ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL
Faculty of Electrical and Computer Engineering
COURSE SYLLABUS
Operating Systems

1. CODE AND NUMBER OF CREDITS

CODE	FIEC02097	
NUMBER OF CREDITS: 4	**Theoretical: 4**	**Practical: 0**

2. COURSE DESCRIPTION

This course presents the fundamental concepts of operating systems. Programming concepts are introduced and analyzed concurrent problems that present themselves as mutual exclusion, deadlock and starvation. It analyzes the data structures used to manage the main memory and the file system in a real operating system. In order to validate these concepts, this course includes lab practices and projects in which students must desing and implement solutions to problems that require the correct use of operating systems functions.

3. PRE-REQUISITES AND CO-REQUISITES

PRE-REQUISITES	FIEC03319 Computers Architecture and Organization
CO-REQUISITES	

4. CORE TEXT AND OTHER REQUIRED REFERENCES FOR THE TEACHING OF THE COURSE

CORE TEXT	1. Operating Systems, Silberchatz, Galvin. Gagne. 9Th Edition,2012 Wiley.
REFERENCES	1. Operating Systems, Andrew Tanenbaum, 3rd Edition; 2007,Pearson

5. COURSE LEARNING OUTCOMES

At the end of the course, the student will be able to:

1. Describe the operating system resource management basic operations
2. Describe the concept of process, and listing the status transitions of several processes.
3. Distinguish the differences between a process and a thread 4.
4. Implement an application with code sections developed on a concurrent way and applying appropriate techniques to avoid problems such as: deadlock and starvation
5. Describe or applying concepts about virtual memory
6. Describe appropriate CPU policies in uni-processor and multiprocessor systems
7. Describe several techniques of disk scheduling
8. Design and implementing concurrent applications using semaphores/monitors for processes' control

6. COURSE PROGRAM

I. Introduction (2 sessions - 4 hours).
   - Definition and history
   - Dual kernel mode

II. Operating System Structures (2 sessions - 4 hours).
   - Operating System Services
   - User interface
   - System calls
   - Design and implementation of Operating System
   - Operating System Structure
   - Virtual Machines

III. Processes (3 sesiones - 6 horas).
   - Concepts
   - Process operations
   - Interprocess communication
   - Lab

IV. Threads (3 sessions - 6 hours).
   - Introduction
   - Multi-thread models

- Thread libraries
- Design and implementation
- Examples
- Lab

V. CPU Scheduling (4 sessions - 8 hours).
- Basic Concepts
- Scheduling criteria
- Scheduling algorithms
- Multi-processor scheduling
- Thread Scheduling
- Examples
- Lab

VI. Process synchronization (4 sessions - 8 hours).
- Project Review
- Introduction
- Critical-section problem
- Hardware synchronization
- Semaphores
- Synchronization classic problems
- Monitors
- Examples
- Lab

VII. Deadlock (2 sessions - 4 hours).
- Model
- Characterization
- Deadlock avoiding mechanisms
- Deadlock recovery

VIII. Main memory management (2 sessions - 4 hours).
- Concepts
- Swapping
- Memory assignment
- Pagination
- Page table structure
- Segmentation
- Discussion Final Project

IX. Virtual memory management (2 session -4 hours).
- Concepts
- On-demand pagination
- Copy-on-write
- Page replacements
- Other considerations

X. File system interface (1 session - 2 hours).
- Concepts
- Access methods
- File system structures
- Mounting a file system
- Sharing files
- File protection

XI. File system implementation (2session - 4 hours).
- File system structure
- Assignment methods
- Free space disk management
- Efficiency and performance
- File system recovery
- Journaling file systems

XII. Special purpose operating systems(1 session - 2 hours).
- System characterization
- Kernel
- Resource management
- An example

7. WORKLOAD: THEORY/PRACTICE

Two sessions a week, 2 hours each

8. CONTRIBUTION OF THE COURSE TO THE EDUCATION OF THE STUDENT

The student will learn fundamental concepts on current Operating systems
The student will be able to exploit system calls to solve practical problems.
The student will develop a software project as part of a team.
The student will learn concurrent programming techniques for multi-threadeading solutions on multiprocessor systems.

BASIC TRAINING	PROFESSIONAL TRAINING	SOCIAL SKILLS DEVELOPMENT
	x	

9. THE RELATIONSHIP BETWEEN THE LEARNING OUTCOMES OF THE COURSE AND THE LEARNING OUTCOMES OF THE DEGREE PROGRAM

LEARNING OUTCOMES OF THE DEGREE PROGRAM*	CONTRIBUTION (High, Medium, Low)	LEARNING OUTCOMES OF THE COURSE**	THE STUDENT MUST:
a) An ability to apply knowledge of computing and mathematics appropriate to the discipline	Medium	1,2,3,5,6,7	Evaluate the most efficient CPU scheduling algorithm
b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution	High	4,5,7,8	Design software solutions for concurrent programing problems
c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs	Medium	8	Design software solutions for concurrent programing problems
d) An ability to function effectively on teams to accomplish a common goal	---		
e) An understanding of professional, ethical, legal, security and social issues and responsibilities	---		
f) An ability to communicate effectively with a range of audiences	Low	8	Elaborate reports that proposes and discuses the design of a concurrent system
g) An ability to analyze the local and global impact of computing on individuals, organizations, and society	---		
h) Recognition of the need for and an ability to engage in continuing professional development	Low	1	Apply Operating System concepts learn in class in a modern Operating System

i) An ability to use current techniques, skills, and tools necessary for computing practice.	Medium	8	Develop an application without IDE to monitor a process performance using system calls
j) Ability to lead, manage and undertake projects	---		

10. EVALUATION IN THE COURSE

Evaluation activities	
Exams	X
Tests	X
Homework/tasks	X
Projects	X
Laboratory/Experiments	X
Class participation	
Visits	
Other	

11. PERSON RESPONSIBLE FOR THE CREATION OF THE SYLLABUS AND THE DATE OF ITS CREATION

Created by	Daniel Ochhoa
Date	February 23, 2013

12. APPROVAL

ACADEMIC SECRETARY OF THE ACADEMIC DEPARTMENT	DIRECTOR OF TECHNICAL ACADEMIC SECRETARY
NAME: Sra. Leonor Caicedo G.	NAME: Ing. Marcos Mendoza V.
SIGNATURE:	SIGNATURE:
Date of approval by the Directive Council: 2013-334 2013-08-12	ESCUELA SUPERIOR POLITÉCNICA DEL LITORAL Ing. Marcos Mendoza V. DIRECTOR DE LA SECRETARÍA TÉCNICA ACADÉMICA

13. VALIDITY OF THE SYLLABUS

RESOLUTION OF THE POLYTECHNIC BOARD:	13-10-269
DATE:	2013-10-17