

K.L.UNIVERSITY
SOPHOMORE ENGINEERING DEPARTMENT - IV
ELECTRONICS & COMPUTER ENGINEERING

II/IV B.Tech.

Academic Year – 2011-12.

Semester - II

COURSE HANDOUT

DATE: 6-12-11

Course No. : **EMC 208**
Course Title : **Operating Systems**
Course Coordinator : **M. Vishnuvardhan**
Team of instructors : **Dr. A.S.N Chakravarthy**

I ELECTRONICS & COMPUTER ENGINEERING PROGRAMME OBJECTIVE:

The main objective of an engineering course in Electronics & Computers is to prove the technical viability of new technology, together with, as appropriate, its possible economic advantages. Provides a quality education with emphasis on strong foundation, fostering creativity and use of modern ICT tools. Demonstration activities are expected to speed up the innovation of new technologies in the field of computers and electronics.

The above program objective can be broadly defined on five counts as below.

- 1. Preparation:** To prepare students for successful careers both in software and hardware industry that meet the needs of Indian and Multinational companies and to prepare students for postgraduate programs in inter-disciplinary streams related to Electronics and Computers.
- 2. Core Competence:** To provide students with solid foundation in mathematical, scientific and engineering fundamentals which are necessary to formulate, solve and analyze engineering problems and also to prepare them for graduate studies.
- 3. Breadth:** To train the students with good engineering skills so as to work as part of teams in Multi disciplinary projects.

4. **Professionalism:** The instruction should emphasize the primary purpose of the profession as being the pursuit of a learned art in the spirit of public service. The sense of professionalism should convey the responsibility to evaluate the impact of the opportunity and obligation of the practitioner, to be in concert with peers, guides, and direct the profession.
5. **Learning Environment:** To develop the ability among students to synthesize data and technical concepts for application to product design. To promote student awareness of the life – long learning and to introduce them to professional ethics and codes of professional practice.

II. Program Outcomes:

- a. Graduates will demonstrate basic knowledge in mathematics, science and engineering.
- b. Graduates will demonstrate an ability to identify, formulate and solve Electronics and Computer Engineering problems.
- c. Graduates will demonstrate the ability to design Electronic circuits and develop programs under different operating systems.
- d. Graduates will demonstrate the ability to design the Embedded System and application software that meets the desired specifications and requirements.
- e. Graduates will demonstrate the ability to visualize and work in both electronic and software industry, involving Multidisciplinary tasks.
- f. Graduate will demonstrate skills to use modern engineering tools, software and equipment to analyze problems.
- g. Graduates will demonstrate knowledge of professional and ethical responsibilities.
- h. Graduate will be able to communicate effectively in both verbal and written form.
- i. Graduate will show the understanding of impact of engineering solutions on the society and also will be aware of contemporary issues.
- j. Graduate will develop confidence for self education and ability for life – long learning.
- k. Graduate who can participate and succeed in competitive examinations like GATE, PGECET, IES, GRE etc.

Mapping of Electronics & Computers Program Objectives (I-V) with Program Outcome (a-k)

Program Educational Objectives	Program Outcomes										
	a	b	c	d	e	f	g	h	i	j	k
I	X	X	X	X							X
II	X	X	X	X		X					
III		X	X	X	X						
IV				X	X		X	X	X		
V									X	X	

IV Course Description:

The design and theory of multiprogrammed operating systems, concurrent processes, process communication, input/output supervisors, memory management, resource allocation and scheduling are studied.

Outcome: An understanding of an operating system and how it abstracts the complexity of the computer hardware by presenting the user with a simple interface that is easy to understand and use.

Scope and Objectives of the Course: An operating system manages all peripheral devices, network interfaces, other program resources and users of such. In short, an OS is a complex program system. The study of operating systems has gained importance with the advancements made in computer organization and programming systems. This course is devoted to a structured survey of OS concepts and practices. Similarly, certain prominent OS will as well be introduced.

Objectives: To introduce operating systems concepts and show how an operating system may manage computer hardware (processor, memory, I/O devices).

V COURSE OUTCOMES

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

- a) Be familiar with the concepts of the operating systems.
- b) Be familiar with the functional units of the operating systems such as the process, memory device and files
- c) Be familiar with the threading and process scheduling algorithms .
- d) Be familiar with the cache subsystem.
- e) Be familiar with the representation of synchronization management.
- f) Be familiar with the scheduling algorithms and deadlocks.
- g) Be familiar with the implementation of the file systems in operating systems.

Mapping of Course Objectives with Programme Outcomes

		Program Outcomes										
		a	b	c	d	e	f	g	h	i	j	k
Course Objectives	1		√	√	√			√				√
	2			√	√	√			√	√		
	3	√		√			√				√	
	4		√	√		√		√		√		
	5	√							√		√	√
	6	√	√		√		√					√
	7						√	√		√	√	

VI Syllabus:

UNIT I: Introduction Computer-System Organization, Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems, Special-Purpose Systems.

Operating-System Structures- Operating-System Services , User Operating-System Interface, System Calls , Types of System Calls, System Programs , Operating-System Design and Implementation, Operating-System Structure, Virtual Machines, Operating-System Generation, System Boot.

(12)

UNIT II: Processes-Concept, Process Scheduling, Operations on Processes, Inter-process Communication Examples of IPC Systems, Communication in Client-Server Systems

Multithreaded Programming- Multithreading Models, Thread Libraries, Threading Issues.

Process Scheduling-Scheduling Criteria, Scheduling Algorithms, Multiple-Processor Scheduling.

(12)

UNIT III: Synchronization-The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization Examples, and Atomic Transactions.

Deadlocks- System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention. Deadlock Avoidance, Deadlock Detection. Recovery from Deadlock.

(12)

UNIT IV: Memory Management Strategies- Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management- Demand Paging, Page Replacement, Allocation of Frames , Thrashing , Memory-Mapped Files , Allocating Kernel Memory

(12)

UNIT V: File-System - The Concept of a File, Access Methods, Directory Structure, File-System Mounting, File Sharing, Protection.

Implementing File system- File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance, Recovery.

(12)

TEXTBOOK:

1. Silberschatz & Galvin, 'Operating System Concepts', 8th edition, Wiley.

REFERENCE:

1. William Stallings-"Operating Systems"- 5th Edition - PHI
2. Charles Crowley, 'Operating Systems: A Design-Oriented Approach', Tata McGraw Hill Co., 1998 edition.
3. Andrew S.Tanenbaum, 'Modern Operating Systems', 2nd edition, 1995, PHI

VII UNIT WISE RATIONALIZATION:

- UNIT-I:** This unit is designed to describe the fundamentals of the operating systems & system structure.
The rationale of this unit is to enable the students to understand the concepts of the operating systems and system structure.
- UNIT-II:** In this unit is used to design a operating systems is responsible for the following activities in connection with process and thread management.
This unit emphasizes the need for understanding the process & thread management.
- UNIT-III:** This Unit is designed for various methods for process synchronization and deadlock handling.
In this unit the student will be able to understand various methods for process synchronization and deadlock handling.
- UNIT-IV:** The Memory unit is an essential component in any operating systems since it is needed for storing programs and data.
This unit explains Memory hierarchy and different types of memories and memory management hardware.
- UNIT-V:** In this unit how the file systems are implemented in a modern computer system.
The student able to understand the advantages and disadvantages and able to implement the algorithms for the file systems.

VIII. SESSION PLAN

S.No	Unit	Session	Content	Learning objective	Methodology	Faculty Approach	Student approach	Learning outcome
1	I	1.	Computer-System Organization, Computer Architecture	Understanding of basics of OS	Chalk & Talk	Explains, Demonstrates	Listens and Participate	Understand
2	I	2.	Operating-System Structure, Operating-System Operations	Why OS is required?	Chalk & Talk	Explains	Listens	Remember
3	I	3.	Simple Structure, Layered Approach, Microkernels,	Operating-System Structure	Chalk & Talk	Explains, Demonstrates	Listen and Practice	Understand
4	I	4.	Simple Structure, Layered Approach, Microkernels,	Operating-System Structure	Chalk & Talk	Explains, Demonstrates	Listen and Practice	Understand and Analyze
5	I	5.	Modules, Implementation	Operating-System Structure	Chalk & Talk	Explains, Demonstrates	Listens	Understand and Analyze
6	I	6.	Modules, Implementation	Operating-System Structure	Chalk & Talk	Explains, Demonstrates	Listens	Understand and Analyze
7	I	7.	Benefits, Examples	Operating-System Structure	PPT	Explains, Demonstrates	Listens	Remember
8	I	8.	Operating-System Generation, Virtual machine	Operating-System Generation, Virtual machines design	Chalk & Talk	Explains	Observe and Comprehend	Understand
9	I	9.	Operating-System Generation,	Operating-System Generation, Virtual machines	Chalk & Talk	Explains	Listens and Participate	Understand

			Virtual machine	design				
10	II	10.	Process, Process State	Process Concept	Chalk & Talk	Explains	Listens	Remember and Recall
11	II	11.	Process Control Block, Threads	How OS represents a process in memory?	Chalk & Talk	Explains	Listen and Practice	Remember and Recall
12	II	12.	Scheduling Queues	Different Scheduling queues	Chalk & Talk	Explains	Listens	Understand
13	II	13.	Schedulers, Context Switch	Long ,short and medium term schedulers	PPT	Facilitates, Conducts	Listens, Participates	Understand and Remember
14	II	14.	Process Creation,	Operations on Processes	PPT	Explains, Narrates	Listen, Observes, Participates	Understand and remember
15	II	15.	Process termination	Operations on Processes	Chalk & Talk	Explains, Demonstrates	Listens ,Observes	Understand and Remember
16	II	16.	Shared Memory Systems	Inter-process Communication	Chalk & Talk	Explains	Listens, Observes	Evaluate
17	II	17.	Synchronization, Naming, Buffering	Inter-process Communication	Chalk & Talk	Explains, Demonstrates	Listens	Understand and Remember
18	II	18.	Synchronization, Naming, Buffering	Inter-process Communication	Chalk & Talk	Explains	Listens	Evaluate and Apply
19	II	19.	Mach, POSIX Shared Memory	Inter-process Communication	Chalk & Talk	Explains	Listens, Participates	Evaluate and Apply
20	II	20.	Mach, POSIX Shared Memory	Inter-process Communication	Chalk & Talk	Explains	Observes	Understand
21	II	21.	Mach, POSIX Shared Memory	Inter-process Communication	Chalk & Talk	Explains	Listens, Observes	Understand

22	II	22.	Windows XP	Inter-process Communication	Chalk & Talk	Explains	Listens, Observes	Understand
23	II	23.	Many-to-One, One-to-One, Many-to-Many	Implementation of Multithreading Models	Chalk & Talk	Explains	Listens	Understand and Remember
24	II	24.	Pthreads, Java Threads, Win32 Threads	Thread Libraries Analysis	Chalk & Talk	Explains	Listens, Practices	Remember & Apply
25	II	25.	Cancellation, fork () & exec ()	Thread Libraries Analysis	Chalk & Talk	Explains	Listens	Understand and Remember
26	II	26.	Signal Handling, Thread Pools Thread-specific Data, Scheduler Activations.	Threading Issues	Chalk & Talk	Explains	Listens, Participates	Remember & Apply
27	II	27.	Process scheduling,CPU Utilization, Throughput, Turnaround time, Waiting Time, Response time	Scheduling criteria	Chalk & Talk	Explains	Listens, Participates	Comprehend & Apply
28	II	28.	FCFS, Shortest-job First Scheduling	Scheduling Algorithms	Chalk & Talk	Explains, Demonstrates	Listens	Remember
29	II	29.	Priority, Round-Robin,	Scheduling Algorithms	Chalk & Talk	Explains	Listens	Understand and Remember
30	II	30.	Multilevel Queue, Multilevel Feedback-Queue	Scheduling Algorithms implementation through queues	Chalk & Talk	Explains	Comprehend, Observes	Understand and Remember
31	II	31.	Approaches to Multiple-	Multiple-Processor Scheduling	Chalk & Talk	Explains	Listen, Participates	Remember & Apply

			Processor Scheduling,	implementation				
32	III	32.	Synchronization- Background The Critical-Section Problem	Synchronization, identification of the Critical- Section Problem	Chalk & Talk	Explains	Listens	Understand and Remember
33	III	33.	Peterson's Solution, Synchronization hardware	Usage & Implementation of Synchronization Hardware	Chalk & Talk	Explains, Facilitates	Listen, participates	Remember & Apply
34	III	34.	Semaphores	Semaphores identification	Chalk & Talk	Explains	Listens	Understand and remember
35	III	35.	Bounded buffer problem, The Readers-Writers Problems,	Classical problems of synchronization	Chalk & Talk	Explains	Listens	Remember and apply
36	III	36.	The Dining-Philosophers Problem	Classical problems of synchronization	Chalk & Talk	Explains	Listens	Remember and Apply
37	III	37.	Monitors	Concept of monitor	Chalk & Talk	Explains	Listens	Understand
38	III	38.	Usage, Dining- Philosophers Solution Using Monitors, Implementing a Monitor Using Semaphores	Usage of monitors	Chalk & Talk	Explains	Listens, Observes	Understand remembers and comprehends
39	III	39.	Deadlocks- Necessary Conditions	Deadlock Characterization	Chalk & Talk	Explains, Demonstrates	Listens, Participates	Apply
40	III	40.	Resource-Allocation Graph	Deadlock Characterization	Chalk & Talk	Explains, Demonstrates	Listens	Understand and Analyze

41	III	41.	Methods for Handling Deadlocks	How to handle deadlocks	Chalk & Talk	Explains, Demonstrates	Listens	Remember
42	III	42.	Deadlock Prevention.	Preventing deadlocks	Chalk & Talk	Explains	Listens	Understand and comprehends
43	III	43.	Deadlock Avoidance	Banker's algorithm	Chalk & Talk	Explains	Listen, participates	Understand
44	III	44.	Deadlock Avoidance	Banker's algorithm	Chalk & Talk	Explains	Listens	Understand
45	III	45	Deadlock Detection.	Detecting a deadlock	Chalk & Talk	Explains	Listens	Understand and comprehends
46	III	46	Recovery from Deadlock	Recovery from deadlocks	Chalk & Talk	Explains	Listens	Understands
47	IV	47	Memory Mapping & Protection, Memory Allocation, Fragmentation	Swapping, Contiguous Memory Allocation	Chalk & Talk	Explains	Listens, Observes	Understand Remembers and Comprehends
48	IV	48	Basic Method, Hardware Support, Protection, Shared Pages, Hierarchical Paging	Implementing Paging	Chalk & Talk	Explains, Demonstrates	Listens, Participates	Apply
49	IV	49	Hashed & Inverted Page Tables, Segmentation.	Understanding Structure of the Page Table	Chalk & Talk	Explains, Demonstrates	Listens	Understand and Analyze
50	V	50	Performance of Demand Paging, Copy-on-write	Virtual memory management- Background	Chalk & Talk	Explains, Demonstrates	Listens	Remember
51	V	51	Basic Page, FIFO, Optimal, LRU,	Implementation of Page Replacement Algorithms	Chalk & Talk	Explains	Listens	Understand and Comprehends
52	V	52	LRU approximation algorithms	Implementation of Page Replacement Algorithms	Chalk & Talk	Explains	Listen, Participates	Understand

53	V	53	Thrashing	Concept of thrashing	Chalk & Talk	Explains	Listens	Understand
54	V	54	File concept, File Attributes, File structure	What is a file and its attributes	Chalk & Talk	Explains	Listens	Understand and Comprehends
55	V	55	Access methods	Accessing data from a file	Chalk & Talk	Explains	Listens	Understands
56	V	56	Access methods	Accessing data from a file	Chalk & Talk	Explains	Listens, Observes	Understand Remembers and Comprehends
57	V	57	Directory structures	Different directory structures	Chalk & Talk	Explains, Demonstrates	Listens, Participates	Apply
58	V	58	File system mounting, Protection	Protecting a file	Chalk & Talk	Explains, Demonstrates	Listens	Understand and Analyze
59	V	59	Directory implementation	Implementing a directory	Chalk & Talk	Explains, Demonstrates	Listens	Remember
60	V	60	Free space management, Efficiency	How to reuse the space from deleted files	Chalk & Talk	Explains	Listen	Understand and Comprehends

IX.SELF STUDY MATERIAL:

Unit	Self Learning Topic	Source
1	Operating system services	Modern operating systems –Andrew S.Tenenbaum, 2nd ed.
2	System boot	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley
3	Thread scheduling	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley
4	Synchronization examples, Atomic transactions	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley
5	Implementation of dead locks	Charles Crowley, ‘Operating Systems: A Design-Oriented Approach’, Tata McGraw Hill Co., 1998 edition
6	Memory mapped files, Allocating kernel memory	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley
7	Operations on files, File types	Modern operating systems –Andrew S.Tenenbaum,2 nd ed.
8	File sharing	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley
9	File system partitioning	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley
10	File system-performance	GalvinSilberschatz&Galvin,‘Operating system Concepts’,8 th edition, Wiley

Evaluation Pattern:

Internal Marks : 40

External Marks : 60

EVALUATION SCHEME

Sl. No.	Nature of examination	Marks %	Type of examination and mode of Assessment		Scheme of examination
1	*Theory	60	Semester end examination (external evaluation)		This examination question paper in theory subjects will be for a maximum of 60 marks
		40	20	Test – 1	2 mid – exams each for 20 marks and of 1½ hr duration are to be conducted. For a total of 20 marks, 75% of better of the two and 25% of the other are added and reported.
				Test - 2	
			5	Assignment Test	6 Question to be released in advance. 2 Questions allotted by Examiners choice to be answered. Duration 45 min.
			5	Home Assignments	Average of Home Assignments minimum 2 per subject
			5	Surprise Quiz	A maximum of two surprise quizzes per subject
5	Attendance / Class notes	5 marks are allotted for attendance and class notes			

Attendance Weightage: 05 Marks

- Attendance of 75 % and above but less than 80 % **01** Mark
- Attendance of 80 % and above but less than 85 % **02** Marks
- Attendance of 85 % and above but less than 90 % **03** Marks
- Attendance of 90 % and above but less than 95 % **04** Marks
- Attendance of 95 % and above **05** Marks

GRADES

After successful completion of the Course work and all the internal and external examinations, a student will graded as follows

Letter	Qualitative Meaning	Grade Point Attached
X	- Excellent	10
A	- Very Good	8
B	- Good	7
C	- Fair	6
D	- Satisfactory	4
F	- Fail	0

NOTICES

ALL notices regarding this subject are displayed on the e-learning site only

COURSE COORDINATOR