University of Delhi
Department of Economics
Syllabus and Textbook for B. A. (Hons) Economics, Course 02: Mathematical Methods for Economics I

August 5, 2016

Following the Course 02 meeting on May 4, there has been some confusion regarding the syllabus and textbook for this course. This document is intended to remove these doubts.

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(Chairperson)

1   The textbook

It was suggested in the meeting on May 4 that we should transit to a "new textbook" on the presumption that the proposed new book was a better fit for the prescribed syllabus. A sub-committee was given the responsibility of establishing a mapping between the syllabus and the new book. The sub-committee has reported that the presumption was false. **Therefore, it has been decided to revert to the earlier textbook for this course, namely**

K. Sydsaeter and P. Hammond: *Mathematics for Economic Analysis*,
    Pearson Educational Asia: Delhi (2006)

- **Guidance for instructor.** The syllabus remains unchanged; it is as described in Section 2. The chapter and section references are to the above-mentioned book. The textbook reverts to the above-mentioned book. The philosophy of the course remains unchanged, as described in Section 3.

- **Guidance for students who have not bought a book.** If you want to buy a textbook, then buy the above-mentioned book.

- **Guidance for students who have bought "the new book".** There are only two significant differences between the above-mentioned book and the one they have bought. The instructor should guide the students to supplement the book they have bought with Sections 9.6 (Concave and Convex functions) and 20.1 (Difference equations) from the above-mentioned book.

2 The syllabus

This 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 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 syllabus are: I (Preliminaries) has 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 (Difference equations) has 5% weight.[1]

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

- **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.

- **Single-variable optimization.** Geometric properties of functions: convex functions, their characterizations and applications; local and global optima: geometric characterizations, characterizations using calculus and applications.

- **Integration of functions.** Areas under curves; indefinite integrals; the definite integral.

- **Difference equations.** First order difference equations

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[1] 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.

3　Philosophy of the course

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

6. 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.

7. Examiners should avoid questions whose solution involve mere memorization of formulae and computation.

8. 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.

9. 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.

10. 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.