

COURSE TEMPLATE

1.	Department/Centre proposing the course	PHYSICS
2.	Course Title (<i>< 45 characters</i>)	ELECTROMAGNETIC WAVES & QUANTUM MECHANICS
3.	L-T-P structure	3-0-0
4.	Credits	3
5.	Course number	PHL 101
6.	Status (<i>category for program</i>)	BASIC SCIENCE CORE

7.	Pre-requisites (<i>course no./title</i>)	NONE
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8.	Status vis-à-vis other courses (<i>give course number/title</i>)	
8.1	Overlap with any UG/PG course of the Dept./Centre	NO
8.2	Overlap with any UG/PG course of other Dept./Centre	NO
8.3	Supercedes any existing course	NA

9.	Not allowed for (<i>indicate program names</i>)	
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10.	Frequency of offering	☒ Every sem ☐ 1 st sem ☐ 2 nd sem ☐ Either sem
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11.	Faculty who will teach the course All faculty of the Department	
12.	Will the course require any visiting faculty?	NO

13.	Course objective (<i>about 50 words</i>): The objective is to make the students learn wave propagation in material media and the basics of Quantum Mechanics alongwith the use of different methods of solutions of differential equations and related boundary value problems that arise in electromagnetic theory. Since such equations also arise in various branches of engineering, the course will equip the students with skills to tackle such problems.	
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14.	Course contents (<i>about 100 words</i>) (<i>Include laboratory/design activities</i>): Electric and magnetic field vectors in a medium, Susceptibility and Conductivity, Maxwell's equations, Boundary conditions; EM wave equation, Plane wave solutions, Polarization of the EM waves, Poynting vector and intensity of the EM wave; Wave packet, Phase and Group velocities; Reflection and refraction of EM waves at a dielectric interface; Brewster angle; Total internal reflection at a dielectric interface; EM waves in a conducting	
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medium and plasma; Wave-particle duality, de-Broglie waves; Quantum mechanical operators; Schroedinger equation, Wave function, Statistical interpretation, Superposition Principle, Continuity Equation for probability density; Stationary states, Bound states, Free-particle solution, 1-D infinite potential well, Expectation values and uncertainty relations; 1-D finite potential well, Quantum mechanical tunneling and alpha-decay, Kronig-Penny model and emergence of bands..

Problem solving sessions will take up application oriented examples from various areas of engineering.

15. Lecture Outline (with topics and number of lectures)

Module no.	Topic	No. of hours
1	Electric and magnetic field vectors in a medium, Susceptibility and Conductivity, Maxwell's equations, Boundary conditions.	3
2	EM wave equation, Plane wave solutions, Polarization of the EM waves, Poynting vector and intensity of the EM wave.	3 + 1 problem solving session
3	Wave packet, Phase and Group velocities.	2
4	Reflection and refraction of EM waves at a dielectric interface.	4 + 1 problem solving session
5		
6	Brewster angle, Total internal reflection at a dielectric interface.	1
7	EM waves in a conducting medium and plasma.	3 + 1 problem solving session
8	Wave-particle duality, de-Broglie waves,	2
9	Quantum mechanical operators	2 + 1 problem solving session
10	Schroedinger equation, Wave function, Statistical interpretation, Superposition Principle. Continuity Equation for probability density.	5 + 1 problem solving session
11	Stationary states, Bound states, Free-particle solution, 1-D infinite potential well, Expectation values and uncertainty relations.	5 + 1 problem solving session
12	1-D finite potential well, Quantum mechanical tunneling and alpha-decay, Kronig-Penny model and emergence of bands..	5 + 1 problem solving session
COURSE TOTAL (14 times 'L')		42

16. Brief description of tutorial activities

Includes 6 hr of problem solving sessions.that will be based on application oriented examples from various areas of engineering.

17. Brief description of laboratory activities

Module no.	Experiment description	No. of hours
1		
2		
3		
4		
5		
6		

7		
8		
9		
10		
COURSE TOTAL (14 times 'P')		

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

1. David Griffiths: Introduction to Electrodynamics
2. David Griffiths: Introduction to Quantum Mechanics.
3. Robert Eisberg and Robert Resnick : Quantum Physics.

19. Resources required for the course (*itemized & student access requirements, if any*)

19.1	Software	
19.2	Hardware	
19.3	Teaching aides (videos, etc.)	
19.4	Laboratory	
19.5	Equipment	
19.6	Classroom infrastructure	
19.7	Site visits	

20. Design content of the course (*Percent of student time with examples, if possible*)

20.1	Design-type problems	
20.2	Open-ended problems	
20.3	Project-type activity	
20.4	Open-ended laboratory work	
20.5	Others (please specify)	

Date: 28 January 2013


 (Signature of the Head of the Department)