NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF INSTRUMENTATION AND CONTROL ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	B. Tech. / Chemical Engineering		
Course Title	PHYSICS		
Course Code	PHIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL	-	-
Session	~~July~~/ Jan. 2022	Section (if, applicable)	Chemical
Name of Faculty	Dr. A. Chandra Bose	Department	PHYSICS
Official Email	acbose@nitt.edu	Telephone No.	0431 - 2503605
Name of Course Coordinator(s) (if, applicable)	Dr. T. Sonamani Singh		
Official E-mail	acbose@nitt.edu	Telephone No.	0431-2503605
Course Type	Core / ~~Elective~~		

SYLLABUS (as approved in Senate)

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, photo electric effect – wave and particle duality of radiation – de Broglie concept of matter waves – electron diffraction – Hisenberg's uncertainty principle – Schrodinger's wave equation – eigenvalues and eigenfunctions – 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.

References:
1. Optic 3rd edition, Ajoy Ghatak, Tata McGraw-Hill, 2005 (Ch. 23 – Lasers, Ch. 24 – Fiber Optics).
2. Concepts of Modern Physics 6th edition, Arthur Beiser, Tata McGraw-Hill, 2003, (Ch. 3 & 5 – Quantum Mechanics, Ch. 11,12 & 13 – Nuclear and Particle Physics)
3. Introduction to Solid State Physics 8th edition, C. Kittel, John Wiley & Sons, 2005.

COURSE OBJECTIVES
• To introduce the principle and properties of laser with applications. • To introduce principle and working of optical fiber with applications. • To introduce mechanics of complex matter waves relevant to understand all phenomena at atomic scale. • To understand the structure of nucleus and reactions taking place within it. • To impart knowledge on basics of conductors, superconductors and nanomaterials with applications.

Mapping of COs with POs	
Course Outcomes (CO)	Programme Outcomes (PO)
1. Principle of laser light and its applications will be appreciated.	PO1
2. Principle of optical fiber and modern communications will be appreciated.	PO3
3. Probabilistic nature of matter in atomic scale will be realized.	PO5
4. Familiarizing with fundamental particles that make up the matter	PO5
5. Physics of certain exotic properties of matter will be appreciated.	PO5

COURSE PLAN – PART II			

COURSE OVERVIEW
Same as course objectives

COURSE TEACHING AND LEARNING ACTIVITIES

S. No.	Week/Contact Hours	Topic	Mode of Delivery
1	8 hours	Lasers	Chalk and talk / PPT
2	8 Hours	Fiber Optics	Chalk and talk / PPT
3	8 Hours	Quantum Mechanics	Chalk and talk
4	8 Hours	Nuclear and Particle Physics	Chalk and talk / PPT
5	8 hours	Physics of Advanced Materials	Chalk and talk / PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S. No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	I Cycle Test	6th week	1.5 Hour	25
2	II Cycle Test	12th week	1.5 Hour	25
3	Assignment I and II	13th week	-	20
CPA	Compensation Assessment*	15th week	1.5 Hour	25
4	Final Assessment *	16th week	2 Hours	30

*mandatory; refer to guidelines on page 4

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

Feedback will be conducted through online (MIS) for self assessment.

COURSE POLICY (including compensation assessment to be specified)

- Continuous assessment comprises two cycle tests and an assignment.
- Only one instance of absence in continuous assessment is permitted. Only one compensation assessment for absentees in continuous assessments will be conducted.
- Compensation assessment will be on the combined portions of two cycle tests.
- Assignment is a group activity with maximum of three students.

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)
- At least 75% attendance is mandatory. A maximum of 10% shall be allowed under On Duty (OD) / Medical Grounds.

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.

ADDITIONAL INFORMATION (if any)
Students are encouraged to meet faculty for academic discussion at any time.

FOR APPROVAL
Course Faculty 1. Dr. A. Chandra Bose   CC-Chairperson:　　　　　　　　　　HOD:

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.