**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**
**KAKINADA – 533 003, Andhra Pradesh, India**
**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

| III Year - I Semester | | L | T | P | C |
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# ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

**UNIT I:**
**Transmission Lines-I**: Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations, Primary&SecondaryConstants,ExpressionsforCharacteristicImpedance,Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.

**UNIT II:**
**Transmission Lines – II:** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations, λ/8,λ/4 and λ /2 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.

**UNIT III:**
ReviewofCo-ordinateSystems,**Electrostatics:**,Coulomb'sLaw,ElectricFieldIntensity,Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems

**UNIT IV:**
**Magneto Statics:** Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems**,**
**Maxwell's Equations (Time Varying Fields):** Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface, Illustrative Problems.

**UNIT V:**
**EM Wave Characteristics:** Wave Equations for Conducting and Perfect Dielectric Media Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem, Illustrative Problems.

**TEXTBOOKS:**
1. Elements of Electromagnetic–Matthew N.O.Sadiku, Oxford Univ. Press,3rded.,2001.
2. Electromagnetic Waves and Radiating Systems–E.C.Jordan and K.G.Balmain, PHI,2ndEdition,2000.

**REFERENCEBOOKS:**

1. Electromagnetic Field Theory and Transmission Lines–SNRaju, Pearson Education 2006
2. Engineering Electromagnetic –William H. Hayt Jr. and John A.Buck, TMH, 7th ed., 2006.
3. Electromagnetic Field Theory and Transmission Lines : G Sasi Bhushana Rao, WileyIndia2013.

**Course Outcomes:**

At the end of this course the student can able to

1. Determine E and H using various laws and applications of electric & magnetic fields
2. Apply the Maxwell equations to analyze the time varying behavior of EM waves
3. Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
4. Calculate Brewster angle, critical angle and total internal reflection
5. Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart