

Proposal for a New Academic Course

Notes: i) All fields, except the Preamble, are mandatory and must be completed with appropriate, complete responses. ii) The proposal should be submitted **both** in **hard copy** & in **electronic** (.pdf) form to

sunanda@iitb.ac.in **or** rajnibhate@iitb.ac.in

Name of Academic Unit (Department /School/ Centre/ ID Group) :

Preamble to the proposal (optional) :

Level : Undergraduate/ Postgraduate

Programme : B.Tech./M.Sc./M.Tech./M.Phil/M.Mgt./M.Des./Ph.D./Other(Specify): _____

i	Title of the course	Principles of Mathematical Modeling
ii	Credit Structure (L-T-P-C)	3-0-0-6
iii	Type of Course (Institute/ Departmental) + (Core/ Elective/ ...)	Institute/CSE elective
iv	Semester in which normally to be offered (Autumn/Spring)	Spring
v	Whether Full or Half Semester Course	Full
vi	Pre-requisite(s) , if any (For the students) – <i>specify course number(s)</i>	One Semester courses in Multi-variable Calculus and Linear Algebra
vii	Course Content *	Construction of Reals. Topology of real space. Review of Linear Algebra. Domains and Functions. The Optimization framework. The combinatorics of tight sets. Karush-Kuhn-Tucker Theorem and the conditions of optimality. Multiple and competing objectives. Elements of Games. Nash Equilibrium. Various examples from everyday situations such as competitive exams, markets, employment and rents, maps and surveying and logistics.
viii	Texts/References **	Walter Rudin, Principles of Mathematical Analysis, McGraw-Hill, 1976. S.Boyd and L.Vandenberghe. Convex Optimization. Cambridge University Press, 2004.Available at http://www.stanford.edu/~boyd/cvxbook/ Roger Myerson, Game Theory-Analysis of Conflict, Harvard University Press, 1997.

ix	Name(s) of Instructor(s) ***	Milind Sohoni
x	Name(s) of other Departments/ Academic Units to whom the course is relevant	Electrical Engg, CTARA, Systems and Control,
xi	Is/Are there any course(s) in the same/ other academic unit(s) which is/ are equivalent to this course? If so, please give details.	There are no equivalent courses. The proposed course focuses on model-building skills. CS435 has a focus on optimization techniques for combinatorial problems. CS709 is a deeper technical course on convex analysis.
xii	Justification/ Need for introducing the course	The aim of the course is to prepare students in the mathematical skills and theory needed for model-building and analysis. This will be done by a close coupling of theory and an analysis of concrete situations picked from a variety of areas. Such a course will better prepare students to do <i>ab initio</i> analysis of complex real-life situations and also in their disciplinary research.

* The course content must **clearly** specify the topics/ components/ material normally intended to be taught/ discussed in the course. It would help, also, to separate essential and optional content, if applicable.

** **Complete details** of texts/ references should be specified, giving as much information as possible about the publisher(s) and/or sources, year of publication, edition, and so on.

*** Note that, there must be **at least** one instructor who is a **permanent** Faculty Member of IIT Bombay for all courses. For **core** courses there must be **at least two** such.

Note to forward an Academic Course Proposal to the Institute Level Academic Bodies from the Academic Unit

The proposal for the Academic Course titled '_____ ' has been accepted by the local Academic Body/Bodies (Specify: DUGC/DPGC/IDPC and so on _____) of the following Academic Unit (Department/ Centre/ School/ ID Group) _____ for recommendation to the Institute level Academic Bodies (Specify UGPC/PGPC/Jointly to UGPC & PGPC and so on : _____) and is forwarded hereby, for consideration and necessary action by this Institute level Academic Body.

Additional Remarks, if any:

Signature with date:

**Convener of the Academic Body
in the Academic Unit/ Head of
Department/ Convener, Interdisciplinary Programme**

Remarks and Signature of **Dean/Associate Dean, Academic Programmes:**
(Convener/Co-Convener of Institute level Academic Bodies)

Remarks of **Chairman, Senate :**