DEPARTMENT OF ECONOMICS
DELHI SCHOOL OF ECONOMICS
UNIVERSITY OF DELHI

Minutes of Meeting

Subject :	B. A. (Hons) Economics (Courses 03 and 06), First and Second Semesters (Academic year 2012-13)
Courses :	03 – Mathematical Methods for Economics I 06 – Mathematical Methods for Economics II (See, page#3)
Date of Meeting :	Monday, 14th December 2012, 11:30 A.M.
Venue :	Department of Economics, Delhi School of Economics University of Delhi, Delhi – 110 007
Convenors:	Dr. Abhijit Banerji and Dr. Sugata Bag

Attended by:

1. Anindita Roy Saha, I.P. College
2. Sonam, Hansraj College
3. Shalini Saksena, DCAC
4. Gita Golani, Shyama Prasad Mukherjee College
5. Sanjeev Kumar, Dyal Singh College
6. Sanghita Mondal, ARSD College
7. Rupa Basu, Kamala Nehru College
8. N. Raghunathan, St. Stephen's College
9. Sandhya Varshney, Dyal Singh College
10. Ram Gati Singh, Shaheed Bhagat Singh College

Remarks:

Certain minor changes (only for course no 06) have been brought in this meeting as prescribed by the attendees. These changes are incorporated under the heading called note below relevant text and are in italics. Further, for linear algebra section, sub-item called linear transformation and properties has been removed.

It was decided to continue with the same criteria for **Internal Assessment** as those followed last year. The total of 25 marks for internal assessment would be assigned as follows. There will be two class tests of 10 marks each and 5 marks would be awarded based on attendance of classes and tutorials.

Course 03: Mathematical Methods in Economics I

Textbook

K. Sydsaeter and P. Hammond: Mathematics for Economic Analysis, Pearson Educational Asia: Delhi (2002))

Note:
The first semester covers Chapters 1-10 and Chapter 20 of the textbook, leaving out Sections 6.7, 10.4 and 20.2-20.5. Note the addition of material on integration (Sections 10.1-10.3) and difference equations (Section 20.1).

The rough weights attached to the five sections mentioned in the new syllabus are: I (Preliminaries) have 10% weight, II (Functions of one real variable) has 55% weight, III (Single variable optimization) has 25% weight, IV (Integration of functions) has 5% weight and V (Deference equations) has 5% weight.*

Description of the Course 03

Part - I. Preliminaries

Logic and proof techniques; sets and set operations; relations; functions and their properties; number systems.

Part - II. Functions of one real variable

Graphs; elementary types of functions: quadratic, polynomial, power, exponential, logarithmic; sequences and series: convergence, algebraic properties and applications; continuous functions: characterizations, properties with respect to various operations and applications; differentiable functions: characterizations, properties with respect to various operations and applications; second and higher order derivatives: properties and applications.

Part - III. Single-variable optimization

Geometric properties of functions: convex functions, their characterizations and applications; local and global optima: geometric characterizations, characterizations using calculus and applications.

Part - IV. Integration of functions

Areas under curves; indefinite integrals; the definite integral.

Part - V. Difference equations

First order difference equations

* See, next footnote for this purpose.

Course 06: Mathematical Methods in Economics II

Textbook

K. Sydsaeter and P. Hammond: *Mathematics for Economic Analysis*, Pearson Educational Asia: Delhi (2002))

Note:
The second semester covers Chapters 12-18 and Chapter 21 of the textbook, leaving out Sections 13.3, 14.4-14.6, 15.9, **17.9**, 18.3 (see exception below), *18.5 (page 690-91 of Indian Ed.)*, 18.8-18.10, 21.3-21.6 and 21.8-21.9. Note the addition of material on differential equations (Sections 21.1, 21.2 and 21.7).

Further notes: (a) While the proof of Theorem 13.1 is not to be done, its statement and uses are to be done. (b) While the proof of Leibniz's formula on page 547 is not to be done, its statement and uses are to be done. *(c) In the section 17.9 on multivariate optimization, treatment to be limited to 3 variables only.* (d) The determinant criterion for quasi-concavity on pages 647-648 is not to be done. (e) In Section 18.3, only the statement of Lagrange's theorem 1(Theorem 18.1) is to be done. (f) The multiple equality constraints case (pages 672-673) is not to be done. *This is in accordance with point (e) above, the Lagrange function for constrained optimization to be limited to two variables and one constraint*)

The rough weights attached to the four sections mentioned in the new syllabus are: I (Differential equations) has 15% weight, II (Linear algebra) has 30% weight, III (Functions of several real variables) has 25% weight and IV (Multi-variable optimization) has 30% weight.[±]

Description of the Course 06

Part - I. Differential equations
First-order differential equations; integral curve, direction diagram and slope field; qualitative theory and stability.

Part - II. Linear algebra
Vector spaces: algebraic and geometric properties, scalar products, norms, orthogonality; *matrix representations and elementary operations*; systems of linear equations: properties of their solution sets; determinants: characterization, properties and applications.

Part - III. Functions of several real variables
Geometric representations: graphs and level curves; differentiable functions: characterizations, properties with respect to various operations and applications; second order derivatives: properties and applications; the implicit function theorem, and application to comparative statics problems; homogeneous and homothetic functions: characterizations and applications.

Part - IV. Multi-variable optimization

[±] These weights are only indicative and not ironclad guarantees of the weights attached to these sections in examinations. The examinations should broadly reflect these weights, but may vary from them by as much as 10% points.

Convex sets; geometric properties of functions: convex functions, their characterizations, properties and applications; further geometric properties of functions: quasiconvex functions, their characterizations, properties and applications; unconstrained optimization: geometric characterizations, characterizations using calculus and applications; constrained optimization with equality constraints: geometric characterizations, Lagrange characterization using calculus and applications; properties of value function: envelope theorem and applications.

Philosophy of the Course

(a) This is not a "Mathematical Economics" course, but a "Mathematical Methods for Economics" course. The intention is not to transmit any particular body of economic theory, but to transmit the body of basic mathematics that enables the creation of economic theory in general. In this course, particular economic models are not the ends, but the means for illustrating the method of applying mathematical techniques to economic theory in general. A pedagogical corollary of this attitude is that economic applications should be chosen as illustrations, not on the basis of their "importance" or "relevance" in economic doctrine, but on the basis of their appropriateness for illustrating particular aspects of mathematical techniques being taught in this course. (Of course, if pedagogical relevance and substantive doctrinal importance coincide in some application, then covering such a Pareto superior application is recommended.) Classroom instruction should stress the understanding and skill in the application of mathematical theorems and techniques, rather than the mastering of any particular set of economic applications.

(b) Stress should be placed on learning mathematical theorems and techniques and recognizing classes of applications where particular theorems and techniques, or their combinations, are applicable and useful.

(c) The prescribed textbook defines the level of sophistication of material to be transmitted to students and the problems contained therein indicate the level of difficulty of questions that may be asked in examinations.

(d) There is no presumption that examination questions will/can be chosen only from the prescribed textbook. However, the examiner should ensure that the level of difficulty is at par with the difficulty of problems in the textbook; the evaluation of "difficulty" is best left to the prudence and academic judgment of the examiner within the institutional context of examination-setting.

(e) Instructors should feel free to draw upon any appropriate supplementary sources for problems and material that they feel is handled inadequately or poorly in the prescribed textbook.

(f) Proofs of propositions that are relatively straightforward may be asked in the examinations. However, questions should not be such as to allow mere regurgitation of theorems proved in the textbook and memorized by the students. Ideal questions should test the student's ability to understand and correctly apply theorems proved in the textbooks rather than merely reproduce their proofs.

(g) Examiners should avoid questions whose solutions involve mere memorization of formulae and computation.

(h) Questions may require students to apply techniques learned in this course to applications drawn from economic theory. However, such questions should be framed with great care. Such questions should explicitly state the mathematical structure required to derive the answer, not leave it implicit, assuming that students will be aware of the economic model in question and the assumptions underlying it. The examiner may assume that students are mathematically sophisticated at a level indicated by this course, but there should be no presumption of economic sophistication or knowledge of economic doctrine beyond what is taught in the Principles course.

(i) Economic applications available in the textbooks and covered in class should not be assumed to be an exhaustive list of potential applications that may be used for framing examination questions.

(j) There should be no presumption that a particular pattern or style of the examination will be replicated from year to year. The examiner shall have latitude to make academically prudent changes subject to the above-mentioned weightage guidelines.