HARDWARE SOFTWARE CO-DESIGN

I Semester: ECE(ES)									
Course Code	**Category**	Hours / Week			**Credits**	Maximum Marks			
BESC05	**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 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 fundamental principles of synthesis algorithms, methodologies and co-design challenges.
  II. The knowledge of target architectures, prototyping and emulation techniques of embedded processors.
  III. The compilation techniques, tools and system level specification languages relevant to 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:
MODULE – I: CO- DESIGN ISSUES (9)
Co- Design Models, Architectures, Languages, A Generic Co-design Methodology Co- Synthesis Algorithms: Hardware software synthesis algorithms: hardware – software partitioning distributed system co-synthesis.

MODULE – II: PROTOTYPING AND EMULATION (9)
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.

MODULE – III: COMPILATION TECHNIQUES AND TOOLS FOR EMBEDDED PROCESSOR ARCHITECTURES I (9)

Modern embedded architectures, embedded software development needs

compilation technologies, practical consideration in a compiler development environment

MODULE – IV: DESIGN SPECIFICATION AND VERIFICATION (9)

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

MODULE – V: LANGUAGES FOR SYSTEM – LEVEL SPECIFICATION AND DESIGN-I (9)

System – level specification, design representation for system level synthesis, system level specification languages, Languages for System – Level Specification and Design-II: Heterogeneous specifications and multi-language co-simulation, the cosyma system and lycos system

V. TEXT BOOKS:
1. Jorgen Staunstrup, "Hardware / Software Co- Design Principles and Practice", Wayne Wolf – 2009, Springer.
2. Giovanni De Micheli, Mariagiovanna Sami, "Hardware / Software Co- Design", 2002, Kluwer Academic Publishers.

VI. REFERENCE BOOKS :
1. Patrick R. Schaumont, "A Practical Introduction to Hardware/Software Co-design", 2010, Springe

VII. WEB REFERENCES:
1. http://nptel.ac.in/courses/106105036/
2. https://www.youtube.com/watch?v=rpdygqOI9mM
3. https://www.youtube.com/watch?v=hELr9-7aAG8

VIII. E-TEXT BOOKS:
1. https://www.ece.iastate.edu/~zambreno/classes/cpre583/documents/Wol94A.pdf
2. https://books.google.co.in/books/about/Hardware_Software_Co_Design.html?id=SkGcGUHyQ3QC