Second Semster 2015-2016
Course Handout Part -II

In addition to Part-I (General Handout) for all course appended to the time table, this handout gives further details of the course.

Course No. : **EEE G547**
Instructor-in-charge : **Devesh Samaiya**
Instructor : **Dr. Kota Solomon Raju** (Principal Scientist, Digital Systems Group, CEERI Pilani)

1. Course Objective:

This course intends to provide an Embedded Systems perspective to Operating Systems fundamentals with emphasis on Embedded Linux in particular. Facilitate beginner level understanding of Linux Kernel Structure and Internals.

Expected Learning Outcomes -

A learner should be able to add following skills upon successful completion of this course -

- Working understanding of Linux Kernel in Embedded Systems perspective.
- Should be able to handle Hardware level details while writing a device driver.
- Should be able to write Kernel Modules.
- Should be able to use the tool chain required to develop an Embedded Linux System.

2. Text Book -

TB – "**Linux Device Drivers**" By Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman, O'Reilly Media

3. Reference Books

R1 - " **Understanding The Linux Kernel**" By Daniel P. Bovet, Marco Cesati, O'REILLY Media
R2 - "**Essential Linux Device Drivers**" By SreeKrishnan Venkateswaran, Prentice Hall
R3 - "**The Linux Kernel Module Programming Guide**" By Peter Jay Salzman, Michael Burian ,Ori Pomerantz
R4 - **"Exploring Beagle Bone – Tools and Techniques for Building with Embedded Linux"** By Derek Molloy, WILEY Publications

4. Course Plan

Lec. No.	Topic	Learning Objectives	Readings

Lec. No.	Topic	Learning Objectives	Readings
1-2	Introduction to OS, Linux History and Culture, Linux Basics, Introduction to Linux Kernel, Versions, Commands, File System, Layered Architecture of OS	To get an in-general culture and basics of the Linux Environment	R1 – Chap 1
3-5	Hardware Board Support Package	Basics of handling BSP	
6-8	Process Synchronization, Critical Section, Race Conditions, Kernel Synchronization, Semaphores, Spin Locks, Completions	How kernel manages process and maintains a functional system with concurrent processes	TB – Chapter 5 R1 – Chapter 3, 5
9-12	Memory Management in Kernel, Allocating Memory, Scull	How kernel manages and allocates memory to processes and peripherals	TB – Chapter 8 R1 – Chapter 2, 8 R2 – Chapter 2
13-16	Debugging, Printk, Traces, Watches, ksymoops, kallsyms, gdb, kgdb, kdb, User Mode Linux	Debugging methods provided by kernel and tool chain	TB – Chapter 4 R3 R2- Chapter 21
17-22	Kernel Module Programming, Device Numbers, Major Minor Numbers, Registering, Unregistering, Static & Dynamic Allocations	Module Programming	TB – Chapter 2 R3
23-27	Character Device Drivers, Adding, Allocating, Initializing and Deleting, User Space Applications and Device Driver mapping, Access methods within the driver, open, read, write and close, Advanced Character Drivers, IOCTL, Wati Queues	Different Categories of Device Drivers	TB – Chapter 3, 6 R2 – Chapter 5
28-35	Timing & Interrupts, HZ & Jiffies,	Interrupts handling	TB – Chapter 7, 9 ,10

Lec. No.	Topic	Learning Objectives	Readings
	Delays, Kernel Timers, Tasklets, Work Queues, Kernel Data Types, Handling I/O, I/O Architecture, I/O Mapped I/O , Memory Mapped I/O, Interrupts & Interrupt Handlers		R1 – 11, 13 Chapter
36 – 44	Parallel Port Driver, Serial Port Driver, Block Drivers, USB Drivers, Network Drivers,.PCI Drivers, tty Subsystem,	Peripheral specific Drivers	TB – Chapter 11, 12, 13, 14 17, 18

5. Evaluation Plan

Serial	Nature of Evaluation Component	Weightage	Date & Time	Type
1	Mid Semester Exam	25%	15/3 9:00 - 10:30 AM	CB
2	Comprehensive Exam	30%	13/5 FN	50% CB and 50% OB
3	Course Project & Assignments	45%	Continuous, TBA	-

6. Chamber Consultation Hours:

DR. Kota Solomon Raju,
Room: E-107, WSN & RCS Labs, Digital Systems Group, CSIR-CEERI, Pilani at 5:00 to 6:00 PM

DEVESH SAMAIYA, Chamber 2210-U, Monday, 4th Hour
devesh.samaiya@pilani.bits-pilani.ac.in,

7. Notices:

Notices, if any, will be communicated through e-Mail by Instructor-in-Charge.