

# Session wise breakup of the course

Course Name: POST GRADUATE DIPLOMA IN ADVANCED EMBEDDED SYSTEM DESIGN

Total Number of Hours: 420 Hrs

Sl No	Course code	Module Name	Session	Topics	Theory	Lab	Total No of hours
1	AES1	Understanding LINUX	LINUX Fundamentals	Basics of Linux,Distributions	4 Hrs	16 Hrs	20 Hrs
				File System ,Basic Commands,Utilities			
				Text Editors, Shell Programming			
		C Programming and Data Structure	C Fundamentals, Operators and Expressions Data Input and Output	Identifiers and Keywords	2 Hrs	3 Hrs	80 Hrs
				Data types, Constants, Variables and Arrays			
				Expressions, Statements and Symbolic Constants			
				Arithmetic, Unary, Relational and Logical Operators			
				Assignment and Conditional Operator			
			Control Statements, Functions and Program Structure	Single character I/O – getchar and Puchar	2Hrs	8 Hrs	
				Data I/O – scanf and printf			
				gets and puts functions			
				Branching and Looping Statements			
				Switch – Case			
				Break and Continue Statement			
				Storage Class			
			Arrays and Functions	Defining an Array	2 Hrs	8 Hrs	
				Processing an array			
Passing Arrays to Functions							
Multi-dimensional arrays							

<b>1</b>	<b>AES1</b>	<b>C Programming and Data Structure</b>	<b>Arrays and Functions</b>	Arrays and Strings			<b>80 Hrs</b>
				Function Prototype and Defining a Function			
				Accessing a Function			
				Passing Arguments to a Function			
				Recursion			
			<b>Pointers</b>	Pointer Declarations	<b>2 Hrs</b>	<b>8 Hrs</b>	
				Passing Pointers to Functions			
				Pointers and One-dimensional arrays			
				Pointers and Multi-dimensional arrays			
				Array of Pointers			
			<b>Preprocessor directives &amp; Bit wise operators</b>	Preprocessor directives	<b>1Hr</b>	<b>4Hrs</b>	
				Command line arguments			
				Bit wise operators			
				Dynamic Memory Allocation			
			<b>Structures and Unions and STACK Abstract Data Types</b>	Defining a Structure	<b>2 Hrs</b>	<b>8 Hrs</b>	
				Processing a Structure			
				User-Defined Data Type			
				Structures and Pointers			
				Passing Structures to Functions			
				Unions, enum data type			
<b>QUEUE Abstract Data Types</b>	Implementation of SLL, DLL	<b>2Hrs</b>	<b>8 Hrs</b>				
	Linked List Implementation of Stack						
	Linked List Implementation of Queue						
<b>Binary Tree</b>	Expression evaluation , creation of trees, Inorder traversal, Preorder traversal and Post Order traversal	<b>2 Hrs</b>	<b>8 Hrs</b>				
<b>Sorting</b>	Sorting Algorithms	<b>2 Hrs</b>	<b>8 Hrs</b>				

2	AES2	Microcontroller Design Engineering	Embedded System Concepts	Microprocessors and Micro controllers Architecture ,Memory,Peripherals,Interrupts	2 Hrs	8 Hrs	10 hrs	
				Design constraints Programming Languages				
				Compilers, Assemblers Simulators,Debuggers,Programmers				
				Development Boards Integrated Development Environment				
			Beginners Level lab	Familiarisation with Arduino	1Hr	3 Hrs		
				PC Communication through UART Sensor data collection-ADC				
				LCD interfacing			3 Hrs	
				DC Motor interfacing			2 Hrs	3 Hrs
				Keypad interfacing			3 Hrs	
				GSM GPS interfacing			2 Hrs	3 Hrs
				8051			Architectural Overview	1Hr
			Assembly Language Programming		1Hr	2 Hrs		
			Addition,Subtraction and Sorting of numbers					
			LED blinking		1Hr	1Hr		
			USART		1Hr	1Hr		
			Timers		1Hr	1Hr		
			KEIL IDE and Embedded C		1Hr	1Hr		
			LCD interfacing		1Hr	40 Hrs		
			External Interrupt		1Hr	1Hr		
			ADC		1Hr	1Hr		
EEPROM interfacing	1Hr	2 Hrs						
Matrix keypad interfacing	1Hr	1Hr						
7 Segment Display Interfacing								
Project Design	1Hr	13 Hrs						

2	AES2	PIC 16F877A	PIC 16F877 Architecture Overview	1Hr	2 Hrs	30 Hrs	
			Assembly Language Programming				
			Getting started with MPLAB IDE and Hitech C	1Hr			
			LED blinking				
			ADC ,USART ,Timers and External Interrupt	1Hr	2 Hrs		
			Compare Capture and PWM module	1Hr	2 Hrs		
			LCD interfacing	1Hr			
			I2C interfacing-RTC,EEPROM	1Hr	2 Hrs		
			SPI Interfacing	1Hr	2 Hrs		
			Stepper Motor Interfacing	1Hr	1Hr		
			Project Design	1Hr	10 Hrs		
			ARM-7 based LPC2138	Architectural Overview	1Hr		40 Hrs
				KEIL MDK			
		External Interrupts & Memory Mapping					
		PLL,Power Control,VPB Divider					
		GPIO, Pin control block		1Hr		2 Hrs	
		Timer 0 and Timer 1		1Hr		2 Hrs	
		PWM		1Hr			
		Real time Clock		1Hr		1Hr	
		LED and LCD Display		1Hr		2Hrs	
		Keyboard Interfacing		1Hr			
		I2C EEPROM Interfacing	1Hr	4Hrs			
		SPI interfacing	1Hr	4Hrs			
DSP Filter design	1Hr						
Project Design		15 Hrs					

2	AES2	Microcontroller Design Engineering	ATMEGA32	Architectural Overview	1Hr	2 Hrs	30 Hrs
				Introduction to AVR STUDIO	1Hr		
				I/O Ports, Timers(8/16)	1Hr		
				USART	1Hr		
				Analog-to-Digital Converter, PWM	1Hr		
				TWI Interfacing	1Hr		
				SPI interfacing	1Hr		
				LED	1Hr		
				LCD interfacing	1Hr		
				Stepper Motor Interfacing	1Hr		
				Wireless Module Interfacing	1Hr		
				Project Design	1Hr		
				3	AES3		
Shell and Services							
System Calls							
Error Handling							
Process Management	Process Control Block	2 Hrs	4Hrs				
	Process Creation and termination						
	Process Scheduling						
	Synchronization Primitives						
File Management	File organisation and Access	2 Hrs	4Hrs				
	System Calls and Device Drivers.						
	Low-level File I/O Access						
	Working with Files						
Inter Process Communication & Synchronization	FIFO	2 Hrs	14 Hrs				
	Pipes						

3	AES3	Linux Internals	Inter Process Communication & Synchronization	Semaphores	2 Hrs	14 Hrs	50Hrs			
				Message Queue						
				Shared Memory						
			Interrupts	Role of interrupts	2 Hrs	4Hrs				
				Process Interrupt						
				Raise and catch of a signal						
			Thread Management	Thread Creation and termination	2 Hrs	4Hrs				
				Thread Synchronization						
			Memory Management	Paging	2 Hrs	4Hrs				
				Reentrancy						
				Segmentation and Virtual Memory						
				Memory Protection and sharing						
			4	AES4	Real Time Operating Systems	Introduction to RTOS		Basics of RTOS	1Hr	30 Hrs
								Types of RTOS		
RTOS Components	Semaphores	1Hr				2Hrs				
	Priority Inversion and Priority Inheritance									
	InterTask Communication									
Introduction to ChibiOS	Semaphores	1Hr				8 Hrs				
	Reentrant Functions									
	Message Queue									
	Task Scheduling									
ChibiOS in STM32F4-Discovery	Tool chain compilation,	2 Hrs				15 Hrs				
	Keil project set up for STM32F4									
	Application development									
	Project Design									

5	AES5	Embedded Linux	Introduction to Embedded Linux	Architecture of a Embedded Linux, System Start up, Types of Boot Configuration	1Hr	4Hrs	30Hrs
				Boot loaders:Configuration, Installation and Parameter Settings of Grub,Uboot and vivi	1Hr		
				Root File System Structure, Root file system setup	1Hr		
				Embedded File Systems	1Hr		
			Porting Linux kernel and Root file system to ARM9 board	Configuring Kernel for Target Platform	1Hr	2 Hrs	
				Cross Compilation Tools and Libraries	1Hr	2 Hrs	
				Target Kernel Compilation-Making Image	1Hr	2 Hrs	
				Creation of File System for ARM – Memory	1Hr	2 Hrs	
				Down loading image and File system to target board	1Hr	2 Hrs	
				Application Programming	1Hr	2 Hrs	
				Inserting Modules in Target System	1Hr	2 Hrs	
				Device Driver Concepts	1Hr	2 Hrs	
				Project Design	1Hr	2 Hrs	
6	AES6	IOT System Design	Python Programming	Introduction to IDLE	1Hr	2Hrs	20 Hrs
				Lists Tuple and Dictionaries			
				Decision and Looping Constructs			
				File Handling			
				Functions			
				Object Oriented Programming			
				Exception Handling			
				Numpy,Matplotlib and opencv			
			IoT Design & Development	Raspberry Pi3 Evaluation board architecture	1Hr	30Hrs	
				Building and setting up RASPBIAN on the ki	1Hr		
Setting up BLE and WiFi on RASPBIAN	1Hr						

6	AES6	IOT System Design	IOT Design & Development	Module dependencies and hardware management	1Hr	2 Hrs	30 Hrs
				Learning GPIO on Rpi3	1Hr		
				LED Blinking, Push Button, Buzzer using PWM	1Hr	2 Hrs	
				Temperature using ADC, Integrating LDR	1Hr		
				Setting RPi as a HTTP server and gateway	1Hr	2 Hrs	
				Setting up MQTT interface to server	1Hr	2 Hrs	
				Introduction to cloud based IOT platforms			
				Overview of Data Aggregation & Analytics concepts	1Hr	2 Hrs	
				Project Design			
7	AES7	EDA Development		ORCAD,Eagle PCB Tools	1Hr		50Hrs
				Schematics Layout	1Hr	10 Hrs	
				Library Creation	1Hr	14 Hrs	
				Output File Generations	1Hr	10 Hrs	
				Pspice ,Proteus Simulations	2 Hrs	10 Hrs	
<b>Final Project</b>							