

**EC530 - EMBEDDED LINUX (Elective III)**

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**Course Objectives:**

- To study the fundamentals of operating systems.
- To understand Linux operating systems.
- To obtain basic knowledge on board support packages and device drivers.

**Course Learning Outcomes:**

- Introduction to embedded Linux
- Understand the Embedded operating systems that is needed to run embedded systems
- Build embedded systems using Embedded Linux operating systems

**UNIT - I (9 hours) Fundamentals of Operating Systems**

Overview of operating systems, Process and threads, Processes and Programs, Programmer view of processes, OS View of processes, Threads, Scheduling, Non preemptive and preemptive scheduling, Real Time Scheduling, Process Synchronization, Semaphores, Message Passing, Mailboxes, Deadlocks, Synchronization and scheduling in multiprocessor Operating Systems

**UNIT - II (9 hours) Linux Fundamentals**

Introduction to Linux, Basic Linux commands and concepts, Logging in, Shells, Basic text editing, advanced shells and shell scripting, Linux File System, Linux programming, Processes and threads in Linux, Inter process communication, Devices, Linux System calls.

**UNIT - III****(9 hours)****Introduction to Embedded Linux**

Embedded Linux-Introduction, Advantage, Embedded Linux Distributions, Architecture, Linux kernel architecture, User space, Linux startup sequence, GNU cross platform Tool chain.

**UNIT - IV (9 hours) Board Support Package and Embedded Storage**

Inclusion of BSP in kernel build procedure, Boot loader Interface, Memory Map, Interrupt Management, PCI Subsystem, Timers, UART, Power Management, Embedded Storage, Flash Map, Memory Technology Device (MTD) –MTD Architecture, MTD Driver for NOR Flash, The Flash Mapping drivers, MTD Block and character devices, mtdutils package, Embedded File Systems, Optimizing storage space – Turning kernel memory.

**UNIT - V (9 hours) Embedded Drivers and Application Porting**

Linux serial driver, Ethernet driver, I2C subsystem, USB gadgets, Watchdog timer, Kernel Modules, Application porting roadmap, Programming with threads, Operating System Porting Layer, Kernel API Driver, Case studies - RTLinux – uClinux.

**TEXT BOOKS:**

1.P. Raghavan ,Amol Lad , Sriram Neelakandan, 'Embedded Linux System Design and Development', Auerbach Publications 2006

**REFERENCES:**

- 1.Dhananjay M. Dhamdhare, 'Operating Systems A concept based Approach', Tata Mcgraw-Hill Publishing Company Ltd
- 2.Matthias Kalle Dalheimer, Matt Welsh, 'Running Linux', O'Reilly Publications 2005
- 3.Mark Mitchell, Jeffrey Oldham and Alex Samuel 'Advanced Linux Programming' New Riders Publications
- 4.Karim Yaghmour, 'Building Embedded Linux Systems', O'Reilly Publications 2003
- 5.Abott, Linux for Embedded and real time applications, newness, 3<sup>rd</sup> edition.