HARDWARE SOFTWARE CO-DESIGN

I Semester: ES

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BESB05	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course intended to provide combined effort of hardware and software concurrent design in order to meet embedded system level objectives. It focuses on the hardware architectures, languages for systems design, system partitioning and design challenges. It gives the platform for designing applications in the area of aircraft, industrial automation, robotics, wireless communication and automobiles.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The various prototyping and emulation techniques for co-design models.
II. The compilation techniques for embedded processor architecture.
III. Use verification tools for verification of co-design.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1	**Illustrate** the co-design issues, models and languages used for the development of embedded systems.	Understand
CO2	**Demonstrate** the generic co-design methodology, co- synthesis algorithms used for the design of cost-effective systems.	Understand
CO 3	**Choose** the proper prototyping and emulation techniques for verifying complex hardware designs and validating the systems.	Apply
CO 4	**Interpret** the architecture for control dominated systems and data dominated systems to use in a wide class of applications in embedded systems	Understand
CO 5	**Utilize** the various compilation techniques and tools for implementing the compiler development environment.	Apply
CO 6	**Select** the latest tools available for both co-design and co-verification of systems for determining the optimum solution to any co-design problem.	Apply

IV. SYLLABUS:

UNIT-I	CO-DESIGN ISSUES	Classes: 09

Co-design models, architectures, languages and a generic co-design methodology; Co-synthesis algorithms: hardware software synthesis algorithms: Hardware, software partitioning distributed system co-synthesis.

UNIT-II	PROTOTYPING AND EMULATION	Classes: 09

prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

Target Architectures: Architecture specialization techniques, system communication infrastructure, target architecture and application system classes, architecture for control dominated systems 8051,Architectures for High performance control, architecture for data dominated systems ADSP21060, TMS320C60, mixed systems.

UNIT-III	COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR ARCHITECTURES	Classes: 09

Modern embedded architectures, embedded software development needs.

Compilation technologies, practical consideration in a compiler development environment.

UNIT-IV	DESIGN SPECIFICATION AND VERIFICATION	Classes: 09

Design, co-design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.

UNIT-V	LANGUAGES FOR SYSTEM	Classes: 09

Level specification and design-I system, level specification, design representation for system level synthesis, system level specification languages;
Level specification and design-II: Heterogeneous specifications and multi language co-simulation, cosyma system and Lycos system.

Text Books:

1. Jorgen Staunstrup, Wayne Wolf, “Hardware / Software Co-Design Principles and Practice”, Springer, 2nd Edition, 2009.
2. Giovanni De Micheli, Mariagiovanna Sami, “Hardware / Software Co-Design”, Kluwer Academic Publishers, 1st Edition, 2012.

Reference Books:

1. Patrick R. Schaumont , “A Practical Introduction to Hardware/Software Co-design,” Springer Issues and Practices”, Elsevier, 1st Edition, 2005.

Web References:

1. http://www.springer.com/in/book/9781461437369
2. http://www.springer.com/us/book/9781441960009
3. http://rijndael.ece.vt.edu/gezel2/book

E-Text Books:

1. http://www.tik.ee.ethz.ch/education/lectures/hswcd/
2. http://freevideolectures.com/Course/3401/Digital-System-design-with-PLDs-and-FPGAs/8