



**Course Name:** Systems Programming

**(UG/PG):** PG

**Number of Credits:** 3

**Level:** 4

**Learning Objective(s):** Learn Linux Distribution built and modularity of Kernel, which help the students to understand the mechanism of developing Operating System Kernel.

**Pedagogy:** Understanding Linux builds by experiments

**Pre-requisites:** Preliminary knowledge of OS kernel.

**Course Outline:**

Sr.No.	Topic	Hours
1	The Extended File system Family Introduction: Second Extended File system Physical Structure, Data Structures Creating a File system: File system Actions Third Extended File system: Concepts, Data Structure	7
2	File systems without Persistent Storage The proc File system, Contents of /proc, Data Structures Initialization, Mounting the File system, Managing /proc Entries Reading and Writing Information, Task-Related Information System Control Mechanism Simple File systems Sequential Files, Writing File systems with Libfs, The Debug File system, Pseudo File systems Sysfs Overview, Data Structures, Mounting the File system, File and Directory Operations, Populating	7

3	Extended Attributes and Access Control Lists Extended Attributes, Interface to the Virtual File system Implementation in Ext3, Implementation in Ext2 Access Control Lists, Generic Implementation, Implementation in Ext3, Implementation in Ext2	4
4	Kernel Activities Interrupts: Interrupt Types, Hardware IRQs, Processing Interrupts Data Structures, Interrupt Flow Handling, Initializing and Reserving IRQs, Servicing IRQs Software Interrupts Starting SoftIRQ Processing, The SoftIRQ Daemon Tasklets: Generating Tasklets, Registering Tasklets, Executing Tasklets Wait Queues and Completions Wait Queues, Completions, Work Queues	7
5	Page and Buffer Cache Structure of the Page Cache Managing and Finding Cached Pages Writing Back Modified Data Structure of the Buffer Cache Address Spaces Data Structures, Page Trees, Operations on Address Spaces Implementation of the Page Cache Allocating Pages, Finding Pages, Waiting on Pages Operations with Whole Pages, Page Cache Read ahead Implementation of the Buffer Cache Data Structures, Operations, Interaction of Page and Buffer Cache Independent Buffers	8

6	Page Reclaim and Swapping Overview Swappable Pages, Page Thrashing, Page-Swapping Algorithms Page Reclaim and Swapping in the Linux Kernel Organization of the Swap Area, Checking Memory Utilization Selecting Pages to Be Swapped Out Handling Page Faults Shrinking Kernel Caches Managing Swap Areas Data Structures, Creating a Swap Area, Activating a Swap Area The Swap Cache Identifying Swapped-Out Pages, Structure of the Cache Adding New Pages, Searching for a Page Writing DataBack Page Reclaim Overview, Data Structures, Determining Page Activity Shrinking Zones, Isolating LRU Pages and Lumpy Reclaim Shrinking the List of Active Pages , Reclaiming Inactive Pages The Swap Token Handling Swap-Page Faults Swapping Pages in, Reading the Data, Swap Readahead Initiating Memory Reclaim Periodic Reclaim with kswapd Swap-out in the Event of Acute Memory Shortage Shrinking Other Caches Data Structures Registering and Removing Shrinkers Shrinking Caches	8
7	Auditing Overview Audit Rules Implementation Data Structures, Initialization, Processing Requests, Logging Events System Call Auditing	4
	<b>Total</b>	<b>45</b>

**Books Recommended:** Red Hat documentation

**Suggested Evaluation Methods:**

**Parallel/Similar courses the existing curriculum:**

S.No.	Name of the course	Institute where it was offered

Name of Member					
Designation					
Org. / Inst.					
Signature					

Name of the Expert:

Signature:

Date: