NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	**Physics I**	**Branch**	**EEE B**
Course Code	**PHIR 11**	**No. of Credits**	**3 (2 credit theory+1 credit lab)**
Department	**Physics**	**Faculty**	**Dr. P.Bahavan Palani**
Pre-requisites Course Code	**Nil**		
Course Coordinator(s) (if, applicable)	**Dr. S. Manivannan** **Dr. N. V. Giridharan**		
Other Course Teacher(s)/Tutor(s) E-mail	**bpalani@nitt.edu**	**Telephone No.**	**9965908012**
Course Type	☑ **Core course** ☐ ~~**Elective course**~~		

COURSE OVERVIEW

The Physics-I course is offered in the first semester to **EEE B** branches of engineering. The subject has a weightage of 2 credit theory and 1 credit practical lab weightage.

COURSE OBJECTIVE

- To make a bridge between the physics in school and engineering courses.
- To introduce the basic concepts of modern science like Photonics, Engineering applications of acoustics, fundamentals of crystal physics and materials science.

COURSE OUTCOMES (CO)

Course Outcomes	**Aligned Programme Outcomes (PO)**
➢ The student will be able to : ➢ Understand many modern devices and technologies based on lasers and optical fibers. ➢ Appreciate various material properties which are used in engineering applications and devices. ➢ Identify the cause of reverberations in buildings. ➢ Analyze the crystal structure of materials. ➢ Decide on suitable materials for engineering applications.	➢ Obtain in-depth knowledge on important Physics concepts. ➢ Carry out independent research work in interdisciplinary areas. ➢ Interact with professionals in related areas. ➢ Communicate ideas and learn new technologies.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	**Week**	**Topic**	**Mode of Delivery**
1.	**7-25th Aug.**	**Lasers** Introduction to Laser-characteristics of Lasers-Spontaneous and stimulated emissions Einstein's coefficients – population inversion and lasing action Laser systems: Ruby laser, He-Ne Laser, semiconductor laser Applications:Holography- CD-drive – industrial and medical applications.	**Lectures, power point presentations, Class room discussions.**

2.	**4-22nd Sep.**	**Fiber Optics** Fermat's principle and Snell's law-optical fiber Principle and construction-acceptance cone - numerical aperture – V-Number Types of fibers, Fabrication: Double Crucible Technique, Vapour phase Oxidation Process Fiber optic communication principle – fiber optic sensors-other applications of optical fibers.	**Lectures, power point presentations, Class room discussions.**
3.	**25th Sep - 6th Oct.**	**Acoustics** Characteristics of musical sound – loudness – Weber-Fechner law – decibel Absorption coefficient – reverberation – reverberation time Sabine's formula – acoustics of buildings – ultrasonics Production of ultrasonics using piezoelectric method – magnetostriction method- applications.	**Lectures, power point presentations, Class room discussions.**
4.	**16-27th Oct.**	**Crystallography** Crystalline and amorphous solids – lattice and unit cell – seven crystal system Bravais lattices – symmetry operation -Miller indices Atomic radius – coordination number – packing factor calculation for sc, bcc, fcc Bragg's law of X-ray diffraction –Laue Method- powder crystal method.	**Lectures, power point presentations, Class room discussions.**
5.	**6-24th Nov.**	**Magnetic materials, conductors and Superconductors** *Magnetic materials:* Definition of terms – classification of magnetic materials and properties – domain theory of ferromagnetism- hard and soft magnetic materials – applications. *Conductors:* classical free electron theory (Lorentz –Drude theory) – electrical conductivity *Superconductors:* definition – Meissner effect – type I & II superconductors – BCS theory (qualitative) – high temperature superconductors – Josephson effect – quantum interference (qualitative) – SQUID – applications.	**Lectures, power point presentations, Class room discussions.**

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Quiz- I	**28 Agu.-1st Sep.(Lasers)**	30 min	10%
2	Mid semester exam	**9-13th Oct.(Lasers, Fiber Optics, Acoustics)**	60 min	20%
3	Quiz – II	**30th Oct.-3rd Nov. (Crystallography)**	30 min	10%
4	Assignment	**25-30th Nov.**	NA	10%
5	Semester exam	**11-22 Dec.**	180 min	50%
		Total		100%
6	Practicals	Five experiments 1. Torsional Pendulum 2. Numerical aperture of an Optical fibre 3. Radious of the curvature of lens-Newton's Rings 4. Conversion of galvanometer into ammeter and Voltmeter	5 x3 h	100% (5X 20%)

		5. Dispersive power of a prism -Spectrometer		

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. A text book of Engineering Physics, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company, New Delhi (2009).
2. Engineering Physics, R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications (P) Ltd., 8th edn., New Delhi (2001).
3. Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004)
4. Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2001).
5. Introduction to solid state physics,7th Edn, Charls Kittel, Wiley, Delhi (2007)
6. Practical Physics, R.K. Shukla, Anchal Srivastava, New age international (2011)
7. B.Sc. Practical Physics, C.L Arora, S. Chand &Co. (2012)
8. http://www.doitpoms.ac.uk/
9. http://vlab.co.in/index.php

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)

- Performance in the assessment methods
- Questionnaire about the effectiveness of the delivery method, topics and the knowledge gained.

COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)

Attendance:

- 75% attendance is mandatory to appear in the final semester examination.
- Student(s) having *less than 75% attendance* will *NOT* be *allowed* in semester examination and will be given *V grade*. Further, the student(s) *should REDO* the course and can get a grade based on the performance in all the assessments.
- Failing in fulfilling the minimum requirements in REDOing would lead the student(s) to opt again either for *REDO*ing or *Formative Assessment*.

Minimum mark to pass the course:

- Each student should score a minimum of, (i) either $\frac{Class\ average}{2}$ or (ii) 35%, but whichever is higher to pass in the course.

Plagiarism, academic honesty & indiscipline etc.:

- Those who involved in malpractice such as copying, plagiarism shall have to REDO the course.
- Those who are absent for any of the assessment tests on genuine grounds will be given an opportunity for a *retest* only.
- For *retest*, the student(s) should get prior permission from concerned faculty member (course teacher), Course coordinators and Head of the Department of Physics. The retest will be covering **Lasers, Fiber Optics, Acoustics & Crystallography** and conducted before the end semester examination.
- The marks for laboratory sessions shall be awarded based on independent experiments, observation, accuracy, skill, punctuality, neatness, etc.
- Those who fail in the course can appear for the supplementary exam. The laboratory and internal marks shall be considered till his/her B.Tech. programme duration.
- The total mark for the evaluation of the course is 100 (for theory 66.66% (2/3) and laboratory practical 33.33% (1/3)).
- Any misbehavior, indiscipline in the classroom/laboratory/exam hall will be dealt with seriously. In the worst case, the final resolution will be taken by the departmental disciplinary committee.

ADDITIONAL COURSE INFORMATION
The lecture materials such as PPT presentation / notes, problems and video lectures will be available with the course faculty. The individual faculty members can be contacted through phone or in person for further discussions and clarifications on a mutually convenient time.
FOR SENATE'S CONSIDERATION
Course Faculty _____ **CC-Chairperson** _____ **HOD** _____