B.E. International Program

Faculty of Economics, Thammasat University

Course Outline

MA217 Calculus for Social Science 2

Semester 1/2013 (13 August – 30 November 2012)

Number of credits: 3 credits

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

Lecture Venue: Room 203, Faculty of Economics

Instructor: Anchalee Manonukul, D.Phil. (Oxon)

E-mail: anchalm@mtec.or.th (the best way to get in touch with me)
Office hours: by appointment

Enrollment Key: 6900

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*, 10th 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*, 4th Edition, McGraw-Hill, 2005.
4. **Barnett, R., Zeigler, M. and Byleen,** *College Mathematics for Business and Economics, Life Science, and Social Science*, 10th 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*, 11th 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 …… quizzes during classes which will be announced beforehand, a midterm examination and a final examination. The course grades will be determined as following:

Quizzes	20%
Midterm (Saturday 5 October 2013, 9.30-11.00 hrs.)	30%
Final (Saturday 7 December 2032, 13.30-16.30 hrs.)	50%

Tentative Schedule and Course Outline

Section	Date	Topic
1	17 Aug	Functions of several variables and partial differentiation (Revision)
2	24 Aug	Application of maximum and minimum of several variables functions with unconstraint
3	31 Aug	Application of maximum and minimum of several variables functions with equality constraints
4	7 Sept	Application of maximum and minimum of several variables functions with equality constraints (cont.)
5	14 Sept	Application of maximum and minimum of several variables functions with inequality constraints
6	21 Sept	Application of maximum and minimum of several variables functions with inequality constraints (cont.)
7	28 Sept	Application of maximum and minimum of several variables functions with mixed constraints
	Sat 5 Oct	***Midterm examination, 9:30-11:00 hrs.***
8	12 Oct	Techniques of integration for one variable functions
9	19 Oct	Techniques of integration for one variable functions (cont.)
10	26 Oct	Multiple integration and its applications
11	2 Nov	Multiple integration and its applications (cont.)
12	9 Nov	Matrices, Algebra of Matrices, Elementary Operations
13	16 Nov	The inverse of a matrix, Determinants, Some Properties
14	23 Nov	Solutions of system of linear equations
15	30 Nov	Revisions of Examination
	Sat 7 Dec	***Final examination, 9:00-12:00 hrs.***

!!!!! 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.

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

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

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

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

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

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

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

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

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

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

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

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

Integration

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

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

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

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

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

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

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

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

Least Squares Approximation

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

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

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