



BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus
Instruction Division

First Semester 2016-2017

EEE G512: Embedded Systems Design

Course Number:	EEE G512	Credits: 4
Course Title:	Embedded System Design	Evaluation marks: Out of 300
Instructor-in-charge:	Devesh Samaiya / Dr. Kota Solomon Raju (CEERI)	

Scope and Objectives of the Course:

- General introduction of models and processor architecture models used for the embedded system design.
 - To teach the basic concepts of embedded system design using ARM (LPC 2148) and 8051 processors for various applications.
 - Focuses on design issues involved in embedded system and system-on-chip technologies.
 - Use of standard embedded system development platform tools, analysis techniques, and methods for embedded system design.
 - Programming concepts with hands-on experience using ARM LPC 2148 experimental board.
 - Current trends in embedded system design.
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Text Book (s) :

T1. Wolf, Wayne, **Computers as Components –Principles of Embedded Computing System Design**, Second Edition, Morgan-Kaufmann, 2005.

Reference Books/Journals/Magazines :



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- R1.** Muhammad Ali Mazidi, Janice Gillespie Mazidi and Rolin D. McKinlay, “**The 8051 Microcontroller and Embedded Systems**”, Second Edition, Pearson Education, 2008.
- R2.** Raj Kamal, “Embedded Systems”, Tata McGraw Hill, New Delhi, 2003.
- R3.** Andrew N. Sloss, Dominic Symes, Chris Wright, “**ARM System Developer’s Guide, Designing and Optimizing System Software**”, Morgan Kaufmann Publishers, Elsevier, 2004.
- R4.** Qing Li and Caroline Yao, “**Real-Time Concepts for Embedded Systems**,” Elsevier publications, 2003.

Course Plan :

Lecture No.	Learning Objectives	Topics	Reference to Text books/References
1	Basics of Embedded Systems	Introduction to Embedded Systems, Design Methodology and Research Areas	T1-Chapter 1, +Clas Notes
2-4	Processors, Memory and I/O Devices, Device Drivers	Processors in Embedded systems. RISC and CISC Architectures. Memories, Exemplary Embedded Systems I/O Devices, Software in Embedded Systems, Device Drive Concepts	T1&R2-Chapter 2,3,4+Class Notes
5	Microcontrollers	Introduction to 8051 Family of Microcontrollers	R1-Chapter 1+ Class Notes
6-9	Design of Software Systems	8051 Programming Model, Addressing Modes, Instruction Set, Special Function Registers(SFRs),Memory Maps, C versus Assembly, Embedded Programming in C	R1-Chapter 2-7+Class Notes
10-11	32-bit Processor Architecture	Introduction to ARM Architecture & NXP’s LPC2148 Microcontroller	R3-Chapter 1,2+Class Notes
12-15	ARM Instruction Set and Programming	Addressing Modes and Instruction Set Overview ,Overview of Thumb Mode Instruction Set, ARM Assembly Programming And C Programming Concepts	R3-Chapter 3,4,5 +Class Notes
16	Interfacing Techniques	Methodology , Synchronizing Software and Processor with I/O	Class Notes



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17-19	8051 On-chip Peripherals	8051 Timers, Serial Ports, Programmable Counter Arrays(PCA),Keyboard Interface, Interrupt Vectors and Priority, Threads	R1-Chapter 9-11(relevant topics)+Class Notes
20-23	Interfacing External Peripherals	Interfacing of LCDs., Relays, DC motors, Stepper Motors, Sensors, External Memories, 8255 etc.	R1-Chapter 12-15 + Class Notes
24-25	LPC 2148 Peripherals	System and Power Control, clock module, GPIOs, Timers, Vector Interrupt Controller	Class Notes
26-29	LPC 2148 Peripherals	UARTs, ADC,DAC and PWM	Class Notes
30-31	Case Studies	General purpose Processor based design	Class Notes
32-38	Peripheral Interface Bus Architectures	LPC 2148's SPI, I2C and CAN Bus Interface	Class Notes
39-40	RTOS basics	Introduction to RTOS	R4 + Class Notes
41	RTOS basics on ARM	Introduction to VxWorks	R4 + Class Notes
42	Embedded System: HW SW Design Issues	CPU Power Consumption and Optimization, ICE , Hardware – Software co-simulation and debugging, real time, Design Cycle	Class Notes

Evaluation scheme:

Component	Duration	Marks	Date
Mid-Semester Assesment (Closed book)	90 Min	35	TBA
Assignments	Continuous	30	Three (3x5 marks) + one (15 marks) assignments would be announced in the



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(Open Book)			class
Project	Continuous	70	Report, Presentation & Demo
Lab	Continuous	75	
Comprehensive Exam (Open Book)	180 Min	90	1/12 AN
Total		300	

Evaluation scheme for Course Project

Novelty	Feasibility , Impact of the product on society & Technology /Market positioning	Practical implementation of concepts	Presentation (7), report (10) and demonstration (8)
10 marks	10 marks	25 marks	25 marks

Consultation Hours:

- Wednesday, 4.00 pm to 5.30 pm at E-107, DSG, CSIR-CEERI, Pilni (for Dr. K S Raju)
- Monday, 10:30 AM to 11:30 AM, 2210-U, FD-2 (IC - Devesh Samaiya)

Instructor-in-charge



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I Semester 2016-2017

Course Number: **EEE G512**
Course Title: **Embedded System Design Lab**

Instructor-in-charge: **Devesh Samaiya**

1. Course Plan :

LABS	Date
Introduction to STM8S Programming, GPIO Experiment	04/8
STM8S ADC Interface	11/8
STM8S Timers	01/9
STM8S UART	08/9
STM8S SPI	15/9
Introduction to ARM7, Kit, Tool Chain, GPIO	22/9



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ARM7 UART Experiment	29/9
ARM7 SPI Experiment	13/10
ARM7 Timer and External Interrupts	20/10
ARM7 I2C Interface	03/11
Course Project Submission & Demo	24/11

Each lab experiment consist of 5 marks

- Attendance in Lab (1)
- Demo of experiment with explanation (3)
- Timely submission of report in prescribed format only (1)

Lab Evaluation

Lab Seminar*	Experiments
25	50

*Lab seminar details will be discussed in the class.



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