuesday 6 December 2022**	
	No.19 12-16 Dec 2022	**University Exam week – No class** **Our M4 Exam will be held on** **Tuesday 13 October 2022**	

5. Teaching

- All the classes will be 100% online. Instructors live stream the classes by each group time schedule. Students must attend the classes by university rule. Please inform instructor in case of absence.
- Students are able to approach optional learning medias via LEB2 which consists of video clips and exercises.

6. Evaluations

- The evaluation of each module will be taken right after finishing contents of that module (referring the table in Section 4.)

Module	Classmarker	Writing	Exam Dates
1	70%	30%	Tuesday 13 Sep 2022

2	70%	30%	Monday 24 October 2022
3	70%	30%	Tuesday 6 Dec 2022
4	70%	30%	Tuesday 13 Dec 2022

***time of the examination will be updated on Facebook**

***If there is any change, the notification will be promptly announced**

- Classmarker is a progressing evaluation system. The difficulties in writing exam are "Proficient" and "Excellent" (see OBEM Rubrics in the following page)
- A student needs to score at least 40% in each Module to pass (S).
- If some students score less than 40% in some module, they have only one more opportunity to "retake" the examination of that module in Classmarker. (Dates for examination retaking will be announced later. The TAs will provide a review session for these students one week before the retake day. In Retake Classmarker, students need scores at least 40 from 70 in order to pass (S) this module. Otherwise, they fail (U) on that module.
- Once the students pass (S) from the Retake Classmarker, they will receive scores exactly 40 from 100 for that module.
- If a student fails (U) in some module, he/she will receive "I (Incomplete)" for MTH101 in New ACIS. Thereafter, the student is able to do self-learning via LEB2 and can appeal for examination (depending on the departmental schedule) without new registration.
- Grading in MTH101
    - For a student who passes (S) every module, his/her own score of each module will be converted by the credit of that module. The summation of these converted scores will be used for grading.

- For a student who passes some retake module, his/her score of that module will count only 40/100 and be converted by the credit of that module. The summation of these converted scores will be used for grading.
- OBEM Rubrics

Module	4-Excellent	3-Proficient	2-Progressing	1-Beginning	0-Not yet
Functions, Limit and Continuity OBEM1	1. Evaluate the limit of a function at a point numerically, graphically and algebraically using appropriate techniques. 2. Find points of discontinuity for functions and classify them.				
be able to evaluate limit and continuity of functions	Able to logically explain and calculate about continuity and limit of functions by showing correct calculation of limit with clear and precise notation.	Able to logically explain and calculate limit and continuity of functions by showing only minor algebraic errors in calculation or using inconsistent notation.	Able to calculate limits and determine continuity of simple functions such as rational functions and can apply limit theorems.	Able to apply simple properties of limit to evaluate limit of basic functions.	

Module	4-Excellent	3-Proficient	2-Progressing	1-Beginning	0-Not yet
Derivatives OBEM2	1. interpret the derivative of a function at a point as the instantaneous rate of change in the quantity modelled and state its units or the slope of the tangent line. 2. be able to show whether a function is differentiable at a point. 3. compute the expression for the derivative of a function using the rules of differentiation including the power rule, product rule, and quotient rule chain rule, implicit differentiation and differentiate exponential, logarithmic, and trigonometric and inverse trigonometric functions. 4. obtain expressions for higher order derivatives of a function using the rules of differentiation 5. understand the consequences of Rolle's theorem and the Mean Value theorem for differentiable functions 6. Apply derivative concepts in graph sketching, related rates, extrema of a function, and use the differential to determine the linear approximations.				
be able to calculate, apply derivatives and interpret their meaning	Clearly explain the concept of derivatives, can calculate, apply and relate the meaning to the complex situations. Clearly identify theorems behind the calculation.	Able to explain the concept of derivatives, can calculate, apply and relate the meaning to the complex situations.	Able to calculate derivatives of functions using chain rule and implicit differentiation and relate their meaning to simple applications.	Able to find derivatives of simple algebraic and transcendental functions using basic properties of derivatives.	

Module	4-Excellent	3-Proficient	2-Progressing	1-Beginning	0-Not yet
Integrals OBEM3	1. Find the anti-derivative of elementary polynomials, exponential, logarithmic and trigonometric functions and using standard integration techniques. 2. Describe how the Fundamental Theorem of Calculus can be used both to evaluate integrals and to define new functions, and determine their basic properties. 3. Interpret the definite integral geometrically as the area under a curve, construct a definite integral as the limit of a Riemann sum, and approximate by numerical integration 4. Classify type of improper integrals and determine the convergence of improper integrals 5. Use the concept of integration in applications such as finding area, volume, etc.				
be able to evaluate integrals and use the concept of integration in applications	Clearly explain the concept and properties of integrals. Able to calculate more complicated integrals requiring several integration techniques showing precise calculation. Able to apply and relate the meaning to complex situation	Able to explain the concept and properties of integrals. Able to calculate more complicated integrals requiring several integration techniques showing only minor algebraic errors in calculation Able to apply and relate the meaning to complex situation.	Able to evaluate basic integrals of functions using integration techniques. Able to apply and relate the meaning to simple real situation.	Able to calculate integrals of basic functions like polynomials, exponential and trigonometric functions.	

Module	4-Excellent	3-Proficient	2-Progressing	1-Beginning	0-Not yet
Differentiation of Functions of Several Variables OBEM4	1. Explain the concepts of differential calculus of functions of two or more variables including limit, continuity, partial differentiation, chain rule, Implicit differentiation and being able to compute. 2. Identify, describe, and visualize the graph of two-variable functions. 3. Find and classify the critical points of a function of several real variables 4. Use the method of Lagrange multipliers to determine relative extrema subject to given constraints.				
be able to evaluate limit of functions of several variables, and able to calculate, apply partial derivatives and interpret their meanings	Able to clearly explain the concept of derivatives of functions of several variables. Able to calculate partial derivatives of complicated functions using derivative theorems showing precise calculation. Able to apply and relate the meaning to the complex situation.	Able to sketch the graph of two-variable functions. Able to calculate partial derivatives of complicated functions using derivative theorems showing only minor algebraic errors in calculation Able to apply and relate the meaning to complex real situation.	Able to identify the graph of two-variable functions. Able to calculate limits and determine continuity of functions of several variables and calculate partial derivatives of simple functions, apply and relate the meaning to simple real situation.	Able evaluate limit of functions of several variables and able to calculate simple partial derivatives.	

7. Guideline for Online Examinations

1. The online examinations will be set up through the Classmarker system (https://www.classmarker.com/) and LEB2. Students must register Classmarker and receive the account before the exam day. TAs will give more detail about Classmarker soon.

2. Students have 30 minutes – 90 minutes to complete each examination. The system will automatically logout when the time is up.

3. Students must login to the examination time lots (which will be announced later). Only serious case (together with reasonable evidence) will be accepted for retaking the exam. Students must directly contact the TAs for those unexpected cases.

4. If some part of questions does not show up while completing examination, students must quickly inform TAs via facebook messenger before the examination ends. Otherwise, the students will receive the score only the part they have completed correctly.

5. If students have any problems during the examination time, please also quickly inform TAs by the same channel as 4 as well.

6. Any problem that is informed after examination will not be considered.

7. For the informed problem that cannot be solved during examination, the TAs will make an appointment with the students who has struggled with the problem to complete the unfinished examination later.

8. Students should keep evidences of doing examination such as note papers, solution papers or solution files in case of unexpected problems.

9. If there is any problem occur during examination, the instructors will only consider based on evidences only.

8. Online Learning Medias

1. The department of mathematics have provided video clips for students to study before classes as well as to review after classes in LEB2 (https://www.leb2.kmutt.ac.th/). These video clips cover all topics of MTH101.

2. There are more exercises for students to practice on LEB2 too.

9. Communication Chanel

Students may use facebook group "2022 MTH101 Inter KMUTT" or "https://www.facebook.com/groups/327804836139546" to contact the instructors and the TAs as well as to receive any announcement.

10. Handouts

- Students are able to download the class handouts from the facebook group.

- Students can further study from any calculus book that is provided at university library or website. The examples of calculus books are:

1. Anton, H., Bivens, I. and Davis, S., **Calculus**, 7th Edition, John Wiley & Sons, New York, 2002.
2. D. G. Zill and W. S. Wright, **Calculus Early Transcendentals**, 4th Edition, Jones and Bartlett, Massachusetts, 2011.
3. George B. Thomas; Ross L. Finney, **Calculus and Analytic Geometry**, 8th Edition, Addison Wesley publishing company, Reading, 1992.
4. Finney, R. L., Weir, M. D. and Giordano, F. R., **Calculus**, Tenth Edition, Addison Wesley, New York, 2003.
5. Smith, R. T. and Minton, R. B., **Calculus**, Second Edition, McGraw-Hill, New York, 2002.
6. Swokowsky, E. W., **Calculus**, Fifth Edition, PWS-Kent Publishing Company, 1992.