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**	
CSC5303	High Performance Computing	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 implementing high performance computing.

By completing this course, students will obtain the following course/learning outcomes:
1.   Knowledge gained:
     (i)   in-depth concepts of high performance computing
2.   Skill gained:
     (ii)   Skills in solving computationally intense problems using parallel algorithms
3.   Competency gained:
     (iii) Computational modelling of parallel algorithms using OpenMP, pthread and MPI

Prerequisites: Basic knowledge in programming.

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

CSC5303 – High Performance Computing

Module 1
The von Neumann architecture, Modifications to the von Neumann Model – Caching, Virtual memory, instruction level parallelism, hardware multithreading, motivation and scope of parallel computing, Flynn's taxonomy.

Module 2
Sources of overhead in parallel programs, performance metrics for parallel systems, speedup & efficiency, Amdahl's law, foster's design methodology.

Module 3
Thread Basics, the POSIX thread API, Thread Creation and Termination, Synchronization Primitives in Pthreads, thread cancellation.

Module 4
The shared memory model, types of OpenMP constructs, OpenMP compiler directives, parallel constructs, work-sharing construct, combined parallel work-sharing constructs, synchronization directives, combining MPI and OpenMP.

Module 5
Principles of Message-passing, send and receive operations, message passing interface (MPI), and case studies.

References:
1.   Hesham El-Rewini and Mostafa Abd-El-Barr, *Advanced Computer Architecture and Parallel Processing*, John Wiley & Sons, Inc Publication, 2005.
2.   Peter S. Pacheco, *An introduction to parallel programming*, Elsevier Inc., 2011
3.   Anantha Grama, Anshul Gupta, George Karypis, Vipin Kumar, *Introduction to Parallel Computing*, Addison Wesley, 2003.
4.   Michael J. Quinn, *Parallel programming in C with MPI and OpenMP, MC Graw Hill, 2003*