

PROFORMA FOR NEW COURSE

1.	Title of the Course	Mathematical Modelling
2.	Course Number	MA6026
3.	Status of the Course	Elective
4.	Structure of Credits	3-0-0-3
5.	Offered To	PG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Mathematics and Statistics
8.	To take effect from	July 2020
9.	Prerequisite	CoT
10.	Whether approved by the Department	Yes
11.	Course Objective: To vivify the real problems through mathematical models. To develop simple models. To introduce complexity to existing models and identify their significant parameters. To apply mathematical techniques to solve models.	
12.	Course Content: System, models, simulations, physical models, input-output systems, open and closed systems; Mathematical models, state variables, black box system, classification, characterization, limitations, properties, source of errors, dimensional analysis, applications, non-uniqueness; Real problems, parameter identification, reduced system, reduction of an open problem to a closed problem, conversion of a real problem into a mathematical problem; Analytical and numerical solutions, physical interpretation, well-posedness; Mechanistic models, ordinary differential equations, partial differential equations, Navier-Stokes equation, traffic flow, difference equations, cellular automata, optimal control problems, inverse problems.	
13.	Text book(s): 1. Dym C L, <i>Principles of Mathematical Modeling</i> , 2nd Edition, Elsevier (2004). 2. Velten K, <i>Mathematical Modeling and Simulation: Introduction for Scientists and Engineers</i> , 1st Edition, Wiley-VCH, Verlag (2009).	
14.	Reference(s): 1. Bender E A, <i>An Introduction to Mathematical Modeling</i> , 1st Edition, Dover Publications (2012). 2. Fowler A C, <i>Mathematical Model in Applied Sciences</i> , 1st Edition, Cambridge University Press (1997). 3. Glordano F R, Fox W P, Horton S B and Weir M D, <i>A First Course in Mathematical Modeling</i> , 4th Edition, Cengage Learning (2008) 4. Meyer W J, <i>Concepts of Mathematical Modeling</i> , 1st Edition, Dover Publications (2014).	