

**NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI**

<b>COURSE OUTLINE</b>			
<b>Course Title</b>	Physics - I	<b>Branch and section</b>	Instrumentation and Control Engineering (Section A)
<b>Course Code</b>	PHIR 11	<b>No. of Credits</b>	3 (2 theory+1 lab)
<b>Department</b>	Physics	<b>Faculty</b>	Dr. K. Prakash
<b>Pre-requisites Course codes</b>	Nil		
<b>Course Coordinator(s) (if, applicable)</b>	Dr.S. Manivannan Dr.N.V. Giridharan		
<b>Other Course Teacher(s)/Tutor(s)</b>	Details available with first year coordinator office	<b>Telephone No.</b>	9025534324
		<b>Email:</b>	prakashk@nitt.edu
<b>Course Type</b>	<input checked="" type="checkbox"/> <b>Core course</b> <input type="checkbox"/> <del>Elective course</del>		
<b>COURSE OVERVIEW</b>			
The PHIR11 (Physics-I) course is offered in the first semester to all the branches of B.Tech engineering. The subject has a weightage of 2 credits for theory and 1 credit for laboratory practicals.			
<b>COURSE OBJECTIVES</b>			
<ul style="list-style-type: none"> <li>➤ To make a bridge between the physics in school and engineering courses.</li> <li>➤ To introduce the basic concepts of modern science like Photonics, Engineering applications of acoustics, fundamentals of crystal physics and materials science.</li> </ul>			
<b>COURSE OUTCOMES (CO)</b>			
<b>Course Outcomes</b>		<b>Aligned Programme Outcomes (PO)</b>	
The student will be able to : 1. Understand many modern devices and technologies based on lasers and optical fibers. 2. Appreciate various material properties which are used in engineering applications and devices. 3. Identify the cause of reverberations in buildings. 4. Analyze the crystal structure of materials. 5. Decide on suitable materials for engineering applications.		<ul style="list-style-type: none"> <li>➤ Obtain in-depth knowledge on important Physics concepts.</li> <li>➤ Develop the ability to apply the knowledge of fundamentals of physics to the field of instrumentation and control.</li> <li>➤ Carry out independent research work in interdisciplinary areas.</li> <li>➤ Interact with professionals in related areas.</li> <li>➤ Communicate ideas and learn new technologies.</li> </ul>	
<b>COURSE TEACHING AND LEARNING ACTIVITIES</b>			
<b>Theory</b>			
<b>S.No</b>	<b>Topics</b>	<b>Week</b>	<b>Mode of Delivery</b>
1.	<b>Lasers</b> <ul style="list-style-type: none"> <li>• Introduction to Laser, characteristics of Lasers,</li> <li>• Spontaneous and stimulated emissions, Einstein's coefficients population inversion and lasing action,</li> <li>• laser systems: Ruby laser, He-Ne Laser, semiconductor</li> <li>• Laser Applications: Holography, CD-drive, industrial and medical applications.</li> </ul>	Aug 7- Aug 11 Aug 14- Aug 18 Aug 21- Aug 25 Aug 28- Sept 1	Chalk & Talk, class room discussions. Chalk & Talk, class room discussions. Powerpoint(ppt) Presentation, discussions. PPT Presentation, class room discussions.

2	<b>Fiber Optics</b> <ul style="list-style-type: none"> <li>• Fermat's principle and Snell's law, optical fiber, principle and construction, acceptance cone numerical aperture</li> <li>• V-Number, types of fibers, Double Crucible Technique, Vapour phase Oxidation Process.</li> <li>• Fiber optic communication principle, fiber optic sensors, other applications of optical fibers.</li> </ul>	Sept 4- Sept 8  Sept 11- Sept 15 Sept 18- Sept 22	Chalk & Talk, discussions.  Chalk & Talk, ppt presentation, discussions. PPT presentation, discussions.
3	<b>Acoustics</b> <ul style="list-style-type: none"> <li>• Characteristics of musical sound, loudness, Weber-Fechner law, decibel, absorption coefficient, reverberation, reverberation time</li> <li>• Sabine's formula, acoustics of buildings, ultrasonics</li> <li>• production of ultrasonics: piezoelectric method, magnetostriction method, applications.</li> </ul>	Sept 25- Sept 29  Oct 2- Oct 6 Oct 9- Oct 13	Chalk & Talk, discussions.  Chalk & Talk, discussions. PPT-presentation, discussions.
4	<b>Crystallography</b> <ul style="list-style-type: none"> <li>• Crystalline and amorphous solids, lattice and unit cell, crystal system and Bravais lattices</li> <li>• symmetry operation, Miller indices, atomic radius, coordination number, packing factor calculation for sc, bcc, fcc</li> <li>• Bragg's law of X-ray diffraction, Laue Method, powder crystal method.</li> </ul>	Oct 16- Oct 20  Oct 23- Oct 27  Oct 30- Nov 3	Chalk & Talk, ppt presentation, discussions.  Chalk & Talk, ppt presentation, discussions.  Chalk & Talk, ppt presentation, discussions.
5	<b>Magnetic materials, conductors and Superconductors</b> <ul style="list-style-type: none"> <li>• <i>Magnetic materials</i>: Definition of terms, classification of magnetic materials and properties, domain theory of ferromagnetism,</li> <li>• hard and soft magnetic materials – applications.</li> <li>• <i>Conductors</i>: classical free electron theory (Lorentz – Drude theory), electrical conductivity</li> <li>• <i>Superconductors</i>: definition, Meissner effect, type I &amp; II superconductors, BCS theory,</li> <li>• high temperature superconductors, Josephson effect, quantum interference, SQUID– applications.</li> </ul>	Nov 6 – Nov 10  Nov 13 – Nov 17  Nov 20 – Nov 24 Nov 27 Dec 1	Chalk & Talk, ppt presentation, discussions.  Chalk & Talk, ppt presentation, discussions.  Chalk & Talk, ppt presentation, discussions. Chalk & Talk, ppt presentation, discussions.

### COURSE ASSESSMENT METHODS

S.No	Mode of Assessment	Tentative Date	Duration & topics	% Weightage
1.	Quiz- I (Objective type)	5 <sup>th</sup> Sept 2017	30 min Lasers	10 %
2.	Mid semester exam (Subjective type)	17 <sup>th</sup> Oct 2017	60 min Lasers, Fiber Optics, Acoustics	20 %
3.	Quiz – II (Objective type)	07 <sup>th</sup> Nov 2017	30 min Crystallography`	10 %
4.	Assignments/group activities	Alternative weeks	30 min Selected topics related to syllabus	10%
5.	Semester exam (Subjective type)	11-22 Dec 2017 (As per NITT Timetable)	180 min Lasers, Fiber Optics, Acoustics, Crystallography, Magnetic materials, conductors and Superconductors	50 %
<b>Total (theory)</b>				<b>100 %</b>

<ul style="list-style-type: none"> <li>• <b>Practicals</b></li> <li><u>List of practical experiments:</u> <ol style="list-style-type: none"> <li>1. Torsional pendulum</li> <li>2. Numerical Aperture of an Optical Fiber</li> <li>3. Radius of Curvature of Lens-Newton's Rings</li> <li>4. Conversion of Galvanometer into Ammeter and Voltmeter</li> <li>5. Dispersive Power of a Prism-Spectrometer.</li> </ol> </li> <li>• <b>No separate semester exam for laboratory</b></li> <li>• <b>Each lab session (3 h each) carries equal weightage (20%)</b></li> <li>• <b>100 % attendance is mandatory for practicals.</b></li> </ul>	<b>100 %</b>
<ul style="list-style-type: none"> <li>• <b>Theory weightage: 2/3</b></li> <li>• <b>Laboratory weightage : 1/3</b></li> <li>• <b>To pass, a student has to score a minimum marks of either class average/2 or 35 % of total marks whichever is the higher.</b></li> </ul>	
<b>ESSENTIAL READINGS :</b>	
<ol style="list-style-type: none"> <li>1. <i>A text book of Engineering Physics, M.N. Avadhanulu and P.G. Kshirsagar, S. Chand and Company, New Delhi (2009).</i></li> <li>2. <i>Engineering Physics, R.K. Gaur and S.L. Gupta, Dhanpat Rai Publications (P) Ltd., 8th edn., New Delhi (2001).</i></li> <li>3. <i>Laser Fundamentals, William T. Silfvast, 2nd edn, Cambridge University press, New York (2004).</i></li> <li>4. <i>Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J.Walker, John Wiley and Sons, New York (2001).</i></li> <li>5. <i>Introduction to Solid State Physics, 7th Edn, Charles Kittel, Wiley, Delhi (2007).</i></li> <li>6. <a href="http://www.doitpoms.ac.uk/">http://www.doitpoms.ac.uk/</a></li> <li>7. <a href="http://vlab.co.in/index.php">http://vlab.co.in/index.php</a></li> </ol>	

**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.)**

- 75 % attendance in theory classes is mandatory. Those who fail to get 75 % attendance will not be allowed to appear for regular end semester exam. They shall redo the course in the following vacation.
- Those who are absent for any of the first three assessment tests on genuine grounds shall be given an opportunity for the retest for only one assessment with the prior permission of the concerned faculty member and Head of Physics Department. The retest shall be conducted before the end semester exam and the topics will be covered from 1. Lasers, 2. Fiber Optics 3. Acoustics and 4. Crystallography.
- The marks for laboratory sessions shall be awarded based on independent experiments, observation, accuracy, skill, punctuality, neatness, etc.
- Those who are absent for any one of the practical laboratory experiments on genuine grounds shall be given an opportunity for the repetition for only one experiment with the prior permission of the concerned faculty member.
- The total marks will be for 100% including the theory and lab put together, of which 2 part will be for the theory and 1 part will be for the laboratory.
- To pass in the course, a student has to score a minimum marks of either class average/2 or 35 % of total marks whichever is the higher.
- Those who fail in the course may appear for the reassessment/supplementary exam in accordance with institute's academic guidelines. The laboratory and internal marks shall be considered till his/her B.Tech. programme duration.

➤ Any misbehavior, indiscipline in the classroom/laboratory/exam hall, or malpractices such as copying, plagiarism will be dealt with seriously in accordance with the Students' Conduct and Disciplinary Codes of the Institute.

**ADDITIONAL COURSE INFORMATION**

Lecture materials such as power point presentation/notes, problems, video lectures etc. shall be displayed by the faculty member. 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**

(P.K.)  
Course Faculty Dr. K. PRAKASH

CC-Chairperson K. Indira

HOD Dr. Gopalakrishna