

EMBEDDED COMPUTING

I Semester: ES								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BESB07	Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45		Tutorial Classes: Nil		Practical Classes: Nil		Total Classes: 45		
I. COURSE OVERVIEW								
<p>This course introduces the basic knowledge of computer architecture, operating system concepts; inter process communication to handle interrupts for design of embedded systems. It includes both hardware and software tools to control the device and programming on LINUX, compilation of GNU and GNC tools, network basis and instruction set. This course provides a platform for Industrial Automation and Control, Intelligent transportation, medical imaging.</p>								
II. COURSE OBJECTIVES:								
The students will try to learn:								
<p>I. The operating system concepts and inter process communication. II. Use tools like simulator, assembler and debugger III. The interrupts and interrupt latency to handle interrupts for design of embedded systems.</p>								
III. COURSE OUTCOMES:								
After successful completion of the course, students should be able to:								
CO1	Understand the programming of microcontroller for the functional stack of IoT ecosystem.						Understand	
CO2	Understand the concepts of data synchronization for agility and autonomy in protocols.						Understand	
CO3	Apply IEEE 802.11 protocol for topology and security in physical and MAC layer.						Apply	
CO4	Identify the applications of IoT including home automation, smart cities, and smart environment to implement the real time applications						Apply	
CO5	Develop the cloud environment using web enabling constrained devices in Internet of things.						Create	
CO 6	Make use of appropriate communication protocols to acquire the knowledge of programming with Raspberry PI						Apply	
IV. SYLLABUS:								
UNIT-I	PROGRAMMING ON LINUX PLATFORM						Classes: 09	
<p>System calls, scheduling, memory allocation, timers, embedded linux, root file system, busybox; Operating system overview: Processes, tasks, threads, multi-threading, semaphore and message queue.</p>								
UNIT-II	INTRODUCTION TO SOFTWARE DEVELOPMENT TOOLS						Classes: 09	
<p>GNU GCC, make, gdb, static and dynamic linking, C libraries, compiler options, code optimization switches, lint, code profiling tools.</p>								

UNIT-III	INTERFACING MODULES	Classes: 09
Sensor and actuator interface, data transfer and control, GPS. GSM module interfacing with data processing and display, open CV for machine vision, audio signal processing.		
UNIT-IV	NETWORKING BASICS	Classes: 09
Sockets, ports, UDP, TCP/IP, client server model, socket programming, 802.11, Bluetooth, ZigBee, SSH, firewalls, network security.		
UNIT-V	IA32 INSTRUCTION SET	Classes: 09
Application binary interface, exception and interrupt handling, interrupt latency, assemblers, assembler directives, macros, simulation and debugging tools.		
Text Books:		
<ol style="list-style-type: none"> 1. Peter Barry and Patrick Crowley, “Modern Embedded Computing”, Elsevier/Morgan Kaufmann, 1st Edition, 2012. 2. Michael K. Johnson, Erik W. Troan, “Linux Application Development”, Addison Wesley, 1st Edition, 1998. 3. Kip R.Irvine, “Assembly Language for x86 Processors”, Pearson, 7th Edition, 2014. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Abraham Silberschatz, Peter B. Galvin and Greg Gagne, “Operating System Concepts”. Wiley, 9th Edition, 2013. 2. Maurice J. Bach Prentice Hall, “The Design of the UNIX Operating System”, Prentice Hall, 1st Edition, 1986. 3. W. Richard Stevens, “UNIX Network Programming”, Addison-Wesley Professional, 3rd Edition, 2003. 		
Web References:		
<ol style="list-style-type: none"> 1. http://video.tu.clausthal.de/vorlesung/469.html 2. https://chess.eecs.berkeley.edu/eecs149/ 3. https://www.coursera.org/learn/iot/lecture/Gah7g/lecture-1-1-what-are-embedded-systems 		
E-Text Books:		
<ol style="list-style-type: none"> 1. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Delhi/Embedded%20Systems%20(Video).htm 2. http://store.elsevier.com/Modern,Embedded,Computing/Peter,Barry/isbn,9780123914903/ 3. www.csie.ntu.edu.tw/~b91066/Embedded%20Computing(2005).pdf 		