Indian Institute of Technology Kanpur

Proposal for a New Course

1. **Course No:** ECO6XX

2. **Course Title:** Economic Data Analysis: Methods and Computational Aspects

3. **Per Week Lectures:** 3 (L), Tutorial: 0 (T), Laboratory: 1 (P), Additional Hours: 0 (A)
   Credits: (3-0-1-0) 6   **Duration of Course:** Half Semester

4. **Proposing Department/IDP:** Economic Sciences
   Other Departments/IDPs which may be interested in the proposed course: None.

5. **Proposing Instructor(s):** Faculty members of the department of economic sciences

   Level of the Course: PG

6. **Course Description:**

   A) **Objectives:** To introduce computational methods to solve mathematical problems related to statistics, data analysis, and time-series analysis. To illustrate the computational aspects with the relevant theory in statistics, machine learning, and econometrics. To enable the students to gain a hands-on experience on implementing different solution methods on real economic data sets, using software such as python & R.

   B) **Contents:**

No.	Broad Title	Topics	No. of lectures
1.	Statistical Inference	Data generating processes, point/ interval estimation, likelihood estimation, hypothesis testing, Bootstrap tests, Monte-Carlo tests, multiple test statistics.	4
2.	Multi-variate Statistics	Regression, classification, OLS, various techniques like ridge regression, lasso, subset selection, principal component analysis, discriminant analysis, random forests, support vector machines.	5
3.	Deep learning	Neural networks, convolutional, recurrent.	2
4.	Time-series analysis	Box-Jenkins approach, Vector Auto Regression (VAR) model, impulse response analysis.	2

   C) **Prerequisites:** For PG students: None. For UG students: Applied probability and statistics or any other equivalent course.

   D) **Short summary:** This course aims to be a basic course on computation to an economic audience. Computational methods that are useful in addressing economic issues are introduced. Students gain a hands-on experience in implementing the methods in real economic problems, through software demonstration lectures and programming assignments. The emphasis of the course would be in learning the implementation of the methods, and not on the theory behind them. A brief introduction of the methods would be provided, assuming that the theory behind the methods is known to the students.

7. **Recommended books:**

   1. James, Witten, Hastie, Tibshirani, *An Introduction to Statistical Learning*, 2013. Available online at https://hastie.su.domains/ISLR2/ISLRv2_website.pdf

2. Hastie, Tibshirani, and Friedman, *The Elements of Statistical Learning*. Available online at https://web.stanford.edu/ hastie/Papers/ESLII.pdf
3. Jeffrey M Woolridge, *Introduction to Econometrics: A Modern Approach*, 5th edition, Cengage learning publishers, 2013.
4. Christian Kleiber and Achim Zeileis, *Applied Econometrics with R*, Springer, 2008.
5. Himanshu Singh, *Statistical Machine Learning*, BPB publications, 2021.
6. Prateek Joshi, *Artificial Intelligence with Python*, Packt Publishing Ltd., 2017. Available at https://mazz.keybase.pub/ebooks/ai/9781786464392-ARTIFICIAL_INTELLIGENCE_WITH_PYTHON.pdf

8. **Any other remarks:** None.

Dated: 04/10/2022   Proposer:_ Dr. Thirumulanathan D_____

Dated:_____DUGC/DPGC Convener:_____

The course is approved / not approved

Chairman, SUGC/SPGC

Dated:_____