**310254 Programming Laboratory-III**

**Teaching Scheme: Examination Scheme: Practical: 4 Hrs/Week Practical: 50 Marks Oral: 50 Marks**

**Course Objectives:**

To learn multi-core, Concurrent and Distributed Programming

To learn Embedded Operating Systems Programming

To learn writing Software Engineering document

To learn Embedded/ Concurrent and Distributed Programming

**Course Outcomes:**

Ability to perform multi-core, Concurrent and Distributed Programming

Ability to perform Embedded Operating Systems Programming

Ability to write Software Engineering Document

Ability to perform Concurrent and Distributed Programming

**Tools:** Latest version of 64 Bit Operating Systems Open Source Fedora-19 or Higher equivalent with LAMP tools, Windows 8 with Multicore CPU equivalent to Intel i5/7 4th generation onwards supporting Virtualization and Multi-Threading, 8 GB RAM, 500GB/1TB HDD, CUDA/OpenCL ,GPU/Begal Bone Black(BBB)/Atmel Cortex A5/M4 Mobile-tablet processor, WSN sensor Processor boards, Latest versions of

64-Bit Programming languages such as Microsoft Visual Studio (ver. 12 or Higher) or equivalent open source, Eclipse 64-bit Platform, 64-bit Database Client-Server architecture equivalent to IBM 3250, MySQL, MongoDB, OpenMP, CUDA/OpenCL or equivalent Open Source, Wireless Network supporting High End data traffic and other tools published by the BoS time to time.

**Documentation:**

32/64 bit LATXT PDF as per the template and revisions published by the BoS time-to-time. It shall Cover Aim, Objectives, Mathematical Modeling covering multi-core and distributed aspects, Efficiency, Data Structures resulted out of Mathematical Modeling, Conclusion.

**Assignments Group A (Mandatory)**

1 Develop an application using Beeglebone Black/ ARM Cortex A5 development board to simulate the operations of LIFT.

2 Develop an application using Beeglebone Black/ ARM Cortex A5 development board to simulate the working of signal lights.

3 Implement an calculator (64 bit Binary Multiplication) application using concurrent lisp

4 Apply the Following Software Engineering to all assignments(No 1,2,3 of Group A and

B). Mathematical Modeling must result into UML Requirements.

Apply Assignment No 4a to 4d for all Group A and Group B assignments of Embedded Operating system and Concurrent and Distributed Programming. Use tools Open source tools like ArgoUML, UMLLet, StarUML or equivalent tools for UML models) Or Use Agile or Scrum-Agile methodologies and Tools.Use of Possitive and Negative Testing.

4a Design mathematical model of the Application/system using set theory, algebraic system, relations and functions, Deterministic and Non-Deterministic entities..

4b Analyze requirements from the Problem statement, mathematical model, Domain requirements and identify Functional, Non functional, Actors, Usecases for the application/system. Create usecase diagram, activity diagram/swimlane diagram for each usecase.

4c Design the architecture for the system/application using package diagram , deployment diagram. Design classes using class diagram.

4d Design the behavior of the system/application using state machine diagram and sequence diagram.

5 Create Project plan, SRS, Design document and Test Plan for one group-C assignment from embedded operating system or Concurrent and Distributed Programming

6 Write an application to parse input text file concurrently and compare the result of concurrent parsing with serial parsing ( Use concurrent YACC parser)

**Assignments Group B (Any Six Assignments, All assignments to be covered in the Batch)**

1 Write an application to and demonstrate the change in BeagleBoard/ ARM Cortex

A5 /Microprocessor /CPU frequency or square wave of programmable frequency.

2 Implement a Parallel Quick Sort algorithm using NVIDIA GPU or equivalent ARM

board.

3 Vedic Mathematics method to find square of 2-digit number is used in a distributed programming. Use shared memory and distributed (multi-CPU) programming to complete the task.

4 Implement a Parallel ODD-Even Sort algorithm using GPU or ARM equivalent.

5 Implement n-ary search algorithm using OPENMP

6 Implement concurrent prims algorithm using OPENMP

7 Implement *nxn* matrix parallel multiplication using CUDA/OpenCL GPU, use shared memory.

8 Develop a network based application by setting IP address on BeagleBoard/ ARM Cortex A5.

9 Implement a Multi-threading application for echo server using socket programming in

JAVA

10 Implement Reader-Writer problem using OPENMP

11 Implement a dinning philosophers problem using OpenCL wherein each philosopher is a distributed computer memory in a cluster.

12 A text file is stored in a distributed manner on three hard disks on three machines such that consecutive lines, one per hard disk are stored in cyclic manner. Write a program using OpenCL to read/Write/Modify the file.

13 A file holds a data structure that is written and modified by number of users in a distributed manner. Multiple users on multiple computers use Read-Modify-Write cycle provided resource is available else use use modify once before exit. Write necessary Program using OpenCL.

14 Perform Assignment No 4 of Group A for Assignment No 12 of Group-B using

UMLLet

15 Perform Assignment No 4 of Group A for Assignment No 13 of Group-B usung concurrent UML.

**Assignment Group C: Advance Technology Assignments (Any One)**

1 Develop Robotics(stepper motor) Application using Beagle Board.

2 Develop bus arbitration logic using VME/PCI bus for cluster of CPU boards for high performance computing (BIG DATA)

3 Implement a Distributed matrix multiplication using CUDA / OpenMPI

Digital Content: Laboratory Manual Developed by college Teachers and get it approved by BoS Applicable PR/OR/TW Examination shall be conducted by the pair of examiners as per university rules and shall be on the experiments performed by the students. During Examination the student must write the Mathematical modeling of the problem statement before attempting the solution. The solution must be as per mathematical modeling. The student must demonstrate the running output with and without debug mode. The scheme of assessment shall be published by the BoS.