

EMI/EMC

ECMC1T6A

Lecture: 4periods/week

Credits: 4

Internal assessment: 40 marks

Semester end examination: 60 marks

Prerequisites: Basic knowledge of electronic components, circuits, electromagnetic fields and systems.

Course Objectives:

- To understand EMI problems in subsystem and system level design.
- To measure the emission. immunity level from different systems to couple with the prescribed EMC standards
- To introduce the concepts of electromagnetic interference and electromagnetic compatibility
- It presents different kinds of electromagnetic interference coupling principles.
- To study the electromagnetic interference control techniques
- To discuss electromagnetic interference measurements and standards

The goal of this course is to provide specialist level expertise on electromagnetic compatibility, leading to full understanding of the aspects related to generating mechanisms of electromagnetic interferences and to their propagation.

On successful completion of this module, the student should be able to evaluate EMC problems in electrical, electronic devices and equipments, according to their technical characteristics and functionalities, and to provide solutions.

Course Outcomes:

Upon completion of the course, students will be able to:

1. Find solution to EMI Sources, EMI problems in PCB level / Subsystem and system level design.
2. To measure emission immunity level from different systems to couple with the prescribed EMC standards

UNIT-I

BASIC THEORY: Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories, EMC Engineering Application.

M.Tech (Microwave & Communication Engineering) PVP17

UNIT-II

COUPLING MECHANISM: Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radiative coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT-III :

EMI MITIGATION TECHNIQUES: Working principle of Shielding and Murphy's Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketing and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient protection.

UNIT-IV:

STANDARDS AND REGULATION: Need for Standards, Generic/General Standards for Residential and Industrial environment, Basic Standards, Product Standards, National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC. Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

EMI Test Methods and Instrumentation

Fundamental considerations, EMI Shielding effectiveness tests, Open field test, TEM cell for immunity test, Shielded chamber, Shielded anechoic chamber, EMI test receivers, Spectrum analyser, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL -STD test methods, Civilian STD test methods.

TEXT BOOK

1. Clayton Paul, "Introduction to Electromagnetic Compatibility", Wiley Interscience, 2006

REFERENCES

1. V Prasad Kodali, "Engineering Electromagnetic Compatibility", IEEE Press, Newyork, 2001.
2. Henry W. Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons Inc, Newyork, 2009
3. Daryl Gerke and William Kimmel, "EDN's Designer's Guide to Electromagnetic Compatibility", Elsevier Science & Technology Books, 2002
4. W Scott Bennett, "Control and Measurement of Unintentional Electromagnetic Radiation", John Wiley & Sons Inc., (Wiley Interscience Series) 1997.
5. Dr Kenneth L Kaiser, "The Electromagnetic Compatibility Handbook", CRC Press 2005,