Electronic Product Design(404185)

Teaching Scheme:

Lectures: 3 Hrs./ Week

Examination Scheme:

In Semester Assessment:
Phase I : 30
End Semester Examination:
Phase II: 70

Course Objectives:

- To understand the stages of product (hardware/ software) design and development.
- To learn the different considerations of analog, digital and mixed circuit design.
- To be acquainted with methods of PCB design and different tools used for PCB Design.
- To understand the importance of testing in product design cycle. `
- To understand the processes and importance of documentation.

Course Outcomes:

After successfully completing the course students will be able to

Understand various stages of hardware, software and PCB design.

Importance of product test & test specifications.

Special design considerations and importance of documentation.

Unit I : Introduction to Electronic Product Design T1-4,5,6   6L

Man machine dialog and Industrial design, user-centered design, five element of successful design, cognition, ergonomics. Packaging and factors, design for manufacture, assembly and disassembly, wiring, temperature, vibration and shock. Safety, noise, energy coupling, grounding, filtering and shielding.

Unit II : Hardware Design & testing methods   R1- 9,10,14   6L

Design process. Identifying the requirements, formulating specifications, design specifications, Specifications verses requirements, System partitioning, Functional design, architectural design, Functional model verses architectural model. Prototyping. Performance and Efficiency measures. Formulating a test plan, writing specifications, Test procedure and test cases, Egoless design, design reviews. Module debug and test: black box test, white box test, grey box test.

Unit III :Software Design and Testing methods   T1-11   6L

Types of Software. Waterfall model of software development. Models, metrics and software

limitations. Risk abatement and failure preventions. Software bugs and testing. Good programming practice. User interface .Embedded, Real time software.

Unit IV : PCB design   T2-1,2,3,6   6L

Fundamental Definitions, Standards. Routing Topology Configurations, Layer Stackup assignment, Grounding Methodologies, Aspect Ratio, Image Planes, Functional Partitioning, Critical frequencies, Bypassing and decoupling. Design techniques for ESD Protection, Guard Band implementation.

Unit V : Product Debugging and testing   T1-12,13   6L

Steps of Debugging, Techniques for troubleshooting, characterization, Electromechanical components, passive components, active components, active devices, operational amplifier, Analog-Digital Conversion, Digital Components, Inspection and test of components, Simulation, Prototyping and testing, Integration, validation and verification. EMI & EMC issues.

Unit VI : Documentation   T1-3   6L

Definition, need, and types of documentation. Records, Accountability, and Liability. Audience. Preparation, Presentation, and Preservation of documents. Methods of documentation, Visual techniques, Layout of documentation, Bill of material.

Text Books

1. Kim Fowler," Electronic Instrument Design" Oxford university press.
2. Robert J. Herrick, "Printed Circuit board design Techniques for EMC Compliance", Second edition, IEEE press.

Reference Books

1. James K. Peckol, "Embedded Systems – A Contemporary Design Tool", Wiley publication
2. J C Whitakar," The Electronics Handbook", CRC press.