NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

Department of Physics

COURSE PLAN			
Name of the program and specialization	B.Tech. I Semester - Computer Science and Engineering (CSE)		
Course Title	Physics		
Course Code	PHIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL		
Session	July 2021	Section (if, applicable)	CSE-B
Name of Faculty	Dr. Annapureddy V.	Department	Physics
Official Email	annp@nitt.edu	Telephone No.	0431-2503603
Name of Course Coordinator(s) (if, applicable)			
Official E-mail		Telephone No.	
Course Type (please tick appropriately)	☑ Core course	☐ Elective course	

Syllabus (approved in BoS)

Lasers

Introduction to Laser-characteristics of Lasers-spontaneous and stimulated emissions – Einstein's coefficients – population inversion and lasing action – laser systems: He-Ne Laser, semiconductor laser-applications.

Fiber Optics

Snell's law-optical fiber – principle and construction – acceptance cone - numerical aperture – types of fibers - fiber optic communication principle – fiber optic sensors.

Quantum Mechanics

Inadequacy of classical mechanics-black body radiation, photoelectric effect- wave and particle duality of radiation – de Broglie concept of matter waves – electron diffraction – Heisenberg's uncertainty principle – Schrodinger's wave equation – eigen values and eigen functions – superposition principle – interpretation of wave function – particle confined in one dimensional infinite square well potential.

Nuclear and Particle Physics

Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half-life. Fundamental forces - Particle physics - classification of matter - quark model.

Physics of Advanced Materials

Conductors: classical free electron theory (Lorentz –Drude theory) – electrical conductivity. Superconductors: definition – Meissner effect – type I & II superconductors – BCS theory

(qualitative). Nanomaterials: introduction and properties – synthesis – top-down and bottom-up approach – applications.

Text Books & References

1. William T. Silfvast, *Laser Fundamentals*, 2nd Edition, Cambridge University press, New York, 2004.
2. D. Halliday, R. Resnick and J. Walker, *Fundamentals of Physics*, 6th Edition, John Wiley and Sons, New York, 2001.
3. Arthur Beiser, *Concepts of Modern Physics*, Tata McGraw-Hill, New Delhi, 2010.
4. R. Shankar, *Fundamentals of Physics*, Yale University Press, New Haven and London, 2014.
5. R. Shankar, *Fundamentals of Physics II*, Yale University Press, New Haven and London, 2016.
6. C.P. Poole and F.J. Owens, *Introduction to Nanotechnology*, Wiley, New Delhi, 2007.
7. Charles Kittel, *Introduction to Solid State Physics*, 8th Edition, John Wiley & Sons, NJ, USA, 2005.

COURSE OBJECTIVES (COs)

1. To introduce the notions of light matter interaction, fabrication of lasers, light propagation in waveguides, applications of lasers and optical fibers to engineering students.
2. To comprehend and explain the concepts of matter waves, wave functions and its interpretation to understand the matter at atomic scale.
3. To teach the fundamentals of nuclear forces, models and classification of matter.
4. To impart knowledge about the basics of conductors, superconductors, nanomaterials and their applications in science, engineering and technology.

Mapping of COs with POs

Course Outcomes	Programme Outcomes (POs)
On completion of this course, the students will be able to,	
♦ know principle, construction and working of lasers and their applications in various science and engineering.	1,2,3,5
♦ explain light propagation in optical fibers, types and their applications.	1,2,3,5
♦ experience and appreciate the behaviour of matter at atomic scale, and to impart knowledge in solving problems in modern science and engineering.	1,2,4,12
♦ understand the role of nuclear and particle physics in applications like radioactivity and nuclear reactions.	1,2,3,7,8,12
♦ recognize, choose and apply knowledge to develop materials for specific applications for common needs.	1,3,4,6,8,12

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

Sl. No.	Week/Contact Hours	Topic	Mode of Delivery
1.	Nov. 3rd Week (1 week)	Introductory class to the syllabus of PHIR11 course	Chalk and talk (CT) & Power point presentation (PPT)

2.	Nov. 4th Week (2 week)	Introduction to Laser- characteristics of Lasers- spontaneous and stimulated emissions. Einstein's coefficients	Chalk and talk & PPT
3.	Nov. 5th Week (3 week)	population inversion and lasing action, laser systems: He-Ne Laser, semiconductor laser applications. Snell's law, optical fiber, principle and construction	Chalk and talk & PPT
4.	Dec. 2nd Week (4 week)	acceptance cone numerical aperture- types of fibers- fiber optic communication principle	Chalk and talk & PPT
5.	Dec. 3rd week (5 week)	fiber optic sensors. Inadequacy of classical mechanics, black body radiation	Chalk and talk & PPT
6.	Dec. 4th week (6 week)	photoelectric effect, wave and particle duality of radiation de Broglie concept of matter waves, electron diffraction	Chalk and talk & PPT
7.	Dec. 5th Week (7 week)	Heisenberg's uncertainty principle, Schrodinger's wave equation Eigen values and eigen functions, superposition principle- interpretation of wave function	Chalk and talk & PPT
8.	Jan. 1st Week (8 week)	particle confined in one dimensional infinite square well potential Nuclear properties and forces, Nuclear models,	Chalk and talk & PPT
9.	Jan. 2nd Week (9 week)	Shell model, Nuclear reaction- Radioactivity, types and half-life.	Chalk and talk & PPT
10.	Jan. 3rd Week (10 week)	Fundamental forces- Particle physics, classification of matter,	Chalk and talk & PPT
11.	Jan. 4th Week (11 week)	Quark model. Conductors. classical free electron theory (Lorentz –Drude theory),	Chalk and talk & PPT
12.	Jan. 5th Week (12 week)	electrical conductivity. Superconductors: definition Meissner effect – type I & II superconductors,	Chalk and talk & PPT
13.	Feb. 1st Week (12 week)	BCS theory (qualitative). Nanomaterials: introduction and properties,	Chalk and talk & PPT
14.	Feb. 2nd Week (13 week)	Synthesis, top-down and bottom-up approach, applications.	Chalk and talk & PPT
15	Feb. 3rd Week (14 week)	Nanomaterials and applications. Revision	Chalk and talk & PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

Sl. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test I	4th Week of Dec.	60 mins	20%
2	Assignment	2nd Week of Jan.	1 Week	10%
3	Cycle Test II	5th Week of Jan.	60 mins	20%
CPA	Compensation Assessment*	3rd Week of Feb.	90 mins	20%
4	Final Assessment **	End of Semester	180 mins	50%

****mandatory; refer to guidelines on page 5**

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

Feedback from the students will be taken twice (mid-semester and end of the semester) on the depth of the knowledge gained, effectiveness of the methodology adopted, and scope of improvement.

COURSE POLICY (including compensation assessment to be specified)

*Compensation assessment shall be conducted only for those students who were absent due to medical resons in their regular assessments (CT1 & CT2).

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance is mandatory for this course.
- A maximum of 10% shall be allowed under On Duty (OD)/medical category after required submission of documents.
- Students with less attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

ACADEMIC DISHONESTY & PLAGIARISM

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others (or websites) during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student(s) (or websites), the students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award

the punishment if the student is found guilty. The report shall be submitted to the Academic office.

- The above policy against academic dishonesty shall be applicable for all the programmes.

FOR APPROVAL

Course Faculty _____ **CC- Chairperson** _____ 7/12/2022 **HOD** _____ 7/12/2022

Guidelines

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

b) Every theory 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. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

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