NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF PRODUCTION ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	B. Tech. / **PRODUCTION ENGINEERING B section**		
Course Title	PHYSICS		
Course Code	PHIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL	-	-
Session	Jan. 2020	Section (if, applicable)	Prod - B
Name of Faculty	Dr. J. Hemalatha	Department	PHYSICS
Official Email	hemalatha@nitt.edu	Telephone No.	0431 - 2503608
Name of Course Coordinator(s) (if, applicable)	Dr. R. Sankaranarayanan and Dr. M. Ashok		
Official E-mail	sankar@nitt.edu ashokm@nitt.edu	Telephone No.	0431-2503609 0431-2503610
Course Type	Core		

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. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004).
2. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).
3. Concepts of Modern Physics, Arthur Beiser, Tata McGraw-Hill, New Delhi (2010), (Quantum Mechanics & Nuclear and Particle Physics)
4. Fundamentals of Physics, R. Shankar, Yale University Press, New Haven and London (2014).
5.Fundamentals of Physics II, R. Shankar, Yale University Press, New Haven and London (2016).
6.Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007).
7. Optic 3rd edition, Ajoy Ghatak, Tata McGraw-Hill, 2005 (Lasers, Fiber Optics).
8. 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)
• The principle, construction and working of lasers and their applications in various science and engineering will be known	
• Principle of optical fiber, modern communications and applications will be appreciated.	
• the behaviour of matter at atomic scale will be understood and the knowledge in solving problems in modern science and engineering will be imparted.	
• the role of nuclear and particle physics in applications like radioactivity and nuclear reactions will be understood.	
• Physics of certain exotic properties of matter will be appreciated.	

COURSE PLAN – PART II				
COURSE OVERVIEW				
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 /PPT
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	Quiz - I	Week -5 (Lasers)	30 minutes	10%
2	Mid Semester Exam	Week – 10 (Lasers, Fiber Optics,Quantum Mechanics)	90 minutes	30%
3	Quiz - II	Week – 12 (Nuclear and Particle Physics)	30 minutes	10%
CPA	Compensation Assessment	(Lasers, Fiber Optics, Quantum Mechanics, Nuclear and Particle Physics)	90 minutes	
4	Final Assessment	As per academic calendar (Entire Syllabus)	180 minutes	50%
COURSE EXIT SURVEY				
• Feedback will be collected through online (MIS) for self-assessment.				
COURSE POLICY				
• Continuous assessment comprises of two quiz and a mid-semester exam. • Only one instance of absence in continuous assessment (on genuine grounds, with the prior permission of the concerned faculty member) is permitted. Only one compensation assessment for absentees in continuous assessments will be conducted. • Compensation assessment will be on the combined portions of first three assessments				

- It will be conducted for 30% and will be converted to 10% for those who were absent for Quiz I or Quiz II

ATTENDANCE POLICY

- 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.

ADDITIONAL INFORMATION (if any)

- The passing minimum shall be 35% or Class Average/2, whichever is maximum.
- The lecture materials such as power point presentations, problems and video lectures will be circulated soon after the class
- The faculty member can be contacted in person at room number PH216 in OJAS for discussions and clarifications at mutually convenient time.

FOR APPROVAL

Course Faculty

-Sd-
Dr. J. Hemalatha

-Sd-
CC-Chairperson

-Sd-
HOD