

Course Title	Embedded System Design
Course Code	EE5301
No. of Credit Hrs (Lecture + Tutorial + Lab)	3 (2+0+1)
No. of Contact Hrs (Lecture + Tutorial + Lab)	4 (2+0+2)
Level-Year	9–5
Prerequisite (if any)	EE4402

1) Course Objectives:

The purpose of this course is to introduce the students to the fundamentals of embedded system hardware and firmware design. This course describes the state-of-the-art methods, concepts, tools and techniques used in system-level design and modeling of multi-processor systems.

2) Expected Learning Outcomes:

1. **Define and explain** the fundamental concepts and architecture of embedded systems. **PLO1 [1]**
2. **Analyze** embedded systems using mathematical models and software tools such as C, C++, and VHDL. **PLO1 [1]**
3. **Design, implement, and test** embedded systems and their components using FPGA and related tools. **PLO2 [2]**
4. **Apply and solve** engineering problems related to embedded system design and functionality. **PLO3 [6]**
5. **Propose and develop** small-scale embedded system models that demonstrate innovative and practical solutions. **PLO9 [7]**

3) Course Contents

1. Fundamentals of embedded systems.
2. Electronic system-level (ESL) design;
3. System-level design languages (SLDLs): SpecC, SystemC;
4. Models of Computation (MoCs): finite state machines (FSMs), dataflow, process networks, discrete event;
5. System specification, profiling, analysis and estimation;
6. System-level design: partitioning, scheduling, communication synthesis;
7. System-level modeling: processor and RTOS modeling, transaction-level modeling (TLM) for communication;
8. System-level synthesis: design space exploration (DSE);
9. Embedded hardware and software implementation: synthesis and simulation;
10. System design examples and case studies.

6. Teaching Methods:

- Lectures and Discussion
- Videos
- Self-learning
- Tutorial sheets

7. Mode of Evaluation: Course Assessment Methods

- Quizzes , Assignment, Homeworks, Reports, Presentations etc.
- Mid Exam
- Final Exam

No	Assessment Activities *	Percentage
1.	Assignments/Quizzes/Mini-Projects/Presentations/Reports and Quizzes	15%
2.	Mid Exam	25%
3.	Tutorial work (Homework/Mini-project, Report, Long essay)	20%
4.	Final Exam	40%

8. Textbook(s):

- D. D. Gajski, S. Abdi, A. Gerstlauer, G. Schirner, Specification and Design of Embedded Systems, ISBN-13: 978-0131507319, Prentice Hall, 1st edition (July 9, 1994)

9. References:

- Gerstlauer, R. Doemer, J. Peng, D. Gajski, System Design: A Practical Guide with SpecC, ISBN 0-7923-7387-1, Kluwer, 2001,.
- T. Groetker, S. Liao, G. Martin, S. Swan, System Design with SystemC, ISBN 1-4020- 7072-1, Kluwer, 2002.
- F. Vahid, T. Givargis, Embedded System Design: A Unified Hardware/Software Introduction, ISBN 978-0-471-38678-0, John Wiley & Sons, 2001.

