NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

Department: Physics

COURSE PLAN			
Name of the program and specialization	**B.Tech. I Semester - Chemical Engineering**		
Course Title	**Physics**		
Course Code	**PHIR11**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**NIL**		
Session	**January 2023**	**Section (if, applicable)**	**-**
Name of Faculty	**Abhishek & P Sasi kumar**	**Department**	**CE**
Official Email	**413120051@nitt.edu 413122001@nitt.edu**	**Telephone No.**	82190-29707
Name of Course Coordinator(s)	Dr. K.N. Sheeba		
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.

COURSE OBJECTIVES

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.

Course Outcomes

On completion of this course, the students will be able to,

- know the principle, construction and working of lasers and their applications in various science and engineering.
- explain light propagation in optical fibers, types and their applications.
- experience and appreciate the behaviour of matter at atomic scale, and to impart knowledge in solving problems in modern science and engineering.
- understand the role of nuclear and particle physics in applications like radioactivity and nuclear reactions.
- recognize, choose and apply knowledge to develop materials for specific applications for common needs.

COURSE PLAN – PART II

COURSE TEACHING AND LEARNING ACTIVITIES

Sl. No.	Week/Contact Hours	Topic	Mode of Delivery
1.	March 21	Introductory class to the syllabus of PHIR11 course	Powerpoint and Greenboard
2.	March 4th Week	Inadequacy of classical mechanics, black body radiation, photoelectric effect, wave and particle duality of radiation	Powerpoint and Greenboard
3.	Mar 5th and april 1st Week	de Broglie concept of matter waves, electron diffraction, Heisenberg's uncertainty principle, Schrodinger's wave equation	Powerpoint and Greenboard
4.	April 2nd Week	Eigen values and eigen functions, superposition principle, interpretation of wave function, particle confined in one dimensional infinite square well potential	Powerpoint and Greenboard
5.	April 3rd week	Nuclear properties and forces, Nuclear models, Shell model, Nuclear reaction	Powerpoint and Greenboard
6.	April 4th week	Radioactivity, types and half-life. Fundamental forces	Powerpoint and Greenboard
7.	May 1st Week	Particle physics, classification of matter, quark model.	Powerpoint and Greenboard
8.	May 2nd Week	Conductors: classical free electron theory (Lorentz –Drude theory), electrical conductivity. Superconductors: definition	Powerpoint and Greenboard

9.	May 3rd Week	Meissner effect – type I & II superconductors, BCS theory (qualitative).	Powerpoint and Greenboard
10.	May 4th Week	Nanomaterials: introduction and properties, synthesis, top-down and bottom-up approach, applications.	Powerpoint and Greenboard
11.	May 5th Week	Snell's law, optical fiber, principle and construction, acceptance cone numerical aperture	Powerpoint and Greenboard
12.	June 1st Week	types of fibers - fiber optic communication principle, fiber optic sensors.	Powerpoint and Greenboard
13.	June 2nd Week	Introduction to Laser-characteristics of Lasers-spontaneous and stimulated emissions, Einstein's coefficients	Powerpoint and Greenboard
14.	June 3rd Week	population inversion and lasing action, laser systems: He-Ne Laser, semiconductor laser applications.	Powerpoint and Greenboard

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

Sl. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment	2nd Week of May	1 Week	20%
2	Cycle test 1	4th Week of April	1 hour	20%
3	Cycle test 2	5th Week of May	1 hour	20%
CPA	Compensation Assessment#	4th Week of June	--	--
4	Final Assessment *	As Per NITT Schedule	3 Hour	40%

***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 taken twice (mid-semester and end of the semester) on the depth of the knowledge gained, the effectiveness of the methodology adopted, and the scope of improvement.

#COURSE POLICY (including compensation assessment to be specified)

Compensation assessment shall be conducted only for those students who were absent, for genuine reason, in their regular internal assessment. The weightage, syllabus, and pattern of exam will be at the sole discretion of the instructor.

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

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- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) / Medical Grounds.
- Students with less than 65% of 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 during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both 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- Abhishek **CC- Chairperson** (CD) **HOD** 3/4/23

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 for all the courses shall be 35% or Class Average/2, whichever is maximum

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.