COURSE DESCRIPTION – PMU199 2016F (Mathematics in the News for Social Science Students)

Mathematics has been key to many spectacular discoveries of our times. The discipline is fundamental to creating and analysing many of the models we use to understand the world around us and to inventing new technologies. From managing business risk to designing medical diagnostic equipment, mathematics provides insights inaccessible by other means. This seminar is based on a review of topics that have been found important enough to appear in the popular media. Most of the source information is now on the internet.

The instructor will begin the course with a survey of developments that created our modern age and relied heavily on mathematics. During the course each student will do a presentation based on an article describing a relevant development of his/her choice either alone or in a team, depending on class size. The instructor will guide the discussion and provide simple explanations whenever possible. Within two weeks after each presentation an independent written report will be required from each presenter covering the material and the discussion. A test will be written by the whole class on the last day of the course containing one question on each presentation.

The first class will include organising teams and choosing presentation dates.   Topics must be chosen at least two weeks prior to the presentation date and submitted to the instructor along with a proposal containing at least one reference. We will try to finalize the presentation topics as early as possible and post the evolving presentation schedule on Blackboard.

Marking scheme

Participation and attendance	20%
Proposal (5%) and Presentation (15%)	20%
Report	40%
Test	20%

Below are possible topics. Of course, you are free to choose another topic with the instructor's approval.

1. Encryption –secure internet communication eg. banking
2. GPS and how to calculate the best route from A to B
3. Game theory –modern economics, the Deep Blue chess program
4. Business risk, financial derivatives, mortgage securities - what went wrong?
5. Computational complexity and its impact
6. Linear programming, optimization and its impact
7. Reliability of complex mechanisms
8. Electric power distribution grids
9. Medical imaging –CAT scans, MRI – s, etc
10. Aircraft and flight –fluid flow and controllability
11. Mathematics models and epidemics
12. Mathematics in meteorology
13. Mathematics in climate change models
14. Mathematics and understanding earthquakes
15. Mathematics and understanding the tsunami
16. Mathematics and finding oil reserves
17. Mathematics describing sound propagation and the properties of gases

18. Mathematics describing the sonic boom
19. Mathematics and remote sensing
20. Mathematics behind artificial intelligence
21. How Google uses mathematics
22. Mathematics behind drones and robots
23. Mathematics in the evolution-creation debates
24. Mathematics in the practice of law
25. Mathematics of elections and voting
26. Mathematics of election campaigns – Victory Lab
27. Mathematics in business decision making and marketing
28. Mathematics of protein folding
29. Mathematics and the genome project

The course will make extensive use of the BLACKBOARD system and email. Students are expected to find source material in the library or on the internet.   In case of the internet, information reliability should be considered. Presentation dates must be chosen before the second lecture and a topic and proposal submitted not later than two weeks before the presentation. Marks penalties may apply for missed deadlines. Presentation teams of two students are acceptable. Reports must be individually written and should incorporate the original research and insights gained from class discussion.

Source materials can be found on the Internet by doing a search using the topic above description or the heading "popular articles on mathematics". A list of sources comes up in the Wikipedia entry under "Popular Mathematics". The following journals and magazines also form a good starting point: New Scientist; Scientific American; American Scientist; Nature. In most cases the complete table of contents for many years back is accessible on the web. The book - Excursions in Modern Mathematics by Peter Tanenbaum and Robert Arnold could also form a starting point for your research.

Instructor:

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