CENTRAL UNIVERSITY OF KERALA
DEPARTMENT OF COMPUTER SCIENCE
M.Sc. COMPUTER SCIENCE

CORE COURSE					
COURSE CODE	COURSE TITLE	CONTACT HRS/WEEK			CREDITS
		LEC	LAB	TUT	
CSC5101	Computational Mathematics	2	2	1	4

Lec = Lecture, Tut = Tutorial, Lab = Practical

This is a participatory and problem solving **skill development course.**

Course Objective:
The objective of the course is to provide theoretical and practical aspects of mathematically representing real world problems and digitally modelling it.

By completing this course, students will obtain the following course/learning outcomes:
1. Knowledge to be gained:
   (i) fundamental concepts of computational mathematics
   (ii) Representation of real world problems into computational algorithms
   (iii) Skills in representation data and implementation of mathematical concepts on computers
   (iv) Influence of data representation on computers on numerical algorithms.
2. Skill to be gained:
   (v) Skills in representation of data and implementation of mathematical concepts using AI related toolbox/packages in Python and MATLAB
   (vi) Critical analyzing and logic skills in developing computational algorithms.
3. Competency to be gained:
   (vii) Computational modelling of any real world problem

Prerequisites: Basic knowledge in mathematics

Grading:

Lab implementation	– 12%
Participatory based group Project	– 10%
Assignment/Quiz/presentation	– 8%
Class Test	– 10%
Final Exam	– 60%

CSC5101 - Computational Mathematics

Module 1
Mathematical Statistics – Concepts of Probability and Random Variables, Classical Relative Frequency and Axiomatic Definition of Probability, Addition Rule, Conditional Probability, Multiplication Rule, Bayes Rule, T Test, χ^2 Test

Module 2
Solution of Algebraic and Transcendental Equations **-** Bisection method, Regula – Falsi Method, Newton_ Raphson method, Solution of Linear System of Equations and Matrix Inversion – Gaussian Elimination Method, Jacobi's Method, Gauss – Seidel Iteration Method, Eigen Value Problems – Power Method.

Module 3
Interpolation – Lagrange's Interpolation Formulae, Newton's Forward Difference Interpolation Formula, Numerical Differentiation and Integration – Trapezoidal Rule, Simpson's Rules, Ordinary Differential Equations – Euler Method, Runge-Kutta Methods. Any one of the finite difference schemes for partial differential equations.

Module 4
Introduction to Graph theory.

References:

1. K Sankara Rao, *Numerical Methods for Scientists and Engineers*, PHI Publication, Eastern Economy edition, 2009.
2. Laurene V Fausett, *Applied Numerical Analysis using MATLAB,* Pearson Edition, 2011.
3. V Rajaraman, *Computer Oriented Numerica Methods,* PHI Publication, Eastern Economy edition, 2009
4. Kreyszig E, *Advanced Engineering Mathematics,* Wiley India edition, 2008.