DEPARTMENT OF PHYSICS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Course Title	**ELECTROMAGNETIC THEORY**		
Course Code	**PH 654**	**No. of Credits**	**4**
Course Code of Pre-requisite subject(s)	**B.Sc. Electricity and Mgnetism**		
Session	**Jan. 2018**	**Section (if, applicable)**	**NA**
Name of Faculty	**Dr. M.C. Santhosh Kumar**	**Department**	**Physics**
Email	**santhoshmc@nitt.edu**	**Telephone No.**	**04312503611**
Name of Course Coordinator(s) (if, applicable)	**Dr. M.C. Santhosh Kumar**		
E-mail	**santhoshmc@nitt.edu**	**Telephone No.**	**04312503611**
Course Type	[√] **Core course**	[ ] **Elective course**	

Syllabus (approved in BoS)

Unit – I: Electrostatics Electric field – divergence and curl – electric potential – conductors – Laplace equation (1D, 2D and 3D) – uniqueness theorem – separation of variables: Cartesian and spherical coordinates – field of an electric dipole – polarization – Gauss's law in dielectrics – linear dielectrics – energy density – boundary value problems.

Unit – II: Magnetostatics Lorentz force – magnetic induction – electric current – equation of continuity – Biot-Savart law – magnetic potential – magnetization – Ampere's law in magnetized material – energy density – linear and nonlinear media.

Unit – III: Maxwell's Equations Faraday's law – generalization of Ampere's law – Maxwell's equations – boundary conditions – scalar and vector potentials – gauge invariance – electromagnetic energy – Poynting's theorem.

Unit – IV: Electromagnetic Waves Electromagnetic wave equation (without source) – solution of 3D wave equation –propagation of EM waves in non-conducting media – waves in conducting media – polarization.

Unit – V: Waves in Bounded Region Reflection and refraction at the boundary of non-conducting media – Fresnel's coefficients – Brewster's angle and critical angle – reflection from a conducting plane – wave guide – TE and TM waves – rectangular wave guide.

COURSE OBJECTIVES

To understand the nature of electric and magnetic force fields and the intricate connection between them.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
On successful completion of this course, students would be able to	

1. Electrostatic force and electric field	The student will be able to appreciate the fundamental physics of electricity and magnetism and its various applications.
2. Magnetostatic field and applications	
3. Maxwell's equations and the propagation of waves in free space and in different media	
4. The origin of reflection and refraction, Snell's and related phenomena	
5.	

COURSE PLAN – PART II

COURSE OVERVIEW

This course deals with the fundamentals of electricity and magnetism. During the course the candidate will understand the inevitable union of electricity, magnetism and optics as a sigle thoery electrodynamics. The importance of Maxwells equations and propagation of waves will be discussed in free space and bound regions.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	2nd week of January	Electric field – divergence and curl of electric field-electric potential – conductors	Conventional/PPT
2	3rd week of January	Laplace equation (1D, 2D and 3D) – uniqueness theorem – separation of variables: Cartesian and spherical coordinates	Conventional
3	4th week of January	Field of an electric dipole – polarization – Gauss's law in dielectrics – linear dielectrics	Conventional
4	1st week of February	Energy density – boundary value problems.	Conventional
5	2nd week of February	Lorentz force – magnetic induction – electric current – equation of continuity – Biot-Savart law – magnetic potential – magnetization	Conventional
6	3rd week of February	Ampere's law in magnetized material	Conventional
7	4th week of February	Energy density – linear and nonlinear media.	Conventional
8	1st week of March	Faraday's law – generalization of Ampere's law – Maxwell's equations	Conventional

9	2nd week of March	Boundary conditions – scalar and vector potentials – gauge invariance	Conventional
10	3rd week of March	Electromagnetic energy – Poynting's theorem	Conventional
11	4th week of March	Electromagnetic wave equation (without source) – solution of 3D wave equation	Conventional
12	1st week of April	Propagation of EM waves in non-conducting media – waves in conducting media – polarization	Conventional
13	2nd week of April	Waves in Bounded Region- Reflection and refraction at the boundary of non-conducting media – Fresnel's coefficients – Brewster's angle and critical angle	Conventional
14	3rd week of April	Reflection from a conducting plane – wave guide – TE and TM waves -Rectangular wave guide.	Conventional

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test -1	3rd week of February	1 hour	20
2	Cycle Test -2	3rd week of March	1 hour	20
3	Quiz	1st week of April	30 minutes	10
CPA	Compensation Assessment*	2nd week of April	1 hour (First 3 units)	Appropriate weightage will be calculated
6	Final Assessment *	4th Week of april	3 hours	50

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

Feedback from the students will be collected after 15th week :on knowledge gained, subjects relevant to the course, methodology adopted, aspect of improvement, whether the topics fulfill the course outcome and program outcome.

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, , academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc) : santhoshmc@nitt.edu

ATTENDANCE : 75% Mandatory

COMPENSATION ASSESSMENT : Based on the production of valid proof of absence; One test covering 3 units and 1 hour

ACADEMIC HONESTY & PLAGIARISM

Those who indulge in malpractice such as copying, plagiarism shall have to redo the course
Any misbehavior, indiscipline in the classroom/laboratory/exam hall will be dealt with seriously. In the worst case, the institute disciplinary committee is empowered to debar the student from the course.

ADDITIONAL INFORMATION

FOR APPROVAL

Course Faculty _____ **CC-Chairperson** _____ **HOD** _____

Guidelines:

a) The number of assessments for a course shall range from 4 to 6.

b) **Every course shall have a final assessment on the entire syllabus with at least 30% weightage.**

c) **One compensation assessment for absentees in assessments (other than final assessment) is mandatory. This is not applicable for project work/industrial lectures/internship**.

d) The policy for attendance for the course should be clearly specified.

e) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.