## UNIVERSITY OF DELHI
## DELHI SCHOOL OF ECONOMICS
## DEPARTMENT OF ECONOMICS

### Minutes of Meeting

Subject          :          B.A. (Hons) Economics, Second Semester (2016)
Course           :          Mathematical Methods for Economics II
Date of Meeting:          Monday, 11th January, 2016
Venue            :          Department of Economics, Delhi School of Economics,
                            University of Delhi
Chairs           :          Prof. Sudhir Shah

Attended by :

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|---|---|---|
| 1 | Rupali Sharma | Ramjas College |
| 2 | Divya Gupta | Daulat Ram College |
| 3 | Ganita Bhupal | Rajdhani College |
| 4 | Deepika Jajoria | Shyamlal College (E) |
| 5 | Suresh Kumar | Kalindi College |
| 6 | Rakesh Kumar | ARSD College |
| 7 | Mahesh Khicher | SRCC |
| 8 | N.Shradha Varma | Maitreyi College |
| 9 | Ram Gati Singh | Shaheed Bhagat Singh College |
| 10 | Bhumika Bhawani | Shivaji College |
| 11 | Abhishek Rai | IP College |
| 12 | Harish Dhawan | Aryabhatta College |
| 13 | Indranil Chowdhury | PGDAV College |
| 14 | Sandhya Varshney | Dyal Singh College |
| 15 | Nidhi Bagaria | Satyawati College |

**There is no change in the readings. Decisions of the previous meeting are reproduced below;**

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

This semester covers Chapters 12-18, **21.1 and 21.7** of the textbook, leaving out Sections 13.3, 14.4-14.6, 15.9, 18.3 (see exception below) and 18.8-18.10.**Note: The sections included from Chapter 21,** are a fresh addition relative to last year's discipline I course of the same name.

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) The determinant criterion for quasi-concavity on pages 647-648 is not to be done. (d) In Section 18.3, only the statement of Lagrange's theorem (Theorem 18.1) is to be done.

The rough weights attached to the four sections mentioned below are: I (Linear algebra) has 30% weight, II (Functions of several real variables) has 30% weight, III

(Multi-variable optimization) has 35% weight and IV (Differential Equations) has 5% weight. 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.

## I.    Linear algebra

Vector spaces: algebraic and geometric properties, scalar products, norms, orthogonality; linear transformations; systems of linear equations: properties of their solution sets; determinants: characterization, properties and applications.

## II.    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.

## III.    Multi-variable optimization

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.

## IV. Differential Equations

First-order differential equations (chapter 21.1); qualitative theory and stability (chapter 21.7).

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 judgement 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.