

## COURSE DESCRIPTION

<b>Department and Course Number</b>	CS 370	<b>Course Coordinator</b>	Raj Pamula
<b>Course Title</b>	Parallel and Distributed Programming	<b>Total Credits</b>	4

### **Current Catalog Description:**

Parallel programming techniques; abstract models of hardware and operating systems to support parallel programs.

### **Textbook:**

None

### **References:**

Instructor notes on the faculty web page.

### **Course Goals:**

At the end of the course, students have a good understanding of

- Parallel hardware architectures
- Parallel programming models
- Parallel algorithms
- Writing parallel programs

These course goals contribute to the success of **Student Learning Outcomes 1.a, 1.b, 1.d, 1.f, 2, 3, 5, and 6.**

### **Prerequisites by Topic:**

- Data Structures
- Algorithms
- High level programming languages
- Operating Systems
- Computer Networks

### **Major Topics Covered in the Course:**

- Parallel hardware architectures
- Parallel programming models
- Shared memory model
  1. Operating system support
  2. Shared memory access
  3. Parallel programming
- Distributed memory model

1. Clusters
  2. Operating system support
  3. Message Passing Interface
  4. Parallel programs
- Parallel Algorithms
  - Efficiency and timing analysis

**Laboratory Projects (specify number of weeks on each):**

The students complete 5-6 lab projects on a selected topic, (1-2 weeks per project)

- Shared memory programming : Using “forking and joining” principle to do a computation
- Shared memory programming : Using “shared memory” principle to do a computation
- Shared memory programming : Using “barrier” principle to do a computation
- Distributed memory programming : Using MPI library to do a computation
- A large project (such as sorting and searching) on Shared and Distributed memory platforms.

**Estimate Curriculum Category Content (Quarter Hours)**

Area	Core	Advanced	Area	Core	Advanced
Algorithms		.75	Data Structures		.75
Software Design		1.5	Prog. Languages		0.5
Comp. Arch.		0.5			

**Oral and Written Communications:**

The students are required to submit the source code and software documentation of the programming project.

**Social and Ethical Issues:**

No significant component.

**Theoretical Content:**

- Introduction to parallel architectures (1 week)
- Introduction to parallel programming modes (1 week)
- Introduction to parallel algorithms (1 week)

**Problem Analysis:**

Students write parallel programs using a particular parallel architecture.

**Solution Design:**

Solution design involves parallel programs on a given architecture using Operating Systems support and other libraries. Students execute programs using both “Shared Memory” and “Distributed Memory” models.