Name of Institute: Indus Institute of Technology & Engineering

Name of Faculty: Prof. Zalak Patel

Course code: EC0505

Course name: Electromagnetics

Pre-requisites: Engineering Physics, Applied Mathematics

Credit points: 04

Offered Semester: 5th

Course Coordinator (weeks 15)

Full Name: Prof. Zalak Patel

Department with sitting location: EC (Antenna & Microwave Lab), Bhanwar Building

Telephone: 3203

Email: zalakpatel.ec@indusuni.ac.in

Consultation times: 3:30 to 4:15 PM

Course Lecturer (weeks 15)

Full Name: Prof. Zalak Patel

Department with sitting location: EC (Antenna & Microwave Lab), Bhanwar Building

Telephone: 3203

Email: zalakpatel.ec@indusuni.ac.in

Consultation times: 3:30 to 4:15 PM

Students will be contacted throughout the Session via Mail with important information relating to this Course.

Course Objectives

By participating in and understanding all facets of this Course a student will:

1. To determine electric and magnetic fields for given problems.
2. To relate the physical basis of Maxwell's equations in integral form and differential form, and apply them for the solution of appropriate problems involving static as well as time varying fields.
3. To acquire basic knowledge of Uniform plane waves.

Course Outcomes (CO)

After completion of this course, expected outcome from the students,

1. Solve the problems on dot product, cross product and co-ordinate systems & conversion.
2. Apply vector calculus to understand the behaviour of static electric fields in standard configurations.
3. Apply vector calculus to understand the behaviour of static magnetic fields in standard configurations.
4. Describe and analyse electromagnetic wave propagation in free-space based on Maxwell's equation.
5. Analyse the uniform plane wave motion in good conductors, perfect dielectric and inside lossy material.

Course Outline

(Key in topics to be dealt)

UNIT-I

[7 hours]

Vector Analysis

Scalars & Vectors, Dot and Cross products, Co-ordinate systems and conversions.

Electrostatics I

Coulomb's law, Electric field intensity, Concept of electric flux density, Gauss's law and its applications, Differential volume element, Divergence, Maxwell's first eqn. and divergence theorem.

UNIT-II

[11 hours]

Electrostatics II

Conductor properties & boundary conditions, boundary condition for perfect dielectric materials, Poisson's and Laplace equation, Uniqueness theorem, Examples.

UNIT-III

[12 hours]

Steady magnetic field

Biot-Savart's law, Ampere's circuital law, Point form of Ampere's circuital law, concept of flux density, Scalar and vector magnetic potential, Stoke's theorem for magnetic field

Time Varying Fields and Maxwell's Equations

Faraday's law, Displacement current, Maxwell's equations in point and integral forms for time varying fields

UNIT-IV

[12 hours]

The Uniform Plane Wave

The wave equation, wave motion in free space, waves motion in perfect dielectric, Plane waves inside the lossy matter, Poynting vector and Wave power, Propagation in good conductor, Phenomena of skin effect, Reflection of uniform plane waves.

Method of delivery

(Face to face lectures, self study material, Active Learning Techniques)

Study time

(5 hours per week including class attendance)

CO-PO Mapping (PO: Program Outcomes)

CO \ PO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
1	√					√	√	√				
2	√					√	√	√				
3		√		√						√		
4		√		√						√		
5		√		√						√		

Blooms Taxonomy and Knowledge retention(For reference)

(Blooms taxonomy has been given for reference)

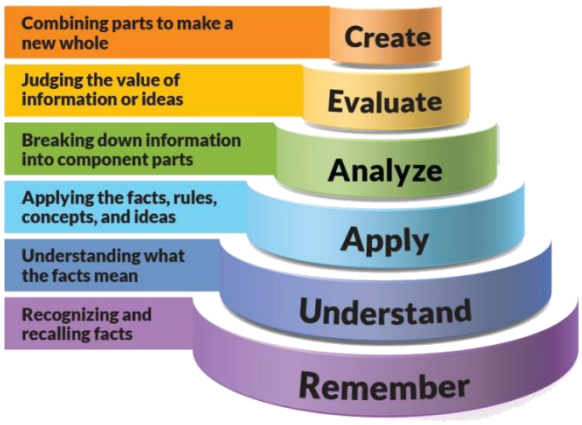

Figure 1: Blooms Taxonomy

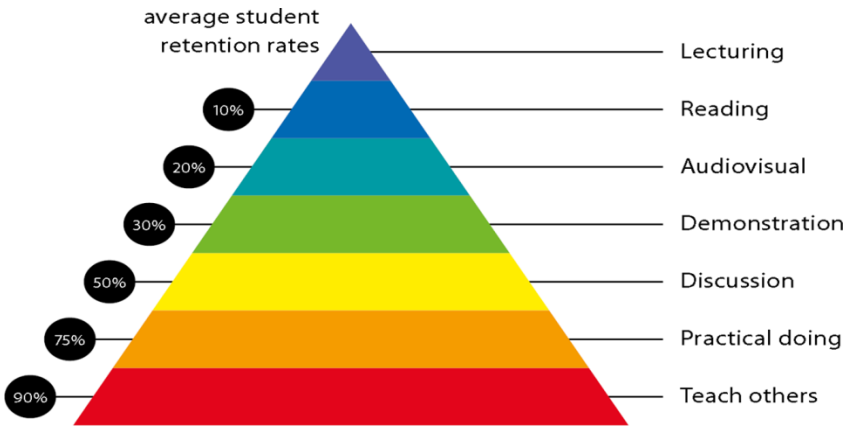

Figure 2: Knowledge retention

Graduate Qualities and Capabilities covered

(Qualities graduates harness crediting this Course)

General Graduate Qualities	Specific Department of _____Graduate Capabilities
Informed Have a sound knowledge of an area of study or profession and understand its current issues, locally and internationally. Know how to apply this knowledge. Understand how an area of study has developed and how it relates to other areas.	**1 Professional knowledge, grounding & awareness**
Independent learners Engage with new ideas and ways of thinking and critically analyze issues. Seek to extend knowledge through ongoing research, enquiry and reflection. Find and evaluate information, using a variety of sources and technologies. Acknowledge the work and ideas of others.	**2 Information literacy, gathering & processing**
Problem solvers Take on challenges and opportunities. Apply creative, logical and critical thinking skills to respond effectively. Make and implement decisions. Be flexible, thorough, innovative and aim for high standards.	**4 Problem solving skills**
Effective communicators Articulate ideas and convey them effectively using a range of media. Work collaboratively and engage with people in different settings. Recognize how culture can shape communication.	**5 Written communication** **6 Oral communication** **7 Teamwork**

Responsible Understand how decisions can affect others and make ethically informed choices. Appreciate and respect diversity. Act with integrity as part of local, national, global and professional communities.	**10 Sustainability, societal & environmental impact**

Lecture/tutorial times

Lecture	Monday	11:10 TO 12:00 PM
Lecture	Tuesday	2:00 to 3:00 PM
Lecture	Friday	10:00 to 11:00 PM

Attendance Requirements

The University norms states that it is the responsibility of students to attend all lectures, tutorials, seminars and practical work as stipulated in the Course outline. Minimum attendance requirement as per university norms is compulsory for being eligible for mid and end semester examinations.

Details of referencing system to be used in written work

Text books

1. Engineering Electromagnetics, W H Hayt, J A buck, 7th Edition, TMH Publication.

Additional Materials

Reference Books

1. Electromagnetic Waves & Radiating Systems, Edward C. Jordan, Keith G. Balmain, 2nd Edition, PHI publication.
2. Fields and Waves in Communication Electronics, Simon Ramo, John R. Whinnery, Wiley Publication

Web Resources

1. http://nptel.ac.in/courses/115101005/
2. http://nptel.ac.in/courses/108104087/
3. http://nptel.ac.in/courses/117103065/
4. ece3300+smith chart

ASSESSMENT GUIDELINES

Your final course mark will be calculated from the following:

Attendance	5%
Seminar/Tutorial	**10**%
Assignment	**5**%
Mid semester	40%
Final exam (*closed book*)	40%

SUPPLEMENTARY ASSESSMENT

Students who receive an overall mark less than 40% in mid semester or end semester will be considered for supplementary assessment in the respective components (i.e mid semester or end semester) of semester concerned. Students must make themselves available during the supplementary examination period to take up the respective components (mid semester or end semester) and need to obtain the required minimum 40% marks to clear the concerned components.

Practical Work Report/Laboratory Report:

A report on the practical work is due the subsequent week after completion of the class by each group.

Late Work

Late assignments will not be accepted without supporting documentation. Late submission of the reports will result in a deduction of -% of the maximum mark per calendar day

Format

All assignments must be presented in a neat, legible format with all information sources correctly referenced. **Assignment material handed in throughout the session that is not neat and legible will not be marked and will be returned to the student.**

Retention of Written Work

Written assessment work will be retained by the Course coordinator/lecturer for two weeks after marking to be collected by the students.

University and Faculty Policies

Students should make themselves aware of the University and/or Faculty Policies regarding plagiarism, special consideration, supplementary examinations and other educational issues and student matters.

Plagiarism - Plagiarism is not acceptable and may result in the imposition of severe penalties. Plagiarism is the use of another person's work, or idea, as if it is his or her own - if you have any doubts at all on what constitutes plagiarism, please consult your Course coordinator or lecturer. Plagiarism will be penalized severely.

Do not copy the work of other students.

Do not share your work with other students (except where required for a group activity or assessment)

.

Course schedule (Antenna & Wave Propagation)

(Mention quiz, assignment submission, breaks etc as well in the table under the Teaching Learning Activity Column)

	Week #	Topic & contents	CO Addressed	Teaching Learning Activity (TLA)
	Weeks 1	Scalars & Vectors, Dot and Cross products, Co-ordinate systems and conversions	CO1	Assignment
	Weeks 2	Coulomb's law, Electric field intensity, Concept of electric flux density	CO1, CO2	Tutorial
	Week 3	Gauss's law and its applications, Differential volume element, Divergence, Maxwell's first eqn. and divergence theorem.	CO2	Tutorial
	Week 4	Conductor properties & boundary conditions, boundary condition for perfect dielectric materials	CO2	Tutorial
	Week 5	Poisson's and Laplace equation, Uniqueness theorem, Examples	CO1, CO2	Tutorial
	Week 6	Biot-Savart's law, Ampere's circuital law, Point form of Ampere's circuital law	CO3	Assignment
	Week 7	Concept of flux density, Scalar and vector magnetic potential, Stoke's theorem for magnetic field	CO3	Tutorial
	Week 8	Time Varying Fields and Faraday's law, Displacement current	CO4	Tutorial

	Week 9	Maxwell's equations in point and integral forms for time varying fields	CO4	*Midsem Exam*
	Week 10	The wave equation, wave motion in free space	CO5	Seminar
	Week 11	waves motion in perfect dielectric, Plane waves inside the lossy matter, Poynting vector and Wave power	CO5	Seminar
	Week 12	Propagation in good conductor, Phenomena of skin effect, Reflection of uniform plane waves.	CO5	Seminar

PROGRAM MAP FOR B.Tech. (ELECTRONICS & COMMUNICATION ENGINEERING)