JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTHAPURAMU
COLLEGE OF ENGINEERING (AUTONOMOUS) :: PULIVENDULA
Btech

I. Course Overview

Course Code	**:**				
Course Title	**:**	**Operating System**			
Course Structure	**:**	Lectures	Tutorials	Practical's	Credits
		3	0	0	3
Course Coordinator	**:**	Mrs. C. Prabhavathi			
Team of instructor	**:**	Dr. S. J. Saritha			

The main objective of the course is to help The students will be able to identify and understand the tasks of an operating system, specifically including: handling input and output, recognizing and installing peripheral devices, managing files and folders, sharing out system memories, loading and running other software applications, handing system errors and alerting users, managing system security, allowing software to communicate with hardware, and moving data to and from the hard disk.

II. Prerequisite(s):

Level	Credits	Periods/Week	Prerequisites
UG	3	3	Awareness of different Operating Systems

III. Assessment:

FORMATIVE ASSESSMENT	
Mid Semester Subjective Test I for 15 Marks in first 2.5 units is conducted at8 the end of 9th week. (Subjective paper shall contain 6 questions on choice based , each unit take 2-question compulsory write one question each question carry 5 marks total 15 marks)	**15 Marks**
Mid Semester Objective Test I for 10 Marks in first 2.5 units is conducted at8 the end of 9th week	**10 Marks**

(Objective paper is set for 20 bits) **Total**	 **25 Marks**
Mid Semester Subjective Test II for 15 Marks in first 2 units is conducted at the end of the course (Subjective paper shall contain 6 questions on choice based , each unit take 2-question compulsory write one question each question carry 5 marks total 15 marks) **Mid Semester Objective Test II for 10 Marks in first 2 units is conducted at the end of the course** **(**Objective paper is set for 20 bits) **Total**	 **15 Marks** **10 Marks** **25 Marks**
Assignment marks	**5 Marks**
Final Internal marks for a total of 30marks shall be arrived at by considering the marks secured by the student in both the mid examinations with **80% weight-age to the better mid exam and 20% to the other.**	

SUMMATIVE ASSESSMENT	
End Semester Examination in all units is conducted for 70 Marks	**70 Marks**
Grand Total	**100 Marks**

IV. Course Objectives

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To understand Processes and Threads
- To understand the concept of Deadlocks
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

V. Course Outcomes

At the end of this Course the student will be able to

- Analyze various scheduling algorithms. **L2**
- Understand deadlock, prevention and avoidance algorithms. **L3**
- Compare and contrast various memory management schemes. **L4**
- Understand the functionality of file systems. **L2**
- Perform administrative tasks on Linux Servers. **L3**

VI. Program Outcomes:

a. An ability to apply knowledge of computing, mathematical foundations, algorithmic principles, and computer science and engineering theory in the modeling and design of computer-based systems to real-world problems (fundamental engineering analysis skills)
b. An ability to design and conduct experiments, as well as to analyze and interpret data (information retrieval skills)
c. An ability to design , implement, and evaluate a computer-based system, process, component, or program to meet desired needs, within realistic constraints such as economic, health and safety, manufacturability, and sustainability (Creative Skills)
d. An ability to function effectively on multi-disciplinary teams (team work)
e. An ability to analyze a problem, identify, formulate and use the appropriate computing and engineering skills for obtaining its solution (engineering problem solving skills)
f. Obtaining the knowledge of algorithmic skills regarding data structures. (program oriented skills)
g. An ability to communicate effectively both in writing and orally (speaking / writing skills)
h. The broad education necessary to analyze the local and global impact of computing and engineering solutions on individuals, organizations, and society (engineering impact assessment skills)

i. Recognition of the need for, and an ability to engage in continuing professional development and life-long learning (continuing education awareness)
j. A Knowledge of structural skills which are related to theoretical skills for programming (detailed subject oriented skills).
k. An ability to use current techniques, skills, and tools necessary for computing and engineering practice (practical engineering analysis skills)
l. An ability to apply design and development principles in the construction of software and hardware systems of varying complexity (software hardware interface)
m. An ability to recognize the importance of professional development by pursuing postgraduate studies or face competitive examinations that offer challenging and rewarding careers in computing (successful career and immediate employment)

Syllabus

B.Tech II-II Semester

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS) PULIVENDULA

OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To understand Processes and Threads
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- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT – I: OPERATING SYSTEM OVERVIEW **8hrs**

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the Basics of Operating System **L1**
- To learn about the evaluation of operating system **L1**
- To learn about the Operating structure **L1**

UNIT – II: PROCESS MANAGEMENT **8hrs**

Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues;
Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the process management **L2**
- To learn about the CPU Scheduling **L2**
- To learn how to overcome the dead locks **L3**

UNIT – III: STORAGE MANAGEMENT **8hrs**

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand The Memory Management **L3**
- To learn about the Page Replacement **L3**
- Understand the Demand paging **L3**

UNIT – IV: FILE SYSTEMS AND I/O SYSTEMS **7hrs**

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the File Systems and I/O Systems **L2**
- To implement the file concepts **L4**
- To learn how to Recovery the data **L3**

UNIT – V: CASE STUDY

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS -iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

Learning Outcomes:

At the end of this unit, the student will be able to

- To implement te Kernal models **L5**
- To implement the Mobile OS **L5**

Text Books:

1.Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, 9th Edition, John Wiley and Sons Inc., 2012.

Reference Books:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, ―Operating Systems – A Spiral Approach‖, Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, Atul Kahate, ―Operating Systems‖, McGraw Hill Education, 2016
3. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Second Edition, Pearson
4. Gary Nutt, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, ―Understanding the Linux kernel‖, 3rd edition, O'Reilly, 2005.
7. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode‖, Fourth Edition, Payload media, 2011.

Course Outcomes:

At the end of this Course the student will be able to

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.
- Perform administrative tasks on Linux Servers.

VII. Course Plan:

Lecture No	Course Outcomes	Topics to be Covered	Reference
		UNIT – I	
1-2	Acquire Knowledge on the fundamental characteristics of Operating Systems	**OPERATING SYSTEM OVERVIEW** Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization.	**T1:** Chapter 1, 1.1
3-4	Obtain Knowledge on various objectives and functions	Operating system overview-objectives and functions	**T1**: Chapter 1, 1.6-1.12
5-7	An Understanding of Evolution of Operating System.	Evolution of Operating System.-Computer System Organization Operating System Structure and Operations	**T1:** Chapter 1,2-1.2,1.3,1.4,1.5,2.1,2.2
8-10	Ability to demonstrate Systems	System Calls, System Programs, OS Generation and System Boot	**T1:** Chapter 2, 2.3,2.4,2.5
		UNIT – II	
11-13	Obtain Knowledge on the roles and responsibilities of Process	**PROCESS MANAGEMENT :** Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication	**T1:** Chapter 3; 3.1-3.4
14-17	Ability to apply the different CPU Scheduling algorithms	CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling	**T1:** Chapter 6;6.1-6.8
18-20	Acquire knowledge on the Threads	Threads- Overview, Multithreading models, Threading issues	**T1:** Chapter 4;4.1-4.7
21-22	Apply Creative skills in developing Synchronization	Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks	**T1:** Chapter 5;5.1-5.5
23-24	An Understanding of Semaphores	Semaphores, Classic problems of synchronization, Critical	**T1:** Chapter 5;5.6-5.9

		regions, Monitors	
25-26	Gain Knowledge on Deadlock	Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.	**T1:** Chapter 7;7.1-7.7
		UNIT – III	
27	Ability to analyze Memory management	**STORAGE MANAGEMENT:** Main Memory – Background, Swapping, Contiguous Memory Allocation	**T1:** Chapter 8, 8.1 -8.3
28-29	Obtain Knowledge on basic Paging and segmentation	Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples;	**T1**: Chapter 8, 8.4 -8.8
30-32	An Understanding of Virtual memory	Virtual Memory – Background, Demand Paging,	**T1**: Chapter 9, 9.1,9.2,9.3
33-34	Different types of Page Replacement	Page Replacement, Allocation	**T1**: Chapter 9,9.4,9.5
35	Acquire Knowledge on the Tharshing	Thrashing; Allocating Kernel Memory, OS Examples.	**T1**: Chapter 9, 9.6-9.10
		UNIT - IV	
36	Ability to analyze Mass Storage System	**FILE SYSTEMS AND I/O SYSTEMS:** Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management;	**T1:** Chapter 10,10.1-10.6
37	Ability to demonstrate File System Interface	File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection;	**T1:** Chapter 11, 11.1-11.6
38	Implement file systems and Directory	File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery	**T1:** Chapter 12,12.1-12.7

39	Understand of the I/O Systems	I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance..	**T1:** Chapter 13,13.1-13.7
UNIT – V			
40	An understanding of rules for Linux system	**CASE STUDY:** Linux System - Design Principles, Kernel Modules	**T1:** Chapter 18,18.1-18.3
40	Ability to design Process Mangement scheduling	Process Management, Scheduling	**T1:** Chapter 18,18.4,18.5
41	Obtain Knowledge on Memory Management	Memory Management	**T1:** Chapter 18,18.6
41	Ability to conduct Input-Output Management	Input-Output Management	**T2:** Chapter 18,18.8
41	Obtain skills to conduct IPC	File System, Inter-process Communication	**T2:** Chapter 18,18.7,18.9
42	Implement the applications in Mobile OS	Mobile OS -iOS and Android - Architecture and SDK Framework	**R7**
43	Ability to test File System	Media Layer, Services Layer, Core OS Layer, File System..	**R7**

VIII. Mapping Course Outcomes leading to the achievement of Program Outcomes:

Course Outcomes (CO's)	**Program Outcomes(PO's)**												
	A	**B**	**c**	**d**	**e**	**F**	**g**	**h**	**i**	**J**	**k**	**l**	**M**
1	**H**		**H**		**H**		**S**			**S**	**H**		**S**
2		**H**	**S**		**S**	**S**						**H**	**S**
3		**S**	**H**		**S**					**S**	**S**	**H**	**S**
4	**S**		**S**								**H**	**S**	
5							**S**	**H**					

S = Supportive H = Highly Related

Justification of Course Syllabus Covering Course Outcomes:

- By covering the syllabus, student would be able to acquire knowledge about different conventional software process models and could be able to design and develop software by following certain design principles for real world problems.

Justification of Course Outcomes and Program Outcomes Mapping Table:

- CO-1 is highly related to PO's - a, c, e and k and acts as a supportive for PO's - g, j and m such that Student can be able to gain knowledge on different software process models which helps them in developing the software for real world problems. It also helps them to communicate effectively in team meetings.
- CO-2 is highly related to PO's - b, l and acts as a supportive for PO's - c, e, f and m such that the student will be able to analyze the requirements in solving the various problems that helps in the development of efficient software.
- CO-3 is highly related to PO's - c, l and acts as a supportive for PO's - b, e, j, k and m such that the student gains the knowledge regarding the thumb rules of designing software and will be able to apply those principles in software development.
- CO-4 is highly related to PO - k and acts as a supportive for PO's - a, c and l such that the student will be able to apply various testing techniques on a software to analyze the quality of the software and validate the requirements
- CO-5 is highly related to PO - H and acts as a supportive for PO's - G such that the student will be able to assess the cost of software development and take necessary measures in maintaining software at Organizational level