SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
MAT	**663**	**Mathematical and Computational Modeling**	**4**	**3**	**٠**	**1**	**9**	**MAT 631**	**2^1-2^2**	**English**

A. Course Description

This course introduces students to mathematical modeling, so that students will be able to analyze, design and begin to control rigorous mathematical models ranging from industrial, biological, and environmental problems. Conceptual models and their solutions using graphical, numerical and analytical approaches are presented

B. Course Outcomes

At the end of this course the student will be able to*:*

1. Acquire an understanding of processes undertaken to arrive at a suitable mathematical model.
2. Learn the fundamental analytical techniques and computational methods used to develop insight into system behaviour.

C. References:

1. **J.N. Kapur**, *Mathematical modeling*; Wiley eastern Ltd., 1994. (Main Reference)

Required Textbook

2. **M.M. Gibbons**, *A Concrete Approach to Mathematical Modeling*; John Wiley and Sons, 1995.
3. **H. Neunzert, A. Siddiqui**, *Topics in Industrial Mathematics*; Kluwer Academic Publishers, London, 2000.

Course Website: Google Classroom Webpage:http://www.imamm.org/

D. Topics Outline

1. **Mathematical Modeling Tools:** Needs and Techniques of mathematical modeling: Idea of mathematical modeling; Steps in mathematical modeling, Characteristics of mathematical modeling.
2. **Case Studies:** Models in mechanical vibration (Spring mass system, pendulum problems); Models in population dynamics (One species model, logistic model, growth model in time delays, Predator-Prey models, Volterra-Lotka models); Models of chemical processes, Electrical network and Diffusion processes, Trafic Flow Models.
3. **Modeling Dynamical Systems:** Differential equations and their numerical solutions, linear and nonlinear dynamics, stability, convergence, attractors.
4. **Physical Systems:** System types and characteristics behaviour, continuous-time, discrete Vs time and discrete, event systems, linear and nonlinear systems.
5. **Exploration of Behaviour through Simulation:** Developing simulations of dynamical systems using Matlab/Simulink: representation and visualization of simulation experiments, analyzing behavioural characteristics for a range of classes of

physical and computational systems *eg*. Predator-prey models, evolutionary systems and cellular system.

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm :** 8^{th} or 9^{th} week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16^{th} week.

Your course grade will be based on your semester work as follows:

Midterm : 30 %	**Final Exam:** 40 %
Quizzes, Homework, Attendance & Participation: 30 %	

The grading distribution:

A^+	A	B^+	B	C^+	C	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[0, 70)

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

Executive Rules for Study Regulations and Examsgoo.gl/ykm7t3