

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	ECD417	RFID	3	0	0	9

Course Objective

This course is designed to familiarize the students with radio frequency identification technique. At the end of the course the students will be able to design their own RFID systems for different applications.

Learning Outcomes

Upon successful completion of this course, students will:

- Basics of Electromagnetics and RF/Microwave Concepts,
- Familiarized with RFID systems
- Applications of RFID.
- International standard and applications.

Module No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Module 1: Maxwell's Equation, Boundary conditions, Power & Energy and Time harmonic electromagnetic fields, Classification of EM Problems and Some Important Theorem, etc. Wave equation and solution, analytical solution, Solution of inhomogeneous vector potential wave equations.	08	Basic idea of electromagnetics and some useful theorem to under the RFID tags at design level.
2	Module 2: Transmission Line Equations, Input Impedance, Standing Wave and Transient Analysis, Stub Matching and Quarter Wave Transformer Matching, Smith Chart, Scattering Matrix, Transmission Matrix, and Basics of Filter Design by Insertion Loss method.	09	Understanding of basics of RF/Microwave Engineering, transmission line and key parameters familiarization of Smith chart, S-parameters to analyze the different design parameters.
3	Module 3: Comparison of Different ID Systems, Components of an RFID System, Fundamental Differentiation Features, Frequency, Range and Coupling, Active and Passive Transponders, Microstrip antennas and wire antenna design.	10	Understanding of fundamental of RFID. Also familiar with the Selection Criteria for RFID Systems and other subsystems.
4	Module 4: Data Flow in an Application, Components of a Reader, Integrated Reader ICs, Connection of Antennas for Inductive Systems, Reader Designs, Near-Field Communication, Glass and Plastic Transponders.	07	Student will familiarize the RFID reader block diagram and other components like antennas, connections and transponder.
5	Module 5: ISO/IEC 69873 – Data Carriers for Tools and Clamping Devices, ISO/IEC 10374 – Container Identification, VDI 4470 – Anti-theft Systems for Goods, Item Management, Contactless Smart Cards, Public Transport, Contactless Payment Systems, NFC Applications, Electronic Passport, Ski Tickets, Access Control, FCC Rules for ISM Band, Identity, Standards, and Guidelines for Securing RFID Systems..	8	Students will able to understand different real world applications of RFID technology. This unit will help student in understanding the International standard and applications.

Text Books:

1. Klaus Finkenzeller, 'RFID Handbook', Wiley, 2nd edition, 2003.

Reference Books:

1. C. A. Balanis, 'Advanced Engineering Electromagnetics', Jhon Wiley & Sons, USA, 2nd edition, 2012.
2. David Pozar, Microwave Engineering, 3rd edition, (Wiley, 2005).

3. C. A. Ballanis , "Antenna Theory, Analysis and Design " , John Wiley & Sons, Third edition , 2005
4. RFID Systems: Research Trends and Challenges, by Bolic M., Simplot-Ryl D., Stojmenovic I., 1st edition, 2011
RFID Design Principles (Artech House Microwave Library), by Harvey Lehpamer, 1st edition, 2008.