DEPARTMENT of Mechanical Engineering

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**B.Tech Electrical and Electronics Engineering**		
Course Title	**Physics**		
Course Code	**PHIR11**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**Nil**		
Session	**July 2023**	**Section (if, applicable)**	**A**
Name of Faculty	**Dr. R. Justin Joseyphus**	**Department**	**Physics**
Email	**rjustinj@nitt.edu**	**Telephone No.**	**3614**
Name of Course Coordinator(s) (if, applicable)	**Dr.T. Sonamani Singh, Dept of Physics**		
E-mail	**takhel@nitt.edu**	**Telephone No.**	
Course Type	[v] **Core course** [ ] **Elective course**		

Syllabus

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
• To introduce the notions of light-matter interaction, fabrication of lasers, light propagation in waveguides, and applications of lasers and optical fibers to engineering students. • To comprehend and explain the concepts of matter waves, wave functions and their interpretation to understand the matter at the atomic scale. • To teach the fundamentals of nuclear forces, models and classification of matter. • To impart knowledge about the basics of conductors, superconductors, nanomaterials and their applications in science, engineering and technology.
COURSE OUTCOMES (CO)
Course Outcomes
1. Know the 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 the atomic scale and 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		**Aligned Programme Outcomes (PO) with level of correlation** **Programme Outcomes (COs)**													
Course Outcomes(Cos)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
	CO1	H	M	H	-	M	L	-	-	-	-	-	M		
	CO2	H	M	H	-	M	L	-	-	-	-	-	M		
	CO3	L	H	-	-	-	-	-	-	-	-	-	H		
	CO4	L	H	M	-	-	H	M	-	-	-	-	H		
	CO5	M	M	H	-	H	L	M	-	-	-	-	H		

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

COURSE PLAN – PART II
COURSE OVERVIEW
The Physics- I theory course is offered in the second semester to the EEE branch. The subject has 3 credit theory weightage. The course introduces modern Physics principles applicable to engineering subjects.

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No.	**Week/Contact Hours**	**Topic**	**Mode of Delivery**
1	3 h/ week First three weeks	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.	Chalk and Talk
2	One week 3 h/ week	Fiber Optics Snell's law-optical fiber – principle and construction – acceptance cone - numerical aperture –types of fibers - fiber optic communication principle – fiber optic sensors.	Chalk and Talk
3	5^{th} – 7^{th} week 3 h/ week	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.	Chalk and Talk
4	8^{th} – 10^{th} week 3 h/ week	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.	Chalk and Talk
5	11^{th} – 13^{th} week 3 h/ week	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.	Chalk and Talk/ppt

COURSE ASSESSMENT METHODS (shall range from 4 to 6)				
S.No.	**Mode of Assessment**	**Week/Date**	**Duration**	**% Weightage**
1	**Assessment - I** (Offline Quiz/short answers)	5^{th}-6^{th} week	60 min	25
2	**Assessment - II** (Offline Quiz/short answers)	11-12^{th} week	60 min	25
3	**Assessment - III** Assignment	13-14^{th} week	60 min	10
CPA	Compensation Assessment*	14-15^{th} week	60 min	25
4	**Final Assessment** (Semester Exam)*	As per the Institute timetable	120 min	40

		Theory weightage	100

***mandatory; refer to guidelines on page 4**
All the assessments shall be conducted in offline mode. Handwritten assignments have to be submitted.

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

Questionnaire about the effectiveness of the delivery method, topics and the knowledge gained shall be undertaken at the end of the course

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

MODE OF CORRESPONDENCE (email/ phone etc)

Can be contacted through phone 2503614.

COMPENSATION ASSESSMENT POLICY

Only one compensation assessment is allowed at the end of the course. A request letter has to be submitted to the class teacher on completion of Assessment III, for the CPA. The CPA shall be conducted before the Final assessment.

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

ADDITIONAL INFORMATION

FOR APPROVAL

Course Faculty 4/9/23 CC-Chairperson 4/9/2023 HOD 12/09/23

Dr R Justin Joseyphus

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.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

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.

h) A minimum of 20 % mark is required for pass at the final assessment exam as per 2019 regulation.

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