DEPARTMENT OF CIVIL ENGINEERING

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	B. Tech -II Semester/ Civil		
Course Title	Physics - II		
Course Code	PHIR12	No. of Credits	4
Course Code of Pre-requisite subject(s)	-	-	-
Session	Jan 2019	Section (if, applicable)	-
Name of Faculty	Dr. N. BASKARAN	Department	Physics
E-mail	nbaski@nitt.edu	Telephone No.	9943562402
Name of Course Coordinator(s) (if, applicable)	Dr. NVG and Dr. SM		
E-mail		Telephone No.	
Course Type	☑ Core course	☐ Elective course	

Syllabus (approved in BoS)

Quantum Mechanics Inadequacy of classical mechanics-black body radiation, photoelectric effect, Compton 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 - Stellar nucleosynthesis. Fundamental forces - Particle physics - classification of matter - quark model - neutrino properties and their detection.

Advanced Materials Nanomaterials: introduction and properties – synthesis – chemical vapour deposition – ball milling – applications. Carbon nanotubes: structure and properties – synthesis– arc method – pulsed laser deposition- applications. Liquid Crystals: types – nematic, cholesteric, smectic – modes: dynamic light scattering, twisted nematic – display systems. Shape memory alloys-one way and two-way memory effect- pseudoelasticityapplications-thermoelectric materials.

Non-Destructive Testing Liquid penetrant testing – magnetic particle inspection- principle of ultrasonic testing – inspection methods – pulse-echo, through transmission-different types of scans — principle and types of radiography – exposure factor – attenuation of radiation – real time radiography – principle of thermography – thermographic camera – advantages and limitations.

Vacuum Technology Introduction- Classification of vacuum pumps -rotary vane pump-roots pump diffusion pump-turbo-molecular pump-measurement of low pressure-pirani gauge-penning guage - applications of vacuum technology - thin film deposition: thermal evaporation.

COURSE OBJECTIVES

To introduce the concepts of matter waves, wave functions and its interpretation to understand the matter at atomic scale.

To understand the fundamentals of nuclear forces, models and classification of matter. To know the basics of advanced materials and their applications.

To introduce the concepts of NDT, vacuum pumps and their applications.

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
1. Basic understanding and applications of lasers will be learned	Students will gain sufficient knowledge/ understanding of basic physics, and learn to apply them for potential engineering applications.
2. Knowledge of fiber optics and acoustics of buildings will be gained	
3. Insightful information about crystal structures and various materials properties will be obtained.	
4. Basic principles of special theory of relativity will be learned	

COURSE PLAN – PART II

COURSE OVERVIEW

This course is offered to non-circuit branch students during second semester of B. Tech programme, and is aimed at motivating students to learn nessary basic physics relevant to their engineering domain.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week	Topics to be covered	Mode of Delivery
1	Jan 7-9	Inadequacy of classical mechanics-black body radiation, photoelectric effect, Compton effect – wave and particle duality of radiation – de Broglie concept of matter waves – electron diffraction	PPT
2	Jan 14-19	– Schrodinger's wave equation – eigen values and eigen functions – superposition principle – interpretation of wave function	C & T
3	Jan 21 - 25	particle confined in one dimensional infinite square well potential. Nuclear properties and forces - Nuclear models - Shell model	C & T
4	Jan 28 – Feb 1	Nuclear reaction - Radioactivity - types and half-life - Stellar nucleosynthesis.	PPT
5	Feb 4 - 8	Fundamental forces - Particle physics - classification of matter - quark model - neutrino properties and their detection	C & T

6	Feb 11 - 15	Nanomaterials: introduction and properties – synthesis – chemical vapour deposition – ball milling – applications.	C & T
7	Feb 18 - 22	Carbon nanotubes: structure and properties – synthesis– arc method – pulsed laser deposition- applications	C & T
8	Feb 25 – March 1	Nematic, cholesteric, smectic – modes: dynamic light scattering, twisted nematic – display systems.	C & T
9	March 4 - 8	Shape memory alloys-one way and two-way memory effect-pseudoelasticityapplications-thermoelectric materials	PPT
10	March 11 - 15	Liquid penetrant testing – magnetic particle inspection- principle of ultrasonic testing – inspection methods – pulse-echo, through transmission-different types of scans	PPT
11	March 18 - 22	principle and types of radiography – exposure factor – attenuation of radiation – real time radiography	C & T
12	March 25 - 29	principle of thermography – thermographic camera – advantages and limitations.	C & T
13	April 1 - 5	Classification of vacuum pumps -rotary vane pump-roots pump diffusion pump	PPT
14	April 8 - 12	turbo-molecular pump-measurement of low pressure-pirani gauge-penning guage	PPT
15	April 15- 19	applications of vacuum technology - thin film deposition: thermal evaporation.	PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assesment 1	6th week	1 h	10
2	Assesment 2	12th week	1 h	10
3	Assingments (2-3)	During the session	-	5
4	Laboratory	Full semester	5 expts.	35
6	Final Assessment *	4rd week of April.	3 h	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 collected based on the knowledge gained, effectiveness of the content and the lecture delivered.

COURSE POLICY (preferred mode of correspondence with students, compensation assessment policy to be specified)

Students can use both e-mail and phones to communicate with me.

COMPENSATION ASSESSMENT POLICY

On genuine grounds, students who are absent for A1 or A2 will be allowed for to appear for retest with appropriate weightage covering 4 units.

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

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- 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.

ADDITIONAL INFORMATION

References

1.Concepts of Modern Physics. Arthur Beiser, Tata McGraw-Hill, New Delhi (2010).

2.Fundamentals of Physics II, R. Shankar, Yale University Press, New Haven and London (2016).

3.Hand Book of Non-destructive evaluation, C.J. Hellier, McGraw-Hill, New York (2001).

4.Vacuum Science and Technology, V.V. Rao, T.B. Ghosh, K.L. Chopra, Allied Publishers, New Delhi (2008).

5.Introduction to Nanotechnology, C.P. Poole and F.J. Owens, Wiley, New Delhi (2007).

6. Introduction to Liquid Crystals Chemistry and Physics, 2nd Ed, Peter J. Collings, Princeton University Press, New Jersey, (2002).

7. Shape memory alloys - modeling and engineering applications, Ed. D. C. Lagoudas, Springer, New York (2008).

FOR APPROVAL

Course Faculty N. Bashiran CC-Chairperson S. T. Jayanthi HOD S. T. Jayanthi for 15/2/19