

8.1 Introduction

- We will discuss about electromagnetic waves, their properties and characteristics, and also their practical uses in our day-to-day life.
- One of the most important applications of electromagnetic waves is in communication.
- Some of the important applications of electromagnetic waves are:-
 1. We are able to see everything around us because of electromagnetic waves.
 2. It helps in aircraft navigation and helps the pilot for the smooth take-off and landing of aeroplanes. It also helps to calculate the speed of the aeroplane.
 3. In the medical field it has got very important applications. For example: - In laser eye surgery, in x-rays.
 4. In radio and television broadcasting signals. These signals are transmitted by electromagnetic waves.
 5. Electromagnetic waves helps in determining the speed of the passing vehicles.
 6. They are used in electronic appliances like T.V. remotes, remote cars, LED TV, microwave ovens etc.
 7. Voice transmission in mobile phones is possible because of electromagnetic waves.

What are Electromagnetic Waves?

- Electromagnetic (EM) waves are the waves which are related to both electricity and magnetism.
- Electromagnetic (EM) waves are the waves which are coupled time varying electric and magnetic fields that propagate in space.
- Waves associated with electricity and magnetism and as they are waves so they will propagate in the space.
- When the electric and magnetic fields combine together and when they are varying with time they both will give rise to electromagnetic waves.
- Electromagnetic equations emerged from Maxwell's equations.
- Maxwell found these EM waves have so many special properties which can be used for many practical purposes.
- Time varying electric field + Time varying magnetic field = Electromagnetic waves.

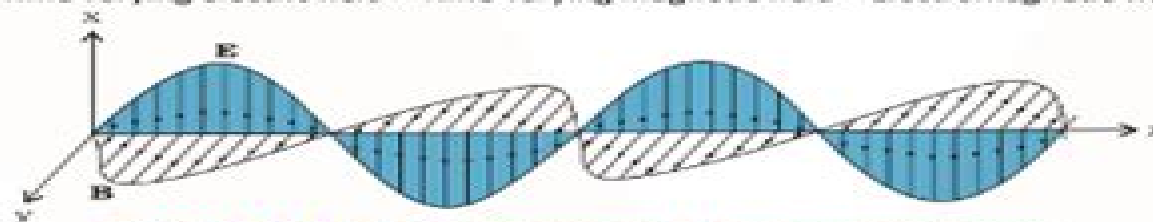


FIGURE 8.4 A linearly polarised electromagnetic wave, propagating in the z -direction with the oscillating electric field \mathbf{E} along the x -direction and the oscillating magnetic field \mathbf{B} along the y -direction.

Maxwell's Experiments

- Maxwell proposed that the time varying electric field can generate magnetic field.
- Time varying magnetic field generates electric field (Faraday-Lenz law).
 1. According to Faraday Lenz law an EMF is induced in the circuit whenever the amount of magnetic flux linked with a circuit changes.
 2. As a result electric current gets generated in the circuit which has an electric field associated with it.

Notes Of Electromagnetic Wave Guide

Michael Brown



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Communications Standard Dictionary Martin Weik, 2012-12-06 Now in its Third Edition the Communications Standard Dictionary maintains its position as the most comprehensive dictionary covering communications technologies available. A one of a kind reference, this dictionary remains unmatched in the breadth and scope of its coverage and its primary reference for communications computer data processing and control systems professionals. *Optical Waveguide Theory* Yury Shestopalov, Yury Smirnov, Eugene Smolkin, 2022-03-26 This book addresses the most advanced to date mathematical approach and numerical methods in electromagnetic field theory and wave propagation. It presents the application of developed methods and techniques to the analysis of waves in various guiding structures: shielded and open metal dielectric waveguides of arbitrary cross section, planar and circular waveguides filled with inhomogeneous dielectrics, metamaterials, chiral media, anisotropic media, and layered media with absorption. It also looks into spectral properties of wave propagation for the waveguide families being considered and the relevant mathematical techniques such as spectral theory of non self adjoint operator valued functions are described, including rigorous proofs of the existence of various types of waves. Further, numerical methods constructed on the basis of the presented mathematical approach and the results of numerical modeling for various structures are also described in depth. The book is beneficial to a broad spectrum of readers ranging from pure and applied mathematicians in electromagnetic field theory to researchers and engineers who are familiar with mathematics. Further, it is also useful as a supplementary text for upper level undergraduate students interested in learning more advanced topics of mathematical methods in electromagnetics. *Telecommunications* National Telecommunication Information Administration, 1997-04-01 This glossary contains more than 5 000 technical terms and definitions that were standardized by the federal government for use by international and U S government telecommunications specialists. It includes international and national terms drawn from the International Telecommunication Union, the International Organization for Standardization, the TIA, ANSI, and others. **Telecommunications** National Telecommunication Information Administration, 1997-04-01 This glossary contains more than 5 000 technical terms and definitions that were standardized by the federal government for use by international and U S government telecommunications specialists. It includes international and national terms drawn from the International Telecommunication Union, the International Organization for Standardization, the TIA, ANSI, and others. **NBS Technical Note**, 1963 **Fiber Optics Standard Dictionary** Martin Weik, 2012-12-06 *Fiber Optics Vocabulary Development* In 1979 the National Communications System published Technical Information Bulletin TB 79-1 Vocabulary for Fiber Optics and Lightwave Communications, written by this author. Based on a draft prepared by this author, the National Communications System published Federal Standard FED-STD 1037 Glossary of Telecommunications Terms in 1980 with no fiber optics terms. In 1981 the first edition of this dictionary was published under the title *Fiber Optics and Lightwave Communications Standard Dictionary*. In 1982 the then National Bureau of Standards

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Simultaneous Systems of Differential Equations and Multi-Dimensional Vibrations Luis Manuel Braga da Costa Campos, 2019-11-05 Simultaneous Differential Equations and Multi Dimensional Vibrations is the fourth book within Ordinary Differential Equations with Applications to Trajectories and Vibrations Six volume Set As a set they are the fourth volume in the series Mathematics and Physics Applied to Science and Technology This fourth book consists of two chapters chapters 7 and 8 of the set The first chapter concerns simultaneous systems of ordinary differential equations and focuses mostly on the cases that have a matrix of characteristic polynomials namely linear systems with constant or homogeneous power coefficients The method of the matrix of characteristic polynomials also applies to simultaneous systems of linear finite difference equations with constant coefficients The second chapter considers linear multi dimensional oscillators with any number of degrees of freedom including damping forcing and multiple resonance The discrete oscillators may be extended from a finite number of degrees of freedom to infinite chains The continuous oscillators correspond to waves in homogeneous or inhomogeneous media including elastic acoustic electromagnetic and water surface waves The combination of propagation and dissipation leads to the equations of mathematical physics Presents simultaneous systems of ordinary differential equations and their elimination for a single ordinary differential equation Includes cases with a matrix of characteristic polynomials including simultaneous systems of linear differential and finite difference equations with constant coefficients Covers multi dimensional oscillators with damping and forcing including modal decomposition natural frequencies and coordinates and multiple resonance Discusses waves in inhomogeneous media such as elastic electromagnetic acoustic and water waves Includes solutions of partial differential equations of mathematical physics by separation of variables leading to ordinary differential equations

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