

## **PX5092 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY**

### DETAILED SYLLABUS

#### **OBJECTIVES**

- To provide fundamental knowledge on electromagnetic interference and electromagnetic compatibility.
- To study the important techniques to control EMI and EMC.
- To expose the knowledge on testing techniques as per Indian and international standards in EMI measurement.

#### **UNIT I INTRODUCTION**

Definitions of EMI/EMC -Sources of EMI- Intersystems and Intrasystem- Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation typical noise path- EMI predictions and modeling, Cross talk - Methods of eliminating interferences.

#### **UNIT II GROUNDING AND CABLING**

Cabling- types of cables, mechanism of EMI emission / coupling in cables –capacitive coupling inductive coupling- shielding to prevent magnetic radiation- shield transfer impedance, Grounding – safety grounds – signal grounds- single point and multipoint ground systems hybrid grounds- functional ground layout –grounding of cable shields- -guard shields- isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding- Earth measurement Methods

#### **UNIT III BALANCING, FILTERING AND SHIELDING**

Power supply decoupling- decoupling filters-amplifier filtering –high frequency filtering- EMI filters characteristics of LPF, HPF, BPF, BEF and power line filter design -Choice of capacitors, inductors, transformers and resistors, EMC design components -shielding – near and far fields shielding effectiveness- absorption and reflection loss- magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets-windows and coatings-grounding of shields

#### **UNIT IV EMI IN ELEMENTS AND CIRCUITS**

Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive inter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction

## **UNIT V ELECTROSTATIC DISCHARGE, STANDARDS AND TESTING TECHNIQUES**

Static Generation- human body model- static discharges- ESD versus EMC, ESD protection in equipments- standards – FCC requirements – EMI measurements – Open area test site measurements and precautions- Radiated and conducted interference measurements, Control requirements and testing methods

### **REFERENCES**

1. V.P. Kodali, "Engineering Electromagnetic Compatibility", S. Chand, 1996
2. Henry W.Ott, " Noise reduction techniques in electronic systems", John Wiley & Sons, 1989
3. Bernhard Keiser, "Principles of Electro-magnetic Compatibility", Artech House, Inc. (685 canton street, Norwood, MA 020062 USA) 1987
4. Bridges, J.E Milleta J. and Ricketts.L.W., "EMP Radiation and Protective techniques", John Wiley and sons, USA 1976
5. William Duff G., & Donald White R. J, "Series on Electromagnetic Interference and Compatibility", Vol.
6. Weston David A., "Electromagnetic Compatibility, Principles and Applications", 1991.