



**DEPARTMENT OF PHYSICS**  
**NATIONAL INSTITUTE OF TECHNOLOGY**  
**TIRUCHIRAPPALLI**

COURSE OUTLINE			
Course Title	Physics - I		
Course Code	PHIR11	No. of Credits	3 (2 Theory +1 Lab)
Department	Physics	Faculty	Dr.S. Manivannan
Pre-requisites	Nil		
Course Coordinator(s) (if, applicable)	Dr. S. Manivannan Dr. N.V.Giridharan		
Other Course Teacher(s)/Tutor(s) E-mail	Details with first year coordinator office		Telephone No. 0431-2503616
Course Type	<input type="checkbox"/> Core course <input type="checkbox"/> Elective course		
COURSE OVERVIEW			
The Physics- I course is offered in the first semester to <b>Mechanical Engineering (Section B)</b> . The subject has 2 credits theory and 1 credit lab weightage.			
COURSE OBJECTIVES			
<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 lasers, fiber optics and photonics.</li> <li>❖ To bring in essential concepts of engineering applications of acoustics, fundamentals of crystal physics and materials science.</li> </ul>			
COURSE OUTCOMES (CO)			
Course Outcomes	Aligned Programme Outcomes (PO)		
<i>The student will be able to</i> 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.	1. Obtain in-depth knowledge on important Physics concepts. 2. Carry out independent research work in interdisciplinary areas. 3. Interact with professionals in related area. 4. Communicate ideas and learn new Technologies.		
COURSE TEACHING AND LEARNING ACTIVITIES			
Week (planned)	Topic	Mode of Delivery	
2 <sup>nd</sup> week of Aug.	<b>Lasers:</b> Introduction to Laser-characteristics of Lasers-Spontaneous and stimulated emissions – Einstein's coefficients	Chalk & talk (C&T)/power point presentation (PPT)	
3 <sup>rd</sup> week of Aug.	population inversion and lasing action – laser systems: Ruby laser, He-Ne Laser	C&T/PPT	

4 <sup>th</sup> week of Aug.	semiconductor laser-applications -Holography-CD-drive - industrial and medical applications	C&T/PPT
5 <sup>th</sup> week of Aug.	<b>Fiber Optics:</b> Fermat's principle and Snell's law-optical fiber - principle and construction	C&T/PPT & discussions
1 <sup>st</sup> week of Sep.	- acceptance cone - numerical aperture - V-Number - types of fibers	C&T/PPT & lab demonstration
2 <sup>nd</sup> week of Sep.	Fabrication: Double Crucible Technique, Vapour phase Oxidation Process - fiber optic communication principle - fiber optic sensors-other applications of optical fibers	C&T/ PPT & discussions
3 <sup>rd</sup> week of Sep.	<b>Acoustics:</b> Characteristics of musical sound - loudness - Weber-Fechner law - decibel - absorption coefficient -	C&T/PPT
4 <sup>th</sup> week of Sep.	reverberation - reverberation time - Sabine's formula - acoustics of buildings -	C&T/PPT
1 <sup>st</sup> week of Oct.	ultrasonics - production of ultrasonics using piezoelectric method -magnetostriction method-applications	C&T/PPT
2 <sup>nd</sup> week of Oct.	<b>Crystallography:</b> Crystalline and amorphous solids - lattice and unit cell - seven crystal system and Bravais lattices	C&T/PPT, group seminars
3 <sup>rd</sup> week of Oct.	- symmetry operation - Miller indices - atomic radius - coordination number - packing factor calculation for sc, bcc, fcc	C&T/PPT, group seminars
4 <sup>th</sup> week of Oct.	- Bragg's law of X-ray diffraction -Laue Method-powder crystal method.	C&T/ PPT, group seminars
1 <sup>st</sup> week of Nov.	<b>Magnetic materials:</b> Definition of terms - classification of magnetic materials and properties - domain theory of ferromagnetism-hard and soft magnetic materials - applications	C&T/ PPT, group seminars/discussions
2 <sup>nd</sup> week of Nov.	<b>Conductors:</b> classical free electron theory (Lorentz -Drude theory) - electrical conductivity	C&T/ PPT
3 <sup>rd</sup> week of Nov.	<b>Superconductors:</b> definition -Meissner effect - type I & II superconductors - BCS theory (qualitative) - high temperature superconductors -	C&T/ PPT
4 <sup>th</sup> week of Nov.	Josephson effect - quantum interference (qualitative) - SQUID - applications.	C&T/ PPT
2 <sup>nd</sup> week of Aug.	<b>Lab. Expt.</b> 1) Torsional pendulum & 2) Numerical Aperture of an Optical Fiber	Demonstration
3 <sup>rd</sup> week of Aug.	<b>Lab. Expt.</b> 3) Radius of curvature of lens-Newton's rings,4) Conversion of galvanometer into ammeter and voltmeter & 5) Dispersive power of a prism spectrometer.	Demonstration

<b>COURSE ASSESSMENT METHODS</b>			
<b>Mode of Assessment</b>	<b>Week/Date (topics)</b>	<b>Time</b>	<b>%Weightage</b>
Assessment –I (Written Quiz-short answer questions and problems)	1st week of Sep. (Lasers)	30 min	10 %
Assessment – II (descriptive questions, problems)	3 <sup>rd</sup> week of Oct. (Lasers, Fiber Optics & Acoustics)	90 min	30 %
Assessment – III (Written Quiz-short answer questions and problems)	2 <sup>nd</sup> week of Nov. (Crystallography)	30 min	10 %
Semester exam (short and long descriptive questions, problems)	11 – 22 Dec. (all the topics)	180 min	50 %
<b>Total (theory)</b>			<b>100 %</b>
<b>Laboratory</b>			
1) Torsional pendulum	1 <sup>st</sup> week of Sep.	3 h	20%
2) Numerical Aperture of an Optical Fiber	2 <sup>nd</sup> week of Sep.	3 h	20%
3) Radius of curvature of lens-Newton's rings	3 <sup>rd</sup> week of Sep.	3 h	20%
4) Conversion of galvanometer into ammeter and voltmeter	1 <sup>st</sup> week of Oct.	3 h	20%
5) Dispersive power of a prism spectrometer	2 <sup>nd</sup> week of Oct.	3 h	20%
Repeat	4 <sup>th</sup> week of Oct.	3 h	
<b>Total (lab)</b>			<b>100 %</b>
<p>No separate semester exam for laboratory  Each lab session carries equal weightage (20% of lab weightage)  Theory weightage: 2 part (66.66%), Laboratory weightage: 1 part (33.33%)</p>			
<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> </ol>			
<b>COURSE EXIT SURVEY</b>			
<ul style="list-style-type: none"> <li>➤ Performance in the assessment methods.</li> <li>➤ Questionnaire about the effectiveness of the delivery method, topics and the knowledge gained.</li> </ul>			

### COURSE POLICY

- 75% attendance (including medical and on duty) is mandatory to take up the final examination. If the students are not satisfying the required attendance criteria, they have to redo the course during vacation.
- Those who are absent for any of the assessment tests on genuine grounds shall be given an opportunity only once for the retest with the prior permission of the concerned faculty member. The retest shall be conducted before the end semester exam and the portions would be lasers, fiber optics, acoustics and crystallography.
- The marks for laboratory sessions shall be awarded based on independent experiments, observation, accuracy, skill, punctuality, neatness, viva, etc.
- A student has to score a minimum mark either class average/2 or 35% whichever is higher.
- Those who fail in the course can appear for the reassessment exam. The laboratory and internal marks shall be considered till his/her B.Tech. programme duration.
- Any misbehavior, indiscipline in the classroom/laboratory/exam hall will be dealt with seriously. Those who indulge in malpractice such as copying, plagiarism, discussion, etc. shall be awarded zero marks in the respective assessment. In the worst case, the institute disciplinary committee is empowered to debar the student from the course.
- The total marks will be for 100% including the theory and lab put together, of which 2 part (66.66%) will be for the theory and 1 part (33.33%) will be for the laboratory.

### ADDITIONAL COURSE INFORMATION

The lecture materials such as hand outs, hard copy of power point presentations shall be available with the faculty member. The faculty can be contacted through office phone or in person for clarifications and for the above said materials by the student on a mutually convenient time.

### FOR SENATE'S CONSIDERATION

Course Faculty

  
07/07/2017  
CC-Chairperson

HOD

