NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF PHYSICS

COURSE PLAN – PART I			
Name of the programme and specialization	B.Tech. ELECTRICAL AND ELECTRONICS ENGINEERING B		
R	PHYSICS - I		
Course Code	PHIR11	No. of Credits	3
Course Code of Pre-requisite subject(s)	NI L		
Session	July 2023	Section (if, applicable)	B
Name of Faculty	Dr. R. NAGALAKSHMI	Department	PHYSICS
Official Email	nagalakshmi@nitt.edu	Telephone No.	+91 9443940384
Name of Course Coordinator(s) (if, applicable)	Dr. M.Venkata Kirthiga, Professor, Dept of EEE		
Official E-mail	~~mvk~~kirthiga@nitt.edu	~~Tele~~phone No.	0431-2503263
Course Type (please tick appropriately**)**	√ Core course	☐ Elective course	

Syllabus (approved in BoS)

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, photoelectric 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. 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.

COURSE OBJECTIVES

1. To introduce the notions of light matter interaction, fabrication of lasers, light propagation in waveguides, applications of lasers and optical fibers to engineering students.
2. To comprehend and explain the concepts of matter waves, wave functions and its interpretation to understand the matter at atomic scale.
3. To teach the fundamentals of nuclear forces, models and classification of matter.
4. To impart knowledge about the basics of conductors, superconductors, nanomaterials and their applications in science, engineering and technology.

Course Outcomes

On completion of this course, the students will be able to

1. know principle, construction and working of lasers and their applications in various science and engineering.
2. explain light propagation in optical fibers, types and their applications.
3. experience and appreciate the behavior of matter at atomic scale, and to impart knowledge in solving problems in modern science and engineering.
4. Understand the role of nuclear and particle physics in applications like radioactivity and nuclear reactions.
5. Recognize, choose and apply knowledge to develop materials for specific applications for common needs.

Theory *PHIR11*				Aligned Programme Outcomes (PO) with level of correlation Programme Outcomes (COs)											
Course Outcomes(Cos)		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	CO1	H	M	H	-	M	L	-	-	-	-	-	M	H	H	-
	CO2	H	M	H	-	M	L	-	-	-	-	-	M	H	-	-
	CO3	L	H	-	-	-	-	-	-	-	-	-	H	-	-	-
	CO4	L	H	M	-	-	H	M	-	-	-	-	H	-	-	-
	CO5	M	M	H	-	H	L	M	-	-	-	-	H	-	H	-

H(High)- 3 (100- 68%) , M (Medium) – 2 (34-67%) , L(Low) – 1 (0-33%)

COURSE PLAN – PART II

COURSE OVERVIEW

- The Physics-I course (Code: PHIR11) is offered to all branches of B.Tech. Engineering students in the first year.
- The course carries 3 credits and have three hours every week.
- In the second semester non-circuit branches of B.Tech. Students take this course.

COURSE TEACHING AND LEARNING ACTIVITIES (Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	1st Week (3hrs/Week)	Laser: Introduction to Laser - characteristics of lasers, Spontaneous and stimulated emissions. Einstein's coefficients	Board Teaching and PPT
2	2ndWeek	Population inversion and lasing action.	Board Teaching and PPT
3	3rd Week	Laser systems - He-Ne Laser, semiconductor laser-applications. Revision of chapter-1	Board Teaching and PPT
4	4th Week	Fiber Optics: Snell's law-optical fiber – principle and construction. Acceptance cone – numerical aperture.	Board Teaching and PPT
5	5th Week	Types of fibers. Fiber optic communication principle – fiber optic sensors. Revision of chapter-2	Board Teaching and PPT
6	6th Week	Introduction to Advanced materials Conductors: Classical free electron theory (Lorentz–Drude theory) & electrical conductivity.	Board Teaching and PPT

7	7th Week	Superconductors: Definition – Meissner effect. Type I & II superconductors – BCS theory	Board Teaching and PPT
8	8th Week	Nanomaterials: Introduction & properties. Synthesis – top-down and bottom-up approach. Applications. Revision of chapter-5	Board Teaching and PPT
9	9th Week	Quantum Mechanics: Inadequacy of classical mechanics-black body radiation. Photoelectric effect - wave and particle duality – de Broglie concept of matter waves – electron diffraction.	Board Teaching and PPT
10	10th Week	Heisenberg's uncertainty principle– Schrodinger's wave equation.	Board Teaching and PPT
11	11th Week	Eigen values and Eigen functions – superposition principle. Interpretation of wave function – particle confined in one dimensional infinite square well potential. Revision of chapter 3	Board Teaching and PPT
12	12th Week	Nuclear & Particle Physics: Nuclear properties and forces - Nuclear models - Shell model - Nuclear reaction - Radioactivity - types and half-life.	Board Teaching and PPT
13	13th Week	Fundamental forces - Particle physics - classification of matter - quark model. Revision of chapter 4	Board Teaching and PPT

COURSE ASSESSMENT METHODS (shall range from 4 to 6**)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	5th Week	60 mins.	20
2	Cycle Test 2	10th Week	60mins.	20
3	Quiz	12th Week	Will be decided during conduct of Quiz	10
CPA	Compensation Assessment*	14th Week	60 mins.	As applicable
4	Final Assessment *	15th Week	180 mins	50

***mandatory; refer to guidelines on page 4**

COURSE EXIT SURVEY
(mention the ways in which the feedback about the course shall be assessed)

Asking feedback at the end of each unit and also through class committee meetings.

- Active participation of students in classroom discussions.
- Performance in the continuous and final assessments.
- Questionnaire about the effectiveness of the delivery method,topics and the knowledge gained.
- Feedback from students on the course outcomes shall be obtained at the end of the course.

COURSE POLICY (including compensation assessment to be specified**)**

MODE OF CORRESPONDENCE (email/ phone etc)

Both e-mail (nagalakshmi@nitt.edu and phone/mobile (0431 2503615, +91 9443940384)

COMPENSATION ASSESSMENT POLICY

It is a test with duration of 60 mins covering first and second cycle test portions. Appropriate weightage will be calculated. It will be conducted only for genuine reasons.

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 not having 75% minimum attendance at the end of the semester will be awarded 'V' Grade and have to REDO the course.

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.
- The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION, IF ANY

Books for 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).
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. Introduction to Solid State Physics, 8th Edition, Charles Kittel, John Wiley & Sons, NJ, USA (2005).

FOR APPROVAL

Course Faculty	CC- Chairperson	HOD
Dr. R. Nagalakshmi		

Guidelines

a) The number of assessments for any theory course shall range from 4 to 6.

b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.

c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.

d) The passing minimum shall be as per the regulations.

<table>
<tr><th colspan="4">B.Tech. Admitted in</th><th rowspan="2">P.G.</th></tr>
<tr><th>2018</th><th>2017</th><th>2016</th><th>2015</th></tr>
<tr><td colspan="2">35% or (Class average/2) whichever is greater.</td><td colspan="2">(Peak/3) or (Class Average/2) whichever is lower</td><td>40%</td></tr>
</table>

e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.

f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.

g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.