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## Best Advanced Embedded Systems Training in Jalandhar & Best Linux Device Drivers Development Industrial Training in Jalandhar

This intensive course transforms an IT-Professional or a Student into a Linux Device Driver & Kernel Developer for Character Storage devices, Block Storage devices & Network Storage devices and for those Programmers who already working on Linux, but looking for a methodical and concept clearing professional training on Linux system and kernel programming. Our training sessions go beyond the basics and provide the desired knowledge level to get the most out of your Linux system. We are dedicated to offering a comprehensive level course covering varied aspects of system programming like Linux programming, Kernel programming, and Linux device drivers.

**COURSE CODE: ITR301**

**COURSE DURATION: 6 WEEKS**

**COURSE OBJECTIVES:**

1. We offer this course for all those beginners and working professionals who are seeking assignments on Linux kernel programming, device drivers.



2. Introduces Linux operating systems.
3. Introduces Linux Kernel and module programming.
4. How to use Character drivers, Block drivers, and Network drivers.
5. The concept of Kernel synchronization and debugging.
6. Introduces time delays deferred execution & interrupt handling
7. Proper grounding on Linux, its concepts and finer nuances of programming
8. Recall the basic Linux commands
9. Grasp core operating system concepts and module programming

## COURSE CONTENTS

### MODULE 1: CHARACTER DEVICE DRIVER

#### CHAPTER 1: GETTING STARTED WITH LINUX KERNEL

1. Linux System Architecture
2. Linux Software Architecture
3. Basic Kernel Services
4. Linux Kernel Code
5. Linux Kernel Tree
6. Linux Kernel Configuration
7. Introduction to GNU Toolchain
  - GCC compiler
  - Makefile
  - GDB

#### CHAPTER 2: INTRODUCTION TO DEVICE DRIVER

1. What is a Device Driver
2. Classes of Devices
3. Device Driver Classification
4. The concept of a Module
5. Kernel Module Vs. Application
6. Major & Minor Numbers
7. Reserved Major Numbers
8. Module Parameters
9. Loading/Unloading Modules
10. Current Process Information



11. Kernel Memory Allocations
12. Driver Entry Points
13. Init Module & Exit Module
14. Character Device Data structures
15. Character Device Registration
16. Character Device Drivers

### CHAPTER 3: FILE SYSTEM AND ITS OPERATION

1. File Structure
2. File Operations Structure
3. Driver-User Data Transfer
4. Open, Read, Write and Close System Calls
5. Driver-Kernel Communication
6. Driver-Device Communication
7. Device File Creation
8. Device File Control Operations
9. Advance char device operations (ioctl), Kernel Timer

### CHAPTER 4: KERNEL SYNCHRONIZATION

1. Introduction to Race Conditions
2. Sources of Race Conditions
3. Semaphores & Semaphore APIs
4. Binary & Counting Semaphores
5. Mutexes & Mutex APIs
6. Spinlocks & Spinlock APIs
7. Deadlock – Sources Deadlock Prevention
8. Rules for Sleeping
9. Wait for queues & Wait for queue APIs

### CHAPTER 5: INTERRUPTS HANDLING

1. What are interrupts?
2. Interrupt Handling
3. Interrupt Service Routine (ISR)
4. Interrupt Latency



5. Installing and implementing an interrupt handler
6. Tasklets and Work Queues
7. Bottom Halves and Top Halves

## CHAPTER 6: KERNEL CONFIGURATION AND COMPILATION FOR x86

1. Retrieving the Kernel Source
2. Configuring and Building, Installing and Booting from a Kernel
3. Upgrading a kernel, Customizing a Kernel
4. Bootloader – Grub Loader, U-Boot

## CHAPTER 7: HANDS-ON PRACTICAL DURING TRAINING

1. Introduction & First Driver
  - Setting up the environment
  - Writing, Building, Using the First Driver
2. Writing Character Drivers
  - Registering the Character Driver
  - Automatic creation of device file nodes
  - Various file operations including reading, write, ioctl
3. Doing Low-level Accesses in an ARM9
  - Led Driver on ARM 9
  - Interrupt Generation on ARM 9
  - Buttons Driver on ARM 9
  - PWM Driver on ARM9
  - LCD Driver on ARM9
  - DC and Stepper Motor Driver on ARM9

## MODULE 2: LINUX BLOCK DEVICE DRIVERS

### CHAPTER 1: FUNDAMENTALS OF 'KERNEL C' PROGRAMMING

1. Concurrency
2. Delays
3. Work Queues



### CHAPTER 2: UNDERSTANDING THE BLOCK DRIVERS

1. Request Queue Ecosystem
2. Kernel C APIs & Data Structures
3. Creating a RAM Block Device
4. Partitioning a Block Device

### CHAPTER 3: LDDK AS A USB MEMORY DEVICE

1. Understanding the USB framework
2. Integrating the USB Horizontal with Block Vertical
3. Programming the Control Endpoint Zero
4. Exchanging the Interrupt Messages

### CHAPTER 4: FILE SYSTEM DESIGN & IMPLEMENTATION

1. Virtual File System & its Role
2. File System Design & Challenges
3. Hardware File System & Formatting
4. Kernel File System & the 5 Operation Sets

### CHAPTER 5: HANDS-ON & PRACTICAL DURING TRAINING

1. Project Development Environment
  - Setting up the project development environment
2. Writing Character Drivers
  - Registering the Character Driver
  - Automatic creation of device file nodes
  - Various file operations including reading, write, ioctl
3. Understanding the Block Drivers
  - Experiments with a RAM-based Block driver
  - Creating Partitions and Formatting them
4. LDDK as a USB Memory Device
  - Auto-probing & detection of a USB device
  - Control operations for memory & LEDs of LDDK
  - USB data transfer through interrupt endpoints
  - Integrating the LDDK memory into block vertical



## 5. File System Design & Implementation

- Designing your custom File System
- Application to Format your File System
- Coding for a hardware-less File System
- Mounting the File System over LDDK

## 6. File System in Action

- Experiments with basic File System operations
- Enhance the File System to Support bigger file sizes
- Add the feature of the (efficient) renaming of files

# MODULE 3: LINUX NETWORK DEVICE DRIVERS

## CHAPTER 1: GETTING STARTED WITH NETWORK DRIVERS

1. OSI Layers & the Network (TCP/IP) Stack Placement
2. Network Driver & Device Registrations
3. Kernel Data Structures & Buffer Management
4. Network Device Operations
5. Interrupt Handling Techniques
6. The First Network Driver

## CHAPTER 2: PROGRAMMING THE PCI

1. Understanding the x86 processor bus: PCI
2. PCI Core & Programming the PCI
3. Finding & Interacting with a PCI Device
4. The First PCI Driver

## CHAPTER 3: DEVELOPING THE PCI BASED NETWORK DRIVER

1. Programming the Network Device Registers
2. Integrating the PCI horizontal with the Network vertical
3. Implementing the PCI Network Driver

## CHAPTER 4: HANDS-ON & PRACTICAL DURING TRAINING

1. Writing a Loopback Network Driver
  - Registering the Network Driver



- Buffer Management with buffers
- Packet Transmission & Reception
- Reception using interrupt and poll
- Other network operations including statistics

## 2. Testing the Network Driver

- Setting up the network
- Communicating over the network

## 3. Writing the first PCI Driver

- Registering & Finding a PCI device
- Mapping & Accessing the PCI device regions

## 4. Writing the PCI Network Driver

- Programming the Network Device Registers
- Implementing the Transmission & Reception with the actual device
- Setting up the network across computers

## WHY CHOOSE US FOR LINUX DEVICE DRIVERS DEVELOPMENT TRAINING IN JALANDHAR?

**Linux Device Drivers Development Training in Jalandhar** can become the best career option for students and it has some reason to sat this phrase.

- We provide flexible class timings according to student's convenience and availability.
- We support any training with more practical sessions & real-time scenarios.
- Our way of training makes the student capable of working on live projects & latest technologies.

## ITRONIX TRAINER'S PROFILE FOR LINUX DEVICE DRIVERS DEVELOPMENT TRAINING IN JALANDHAR

Linux Device Drivers Development trainers at **ITRONIX SOLUTIONS:**

- Our Expertise is fully up-to-date in the subjects & have hands-on experience in real-world industry application.
- Have received awards and recognition from our partners and various recognized IT Organizations.
- Our expertise is certified in their particular field.
- Have received awards from top leading brands & our partner like Google, IBM,



Microsoft & Intel.

- Our trainer for this Linux Device Drivers Development has hands-on experience in Linux Device Drivers Development, including an immense year of experience teaching Linux Device Drivers Development for entrepreneurs and professionals.

## ITRONIX'S Placement Assistance

Being one of the top Linux Device Drivers Development Training Institute and a Certified Google Partner, Itronix Solutions deals with 100% Job Placements for Eligible Students after successful completion of the course.

- ITRONIX helps in Learn how to keep yourself updated with latest trends and technologies.
- ITRONIX helps in updating your resume according to the job requirement
- ITRONIX helps in sorting and training the candidates according to company requirement.
- ITRONIX helps in Interview Training Questions and Answers, Spoken English, Group Discussions, Mock Interviews, Presentation skills to prepare students to face a challenging interview situation with ease.
- ITRONIX helps in providing placement assistance in top IT FIRMS like Google, Youtube, Saksen, Amazon, HCL, TCS, Infosys, Wipro, Intel, Robert Bosch, Mindtree, Accenture and many more.

## ITRONIX SOLUTIONS Course duration for Linux Device Drivers Development Industrial Training in Jalandhar

- **Fast Track Training** Program (6+ hours daily)
- **Regular** Classes(Morning, Daytime & Evening)
- **Weekend Training** Classes(Saturday, Sunday & Holidays)

## Top 25 Reasons to Choose ITRONIX for Linux Device Drivers Development Training in Jalandhar

- Linux Device Drivers Development training in Jalandhar is designed according to current IT field scenarios.
- We offer the best Linux Device Drivers Development training and placement in Jalandhar with well-defined training modules & curriculum
- We facilitate regular, weekend and personal Linux Device Drivers Development training in Jalandhar.
- We have one of the biggest team of certified expertise with 7+ years of real industry



experience.

- Mentors of Linux Device Drivers Development training in Jalandhar helps in major project training, minor project training, live project preparation, interview preparation, and job placement support.
- Smart labs with fully equipped & latest equipment's.
- 24x7 lab facility. Students are free to access the labs for an unlimited period of hours as per their own preferred timings.
- Smart classrooms fully equipped with projectors, live racks, Wi-Fi connectivity, digital pads. We have the latest labs equipment.
- Weekly Group Discussions.
- On training included mock test series, interview preparation, group discussions
- Free of cost weekly seminars on personality development & personal presentation.
- A series of Study Material provided: Books, PDF's, Video Lectures, Sample questions, Interview Questions (Technical and HR), and live Projects.
- PG/Flats facilities available at Rs.4,500/- per month for Linux Device Drivers Development training in Jalandhar.
- 24\*7 assistance from our expertise.
- Globally recognized course completion certification.
- Extra Time Slots (E.T.S.) for Practical 's, Absolutely Free.
- Doubt Sessions on weekends.
- The ability to retake the class at no-charge as often as desired.
- One-on-One attention and guidance by our trainers.
- Instructors help students to take knowledge of complex technical concepts.
- Payment options: Cheque, Cash, Credit Card, Debit card, Net Banking, Paytm, Google Pay.
- We are committed to helping students achieving their desired goals
- Our years of experience helps us in delivering true value solutions to students, professionals, and entrepreneurs.
- Success in ITRONIX SOLUTIONS gives students admission to the world's best MNC's
- ITRONIX SOLUTIONS is passionate about the education of students, this factor makes us an extremely popular & first choice for learners.

## CONTACT US.



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