EMBEDDED COMPUTING

II Semester: ECE(ES)								

Course Code	Category	Hours / Week			Credits	Maximum Marks		
BESC18	**ELECTIVE**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	30	70	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes:45**		

I. COURSE OVERVIEW:
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.

II. COURSE OBJECTIVES:
The students will try to learn:
I.   The fundamental principles of software tools, scheduling tasks, compiling for software design of embedded system.
II.   The embedded system design using the GNU tool chain GCC, Git version control and developing Software in LINUX on a virtual machine.
III.   The basics of various networking and modules to interface with display and audio signal processing applications.

III. COURSE OUTCOMES:
After successful completion of the course, students should be able to:

CO1	**Recall** the concepts of processes, threads, tasks, multitasking, multithreading in context of real time systems using LINUX kernel.	Remember
CO2	**Analyze** the GCC, GNU's compile Collections used to compile Objective C and Objective C++.	Analyze
CO3	**Illustrate** the benefits of software development tools to distributed systems that support multiple computers for hosting different applications.	Understand
CO4	**Utilize** Ports, UDP, TCP/IP, client server model, firewalls and network security used for data transmission across the multiple networks over the internet.	Apply
CO5	**Demonstrate** the IA32 Instruction Set, assembler directives, macros, simulation and debugging tools for application binary interface.	Understand
CO 6	**Classify** the wireless local area networks for the user device to communicate with in intranet and internet.	Understand

IV. SYLLABUS:
MODULE-I: PROGRAMMING ON LINUX PLATFORM (9)
System calls, scheduling, memory allocation, timers, embedded Linux, root file system, busy box; Operating system overview: Processes, tasks, threads, multi-threading, semaphore and message queue.

MODULE-II: INTRODUCTION TO SOFTWARE DEVELOPMENT TOOLS (9)
GNUGCC, make, gdb, static and dynamic linking, Clibraries, compiler options, code optimization switches, lint, code profiling tools.

MODULE-III: INTERFACINGMODULES (9)
Sensor and actuator interface, data transfer and control, GPS.

GSM module interfacing with data processing and display, open CV form a chine vision, audio signal processing.

MODULE-IV: NETWORKING BASICS (9)
Sockets,ports,UDP,TCP/IP,clientservermodel,socketprogramming,802.11,Bluetooth,ZigBee,SSH,firewalls,networksecurity.

MODULE – V: IA32 INSTRUCTION SET (9)
Application binary interface, exception and interrupt handling, interrupt latency, assemblers, assembler directives, macros, simulation and debugging tools.

V. TEXT BOOKS:
1. Peter Barry and Patrick Crowley, "Modern Embedded Computing", Elsevier / Morgan Kaufmann, 1st Edition, 2012.
2. Michael K.Johnson, ErikW.Troan,"Linux Application Development", Adission Wesley 1st Edition,1998.
3. KipR.Irvine, "Assembly Language for x86Processors", Pearson, 7th Edition, 2014.

VI. REFERENCE BOOKS:
1. Abraham Silberschatz, PeterB.Galvin and Greg Gagne, "Operating System Concepts", Wiley, 9th Edition, 2013.
2. MauriceJ.Bach,"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.

VII. WEB REFERENCES:
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

VIII. E-TEXT BOOKS:
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