



Master of Science (Electronics)
M.Sc.(Electronics) Semester II

Course Code	PS02CELE51	Title of the Course	Electromagnetism and Antenna Theory
Total Credits of the Course	4	Hours per Week	3+1=4Hours

Course Objectives:	<ol style="list-style-type: none">1. This course entails the analysis, synthesis, physical interpretation and applications of electric and magnetic fields.2. To impart working knowledge of the basic theorems and concepts of electromagnetism.3. To get aware about different types of Transmission Lines and Waveguides.4. To give basic understanding of various Antennas and its applications.5. To make students aware about microwave devices.
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Course Content		
Unit	Description	Weightage* (%)
1.	Basics of Electromagnetism, Electrostatics – Review of Laws of Electrostatics – Coulomb’s Law, Proof of Gauss law on arbitrary surface, Poisson and Laplace equations, Green’s Theorem, Potential energy and energy density. Magnetostatics – Biot and Savart law, Ampere’s Circuital law, Energy density in magnetic field, Maxwell’s equations, Concept of Displacement current, Scalar and Vector Potential, Gauge transformations, Importance of Poynting’s theorem.	25
2.	Propagation of Electromagnetic Waves in conducting medium and non- conducting medium, Transmission lines – Telegraphic Equation for transmission line, Classification of Transmission lines : Coaxial Cable, Twin wire line, Strip and Microstrip line, Standing wave, Reflection coefficient and Impedance, Smith Chart and its applications, Quarter and Half wavelength lines, Matching Devices-Stub and Baluns.	25
3.	Types of Wave guides, Wave propagation in Rectangular and Circular wave – guides, Wave-guide modes : Transverse Electric (TE) Mode, Transverse Magnetic (TM) Mode, Wave guides coupling, Wave guide joints: T-Junctions and Hybrid Junctions, Isolators and circulators, Matching and attenuations.	25
4.	Antenna- The radiation mechanism, Types of Antenna : Elementary doublet, Resonant & Non-resonant antenna, Antenna Parameters : Antenna gain and directivity, Antenna impedance and efficiency, Dipole arrays, Folded Dipole and Yagi-Uda Antenna (VHF),	25





	Microwave Antennas: Antenna with parabolic reflectors, Horn antenna, Loop antenna and Log periodic Antenna. Microwave tubes- Klystron, Reflex Klystron and Magnetron, Traveling wave tubes, Tunnel Diode and Gunn devices- Modes of Gunn diodes. Microwave detectors - PIN and Schottky diodes.	
Teaching-Learning Methodology	Use of ICT Tools, Classroom Teaching (Offline/Online), Use of Power point Presentation, Tutorial Problem Solving, Assignments, Group Discussion, Video Animation and Presentation, Experimental demonstration.	

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand the various theorems related to Electrostatics, Magnetostatics and Electromagnetism.
2.	Learn all basic terminologies and applications of Electric field and Magnetic field.
3.	Study the behaviour of charges with respect to different mediums and Time varying fields.
4.	Grasp the concepts of Transmission Lines, Waveguides and their applications.
5.	Know the Types of Antennas and Identify the advance applications of Antennas.





Suggested References:

Sr. No.	References
1.	Electromagnetic Fields T.V.S.Arun Murthy (S.Chand Publications)
2.	Electronics Communications Systems George Kennedy (McGraw Hill International Edition.,N.Y., USA)
3.	Electromagnetism (Theory and Applications) Ashutosh Pramanik (Prentice Hall of India Pvt. Ltd. ,New Delhi, INDIA)
4.	Elements of Electromagnetics Matthew N.O.Sadiku (Oxford Publication)
5.	Microwave Engineering and Applications O.P.Gandhi (Maxwell Macmillan International Edition.)
6.	Classical electrodynamics J.D.Jackson (Willey Eastern Ltd., New Delhi, INDIA)
7.	Classical Electrodynamics S.P.Puri (Tata McGraw Hill Publishing Co.Ltd., New Delhi, INDIA)
8.	Introduction to Electrodynamics David J. Griffith (Prentice Hall of India Pvt. Ltd., New Delhi, INDIA)
9.	Modern Microwave technology Victor F. Velley (Prentice Hall Inc. N.Y., USA)
10.	Electromagnetic Field Theory Fundamentals Bhag Guru (Cambridge Publications)
11.	Electromagnetic Field theory and Transmission Lines G.S.N.Raju (Pearson Education, South Asia)
12.	Antenna Handbook Joseph J.Carr (Galgotia Publication pvt.ltd.
13.	Antennas John D.Kraus
14.	Electromagnetic Concepts and Applications Stanley V. Marshall, Gabriel G.Skitek (Prentice-Hall International Editions)





On-line resources to be used if available as reference material

On-line Resources

1. <https://www.worldscientific.com/worldscibooks/10.1142/2599>

2. <https://apps.dtic.mil/sti/pdfs/AD1029150.pdf>

3. <http://onlinelibrary.wiley.com/doi/10.1002/9781119079699.refs/pdf>

4. https://www.researchgate.net/publication/322921543_Antenna_theory_design

5. <https://interferencetechnology.com/antenna-fundamentals/>

6. On Line Video Lectures of course on Electromagnetism -SWAYAM

7. On Line Video Lectures of course on Introduction to Electricity and Magnetism -NPTEL

