1- SUBJECT DESCRIPTION

Most people regard Mathematics as an abstract science based on proofs, theorems and axioms. However, this science has very real and widespread applications across all disciplines, such as natural sciences (physics, chemistry and biology), business disciplines (economics and finance), statistical theory and decision making. A part of this course aims to prepare you with the foundation to pursue the applied disciplines mentioned above.

To this end, the course can be divided into 2 components: the pure mathematical component (comprising Calculus & Algebra) and the applied component (comprising topics such as Cobb-Douglas functions and logarithms).

2- OBJECTIVES AND SKILLS

- To provide necessary a mathematical foundation for analyzing data and drawing inferences from that analysis.
- To increase the student's mastery of the deductive nature of reasoning.
- To understand the nature of critical thinking.
- To increase the student's ability in problem solving.
- To increase the student's ability to work with others towards a common goal.

3- CONTENT

SESSION 1 – 2

Topic 1: Introduction & Review
Topics covered:
- Introduction
- Review of Functions & Graphs
SESSIONS 3 – 4

**Topic 2: Derivatives**
Topics covered:
- Derivatives
- Rules (Basic, Product & Quotient, Implicit)
- Graphical interpretation
- Practical applications
- Linear approximation
- Exponential functions and their differentials

SESSIONS 5 – 10

**Topic 3: Optimization**
Topics covered:
- Max / Min points
- Local extreme points
- Concavity and convexity
- Applications

SESSIONS 11– 17

**Topic 4: Functions of 2 variables and their derivatives**
Topics covered:
- Functions of 2 variables
- Graphical representations
- Limit & continuity
- Partial derivatives and graphical interpretation
- Direction derivatives and graphical interpretation
- Gradient of functions
- Tangent planes and normal lines

SESSIONS 18 – 21

**Topic 5: Constrained Optimization**
Topics covered:
- Lagrange multiplier
  - Problems
  - Economic interpretation
SESSIONS 22 – 31

**Topic 6: Integration**
Topics covered:
- Integrals
- Primitive and definite integrals
- Graphical representation
- Practical applications

SESSIONS 32–40

**Topic 7: Differential equations (dependent on time)**
Topics covered:
- Differential equation of the first order
- Differential equations of the second order
- Applications

SESSION 41
Final examination.

4- METHODOLOGY AND EVALUATION

Session 41 will be the final exam.

Because of the technical nature of some of the material, it is important to keep up by working exercises. You should do the Problem Sets, the class exercise (& solutions) and try the quizzes and problems at the end of each chapter in the textbook (discuss your solutions with the other members of your study group). It is also essential to do the preparation ahead of time to ensure you obtain the most out of the classes.

Attendance and punctuality are mandatory – please note that you are **required** to email the Instructor (in advance preferably) if you are unable to attend.

**Attendance:**

University policy regarding mandatory attendance states that students should attend **at least 70% of the sessions**. This means that all excused and unexcused absences will be accommodated within the allowed 30%. Only on extremely special cases (ie, a long illness) the rule can be reconsidered by the Academic Director for authorization. If a student exceeds the allowed 30%, he/she will get a 0 in the course. (Nevertheless he/she can be allowed to continue the learning process, receiving feedback on the class work and taking the exams, although this will not change his/her grade).
Participation:

As class participation contributes to the overall grade – please note that 2 tardies (being over 5 minutes late) counts for 1 unexcused absence.

The range of prior knowledge within the class is wide. Those who have already had exposure to this material should be patient. There will be a number of exercises designed to help those who have not seen this before to absorb and understand the techniques.

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Weight</th>
<th>Group/ Individual</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final examination</td>
<td>40%</td>
<td>Individual</td>
<td>Session 41</td>
</tr>
<tr>
<td>4 problem sets</td>
<td>12.5% each or 50% total</td>
<td>Group</td>
<td>Per class announcement</td>
</tr>
<tr>
<td>Class Participation</td>
<td>10%</td>
<td>Individual</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>

A - Final Exam – cumulative – the final is worth 40% of the overall grade – a scientific calculator (non-graphing, non-financial) is recommended. **You need to score at least 40% on the final exam to pass the overall course, even if you have already passed the course through the other course assessments.** It is important that you are motivated to score a good grade on the final exam, to have a comprehensive, cumulative picture. Otherwise you will have to retake the exam in July during the Extraordinary period (see section).

B - Problem Sets - each problem set contributes 12.5% to overall grade – you are recommended to work in groups no larger than 2 students and hand in the assignment promptly at the deadline. Late work by a day will lose its value in the following way: by 10% if submitted on the same day but not during class, by 25% if submitted next day. Beyond Day 2, late assignments will not be accepted.

C - Participation – 10% of the overall grade - students are expected to come prepared and participate actively (and voluntarily) during lectures. In addition, I reserve the right to cold-call on students, particularly on those who have not participated in a while. Your class grade (assigned per session) will be based on attendance, punctuality, participation, and class conduct – there may be a penalty if you create a disruption, talk excessively, or use electronic devices. For further details please refer to the Guideline Document on Campus Online for Class Grade. Your overall class grade is the weighted average of the combined class grades across all the sessions.

There is a University level requirement regarding **mandatory attendance** – which will prevail – please refer to Student Guide. In case of unexcused absences, students may potentially be required to put in additional work.

The **final grade** for the course will be made available within **10 business days** after the examination.

**Regrading policy:** There are no verbal appeals of grades. You must provide a written statement as to where and why there is a problem. All regrade requests must be submitted within **2 business days** of receiving the overall grade (i.e. after the final examination). As a
result, the examination will be reassessed within 2 business days and the overall score may increase, remain the same, or decrease, and no subsequent appeals are accepted.

Overall students have 4 chances to pass the course:

- During the Normal Assessment period (semester in which the assessment is held),
- The Extraordinary Exam period (in July, at the end of that academic year),
- To retake the course, in the following academic year, and
- Extraordinary Exam period in July (at the end of the academic year, when the student registered for the Retake).

Guide to July Extraordinary Exams (Source: University Rules):

“The final grade of the student in the extraordinary exam period will be adjusted according to the following rules:

a. If the student has participated in the process of continuous evaluation, the extraordinary exam in July will have a weight of 40%. The final grade for the subject will take into account the grade achieved during the period of continuous evaluation (60%) and the grade achieved in the extraordinary exam (60%). In this case the overall pass mark will be 50%, and the student would need to achieve a 40% minimum on the exam.

b. If the student did not participate in the process of continuous evaluation due to special circumstances, they have the right to take an exam in the extraordinary exam period with a value of 80% of the final grade for the subject. In this case, the maximum grade that the student can achieve will be 8.0 and the necessary grade to pass the course will be 6.25 out of 10, taking into account the grade for continuous evaluation will be 0.

c. Even if the student has participated in the continuous evaluation process, the final grade could be calculated according to paragraph b) if the student requests it formally before sitting the exam.”

Guide to Retakes of the course:

If the student has not passed the course after taking the July Examination, he / she has a third opportunity to retake the course. Assessment / Methodology will be as already discussed in the syllabus.

However if the student is unable to attend the class physically, then he / she must meet me within the first week when classes re-commence to discuss his / her personal situation.

Depending on the personal situation an alternative solution may be sought and additional work may be given. If the student fails to raise this to my attention within the first week of classes, then their assessment methodology will be as already described above.
RETAKE POLICY

Each student has 4 chances to pass any given course distributed in two consecutive academic years (regular period and July period).

Students who do not comply with the 70% attendance rule will lose their 1st and 2nd chance, and go directly to the 3rd one (they will need to enrol again in this course next academic year).

Grading for retakes will be subject to the following rules:

- Students failing the course in the first regular period will have to do a retake in July (except those not complying with the attendance rules, which are banned from this possibility).
- Dates and location of the July retakes will be posted in advance and will not be changed. Please take this into consideration when planning your summer.
- The retake will consist of the Extraordinary exam held in July, which is comprehensive.
- Retake instructions
  - July retake: comprehensive final exam during the Extraordinary period with the weighting per the subsequent bullet.
  - Retake in the ordinary period: if previously continuous evaluation had been submitted, then: 4 class assignments (weight: 50%), presentation (10%) & final examination (40%). In this instance, the student must obtain a 50% minimum overall for the course grade and a 40% minimum in the exam. If previously continuous evaluation was not submitted, students must obtain 62.5% in the exam to pass the course.

- The grading criteria for the retakes are the following: in case the student passes the attendance rule and submits continuous evaluation during the Ordinary period, it will take on 60% weight and the Extraordinary exam will have 40% weight. In order to pass the course the student must obtain over 40% in the Extraordinary exam, and an overall 50% minimum for the course. In case of not submitting continuous evaluation, students must obtain at least 62.5% in the Extraordinary exam to pass the course.
- The maximum grade that a student may obtain in the retake will be 8 out of 10.

Plagiarism

Sometimes inexperienced research paper writers find that once they have written their text there are many citations, references to authors or to their ideas that are not properly recorded. Since crediting sources is one of the most important aspects of academic writing this may probably invalidate those parts of their texts or worse, the author may be accused of plagiarism, that is, of presenting the work of another person as if it were his or her own work. In order to avoid this problem, we must learn how to write down all the data about the source.

How to avoid plagiarism
Find the complete information at: IE University’s Online Campus - Language Center – Documents - “Academic writing. Textbook”, pages 11-16: “How to record a source” and “How to record information from a source”

IE University’s Ethics Code on plagiarism

This code expressly prohibits plagiarism among IE University members. For the purposes of this code, plagiarism means the dishonest practice of presenting the ideas, writings or words of another person as if they were one’s own. Some examples of plagiarism include, but are not limited to, the following:

- Reproducing the exact words of another person without punctuating them in quotation marks and without mentioning the source.
- Reproducing another person's idea, even if expressed in different words, without mentioning the source.
- Receiving help in academic work (with the teacher's permission) without mentioning such help.

5- USE OF ELECTRONIC DEVICES IN CLASS

All cell phones must be turned off and out of sight during class and will result in the class grade being reduced to 60% of the score achieved for that session. This includes the use of laptops – as the subject does not require the use of a laptop in class; nevertheless if you want to bring your laptop, please contact the professor.