



# B.E. International Program

## Faculty of Economics, Thammasat University



### Course Outline

#### MA217 Calculus for Social Science 2

Semester 1/2017 (15 August – 9 Dec 2017)

**Number of credits:** 3 credits

**Lecture Time:** Saturdays, 09:00-12:00 hrs.

**Lecture Venue:** Room 203, Faculty of Economics

**Instructor:** Assoc. Prof. Julaluk Carmai, D.Phil. (Oxon)

**E-mail:** [jc211cb@gmail.com](mailto:jc211cb@gmail.com) (the best way to get in touch with me)  
Office hours: by appointment

**Enrollment Key:** 1916

#### Course Description:

Matrices, determinants, solutions of system of linear equations, higher order partial derivatives, application of maximum and minimum of several variables functions with unconstraint and constraint, techniques of integration for one variable functions, polar coordinates and area in polar coordinates, multiple integration and its applications.

**Prerequisite:** MA 216

#### Course Objectives:

Calculus has influenced nearly every branch of natural and social sciences, since its invention about three hundred years ago. Calculus is not only one of the most beautiful ideas in the history of human thought, but also one of the most useful and influential. This course is designed to train students to understand and appreciate both theory and calculation. In each topic, students will not only learn how to solve the problem but also learn the concepts, the hypotheses behind and how to apply them correctly. The student should be able to understand and apply the topics covered in the course which are: higher order partial derivatives, application of maximum and minimum of several variables functions with unconstraint and constraint, matrices, determinants, solutions of system of linear equations, techniques of integration for one variable functions, multiple integration and its applications.

**Reading lists:**

In addition of attending lectures and following handouts and assignments, students are recommended to consult textbooks for further examples and alternative explanations. The class discussion will follow Hoffman and Bradley (2009) and Klein (2002) which give many economic examples and other fields. Other books are also suitable. If you already have a similar book, it is not absolutely necessary to acquire another one.

1. **Hoffman, L.D. and Bradley, G.L.**, *Calculus for Business, Economics, and the Social and Life Sciences*, 10<sup>th</sup> edition, McGraw Hill, 2009. (Recommended)
2. **Klein, M.**, *Mathematical Methods for Economics*, 2nd Edition, Pearson Education, 2002. (Recommended)
3. **Chiang, A. and Wainwright, K.**, *Fundamental Methods of Mathematical Economics*, 4<sup>th</sup> Edition, McGraw-Hill, 2005.
4. **Barnett, R., Zeigler, M. and Byleen,** *College Mathematics for Business and Economics, Life Science, and Social Science*, 10<sup>th</sup> edition, Pearson Education, 2005.
5. **Haeussler, E.F.Jr., Paul, R.S., and Wood, R.**, *Introductory Mathematical Analysis for Business, Economics, and the Life and Social Sciences*, 11<sup>th</sup> edition, Prentice Hall, 2006.
6. **Sydsaeter, K. and Hammond, P.J.**, *Mathematics for Economic Analysis*, Prentice Hall, 2002.
7. **Simon, C., and Blume L.**, *Mathematics for Economists*, Norton & Company, 1994.

**Calculator during Examination:**

- No calculator
- A non-scientific calculator
- A basic scientific/financial calculator (with exponential and logarithmic functions) but not graphical calculator
- A scientific/financial and graphical calculator
- Other e.g. ....

***Familiarise yourself with your calculator.***

**Grading:**

There will be 2 quizzes during classes which will be announced beforehand, a midterm examination and a final examination. The course grades will be determined as following:

Quizzes	10%
Midterm (Saturday 7 October 2017, 9.00-11.00 hrs.)	40%
Final (Saturday 23 December 2017, 9.00-12.00 hrs.)	50%

## Tentative Schedule and Course Outline

Section	Date	Topic
1	19 Aug	Application of maximum and minimum of several variables functions with unconstrained
2	26 Aug	Application of maximum and minimum of several variables functions with equality constraints
3	2 Sep	Application of maximum and minimum of several variables functions with equality constraints (cont.)
4	9 Sep	Application of maximum and minimum of several variables functions with equality constraints (cont.)
5	16 Sep	Application of maximum and minimum of several variables functions with inequality constraints
6	23 Sep	Application of maximum and minimum of several variables functions with inequality constraints (cont.)
7	30 Sep	Application of maximum and minimum of several variables functions with mixed constraints
	<b>Sat 7 Oct</b>	<b>Midterm examination, 9:00-11:00 hrs.</b>
8	14 Oct	Matrices, Algebra of Matrices, Elementary Operations
9	21 Oct	Solutions of system of linear equations
	28 Oct	No Class
11	4 Nov	The inverse of a matrix, Determinants, Some Properties
12	11 Nov	Techniques of integration for one variable functions
13	18 Nov	Techniques of integration for one variable functions (cont.)
14	25 Nov	Multiple integration and its applications
15	2 Dec	Multiple integration and its applications (cont.)
16	9 Dec	Revisions for Final
	<b>Sat 23 Dec</b>	<b>Final examination, 9:00-12:00 hrs.</b>

**!!!! Familiarise yourself with this. !!!!**  
**!!!! This is what you will be given in your examination. !!!!**

**Formulas**

**Differentiation**

We assume that  $u$  is a differentiable function of  $x$ .

$$\frac{d}{dx}(c) = 0$$

$$\frac{d}{dx}(x^n) = n x^{n-1}$$

$$\frac{d}{dx}[c f(x)] = c f'(x)$$

$$\frac{d}{dx}[f(x) \pm g(x)] = f'(x) \pm g'(x)$$

$$\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + f'(x)g(x)$$

$$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$$

$$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$$

$$\frac{d}{dx}(u^n) = n u^{n-1} \frac{du}{dx}$$

$$\frac{d}{dx}(\ln u) = \frac{1}{u} \frac{du}{dx}$$

$$\frac{d}{dx}(e^u) = e^u \frac{du}{dx}$$

$$\frac{d}{dx}(\log_b u) = \frac{1}{(\ln b)u} \cdot \frac{du}{dx}$$

$$\frac{d}{dx}(a^u) = a^u (\ln a) \frac{du}{dx}$$

**Integration**

$$\int k dx = kx + C$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1$$

$$\int e^x dx = e^x + C$$

$$\int kf(x) dx = k \int f(x) dx$$

$$\int [f(x) \pm g(x)] dx = \int f(x) dx \pm \int g(x) dx$$

$$\int [u(x)]^n du = \frac{u^{n+1}}{n+1} + C$$

$$\int e^u du = e^u + C$$

$$\int \frac{1}{u} du = \ln|u| + C, u \neq 0$$

**Least Squares Approximation**

$$\hat{y} = \hat{a} + \hat{b}x$$

$$\hat{a} = \frac{\left(\sum_n x_i^2\right)\left(\sum_n y_i\right) - \left(\sum_n x_i\right)\left(\sum_n x_i y_i\right)}{n \sum_n x_i^2 - \left(\sum_n x_i\right)^2} \text{ and}$$

$$\hat{b} = \frac{\sum_n x_i \sum_n y_i - n \sum_n x_i y_i}{\left(\sum_n x_i\right)^2 - n \sum_n x_i^2}$$