

SEMESTER S6

EMBEDDED LINUX SYSTEMS

Course Code	PEEVT 633	CIE Marks	40
Teaching Hours/Week (L: T:P: R)	3:0:0:0	ESE Marks	60
Credits	3	Exam Hours	2 Hrs. 30 Min.
Prerequisites (if any)	PBEVT504 Embedded System Design	Course Type	Elective

Course Objectives:

1. Understand the fundamental concepts of Embedded Linux, including its advantages, system architecture, development setups, and supported processor architectures.
2. Gain proficiency in setting up and using the GNU toolchain for cross-platform development, including configuring and using various development tools and IDEs.
3. Learn to select, configure, compile, and install the Linux kernel, along with understanding the structure and components of the root file system and storage device manipulation.
4. Develop the ability to set up various types of filesystems for embedded devices, configure bootloaders, and gain an introduction to device drivers.

SYLLABUS

Module No.	Syllabus Description	Contact Hours
1	Introduction: Embedded Linux, Real Time Linux, Types of Embedded Linux systems, Advantages of Linux OS, Using distributions, Examples of Embedded Linux systems - system architecture, Types of host/target architectures for the development of Embedded Linux Systems, Debug setups, Boot Configurations, Processor architectures supported by Linux.	9
2	Cross platform Development toolchain: GNU tool chain basics, Kernel Headers Setup, Binutils setup, Bootstrap Compiler Setup, Library Setup, Full Compiler Setup, Using the tool chain. C library alternatives, JAVA, Perl, Python, Ada, IDEs , Terminal Emulators.	9

3	Kernel and Root File System, Kernel Considerations- selection, configuration, Compiling and Installing the kernel Root File System Structure, Libraries, Kernel Modules, Kernel Images, Device Files, Main System Applications, Custom Applications, System Initialization. Storage Device Manipulation. MTD Supported Devices, Disk Devices, Swapping.	9
4	Root Filesystem Setup : Filesystem Types for Embedded Devices, Writing a Filesystem Image to Flash using an NFS-Mounted Root Filesystem, Placing a Disk Filesystem on a RAM Disk, Rootfs and Iniramfs, Setting Up the Bootloader, Embedded Bootloaders, Introduction to Device Drivers.	9

Course Assessment Method
(CIE: 40 marks , ESE: 60 marks)

Continuous Internal Evaluation Marks (CIE):

Attendance	Assignment/ Microproject	Internal Examination-1 (Written)	Internal Examination- 2 (Written)	Total
5	15	10	10	40

End Semester Examination Marks (ESE)

In Part A, all questions need to be answered and in Part B, each student can choose any one full question out of two questions

Part A	Part B	Total
<ul style="list-style-type: none"> • 2 Questions from each module. • Total of 8 Questions, each carrying 3 marks <p style="text-align: center;">(8x3 =24marks)</p>	<ul style="list-style-type: none"> • Each question carries 9 marks. • Two questions will be given from each module, out of which 1 question should be answered. • Each question can have a maximum of 3 sub divisions. <p style="text-align: center;">(4x9 = 36 marks)</p>	60

Course Outcomes (COs)

At the end of the course students should be able to:

Course Outcome		Bloom's Knowledge Level (KL)
CO1	Explain the components, advantages, and architectures of Embedded Linux systems, as well as the development and debugging setups used.	K2
CO2	Gain proficiency in setting up and using the GNU toolchain and other development tools for cross-platform development, including various programming languages and IDEs.	K3
CO3	Demonstrate the ability to select, configure, compile, and install the Linux kernel, and understand the root file system structure and storage device manipulation.	K3
CO4	Gain the capability to set up different types of filesystems for embedded devices, configure bootloaders, and understand the basics of device drivers	K3

Note: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create

CO-PO Mapping Table:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	1				1	1		
CO2	2	2	2	1	3				1	1		
CO3	2	2	3	2	3				2	2		
CO4	2	2	3	2	3				2	2		

Note: 1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation

Text Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Building Embedded Linux Systems	Karim Yaghmour, Jon Masters, Gilad Ben-Yossef, and Philippe Gerum	O'Reilly Media, Inc.	2 nd , 2008
2	Linux Device Drivers	Alessandro Rubini, Jonathan Corbet	O'Reilly Media, Inc.	3 rd , 2005
3	Embedded Linux Primer A Practical Real – World Approach	Christopher Hallinan	Prentice Hall	1 st 2006

Reference Books				
Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
1	Embedded Linux System Design and Development	P Raghavan, Amol Lad, Sriram Neelakandan	CRC Press	2005
2	Essential Linux Device Drivers	Alan Cox, Sreekrishnan, Venkateswaran	Prentice Hall	1 st , 2008
3	Embedded Linux - Hardware, Software and Interfacing	Craig Hollabaugh	Pearson Education	2002

Video Links (NPTEL, SWAYAM...)	
Module No.	Link ID
1	https://nptel.ac.in/courses/106105193
2	https://nptel.ac.in/courses/117106113
3	https://elearn.nptel.ac.in/shop/partnering-courses/embedded-linux-batch-3/?v=c86ee0d9d7ed
4	https://www.youtube.com/watch?v=Sk9TatW9ino