SANKALCHAND PATEL UNIVERSITY
।। अथातो ज्ञानजिज्ञासा ।।

# FACULTY OF SCIENCE

**M.Sc. Mathematics (SEM-I)**

In Effect from Academic Year 2016-17

| Subject Code: 1SC2040104 | Subject Title: MATHEMATICAL MODELLING |
|---|---|

**Course Objective:**

- The overall objective of this course is to provide an introduction to the process of mathematical modeling while giving students an opportunity to develop and construct appropriate models for various problem situations.
- Analyze given models to uncover underlying assumptions.
- Investigate particular problems to find out what has already been done toward developing solutions.

| Teaching scheme (hours) per week | | Credit | | | Theory Marks | | Practical Marks | | Total |
|---|---|---|---|---|---|---|---|---|---|
| Lecture | Tutorial | Theory | Practical | Total | Uni. Assessment | Cont. Assessment | Uni. Assessment | Cont. Assessment | |
| 4 | 1 | 5 | - | 5 | 60 | 40 | -- | -- | 100 |

| Subject Contents | | | |
|---|---|---|---|
| Unit. No | Topic | Total Hours | Weight (%) |
| 1 | Introduction to the subject, its scope and limitation, classification of models. Dimensional Homogeneity, Technique of dimensional analysis, an arithmetic model of Gravity, Simple population growth model, Logistic population growth model, Geometric interpretation of logistic growth function. | 18 | 25 |
| 2 | Two Species Population Models: Prey–Predator models for population dynamics, Geometric interpretation and stability of Prey-Predator model, competition model, Epidemic Models, Simple deterministic model, SIS Model, Epidemic Models with constant number of carriers, Epidemic model with removal. | 18 | 25 |
| 3 | Diffusion and Glucose in the Blood stream, Model for diabetes Mellitus, Genetics Models: Hardy-Weinberg law model for genetics, Genetics model for Blood groups. | 18 | 25 |
| 4 | Traffic Models: Macroscopic Highway traffic model, continuum hypotheses and the fundamental diagram, linear-car-following models. | 18 | 25 |

**Course Outcome:**

On successful completion of the course, students should be able to

- Students learn to use the modeling process to translate problem situations to mathematical expressions,
- Use a variety of mathematical resources and tools to study problem situations.
- Use appropriate technology to assist in the problem-solving process.
- Take an analytical approach to problems in their future endeavors

- Identify and classify zeros and singular points of functions.

**List of References:**

- Braum, Colemem & Drew, *Differential Equation Models*, Springer–Verlag, 1983.
- Martin Braun, *Differential Equation and their applications*, Springer-Verlag, 1977.
- Dym & Ivey, *Principles of Mathematics Modeling*, , Academic press – 1980.
- Lucas & Roberts, *Discrete and system models*, Springer Verlag, 1983.
- Haberman, *Mathematical Model*, Prentice–Hall Inc., 1977.

**Note:** The course is roughly covered by the following two books:

1. J. N. Kapur, *Mathematical Modeling*, Wiley Eastern Ltd., 1988.
2. J. N. Kapur, *Mathematical Models in Biology and Medicine*, East–West press Pvt. Ltd., 1992.