



Estd.2001

Sri Indu

College of Engineering & Technology
UGC Autonomous Institution

Recognized under 2(f) & 12(B) of UGC Act 1956,
NAAC, Approved by AICTE &
Permanently Affiliated to JNTUH



NAAC
NATIONAL ASSESSMENT AND
ACCREDITATION COUNCIL



DEPARTMENT OF HUMANITIES & SCIENCES

APPLIED PHYSICS (R20)

I BTECH I& II SEMESTER

(COMMON TO ECE, EEE, CSE, IT, CSIT, CS, DS, IoT, AI&ML&AI&D)

DEPARTMENT OF HUMANITIES & SCIENCES

Branch: COMMON TO ECE, EEE,CSE,IT,CSIT,CS,DS,IoT,AI&ML&AI&D

Class: B.Tech- I Year- I SEM & II SEM

Subject: APPLIED PHYSICS

Subject Code: R20EAP1201

Academic Year: 2021-22

Regulation: R20

Core/Elective/H&S: H&S

Credits: 3

SNO	Prepared By	Regulation
1	Dr. P Balasubrahmanyam	R20
	N Shailaja	
2	N Shailaja	
	Ashok Kumar Ch	

Head of the Department

DEPARTMENT OF HUMANITIES & SCIENCES

APPLIED PHYSICS

S. No	Contents
1	Vision, Mission, PEOs, POs, COs
2	Theory
i)	Syllabus Copy
ii)	Lesson plan
iii)	Lecture Notes
iv)	Individual Faculty Time Table



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

Department of Electronics and Communication Engineering

INSTITUTION VISION

To be a premier Institution in Engineering & Technology and Management with competency, values and social consciousness.

INSTITUTION MISSION

- IM₁** Provide high quality academic programs, training activities and research facilities.
- IM₂** Promote Continuous Industry-Institute interaction for employability, Entrepreneurship, leadership and research aptitude among stakeholders.
- IM₃** Contribute to the economical and technological development of the region, state and nation.

DEPARTMENT VISION

To be a Technologically adaptive centre for computing by grooming the students as top notch professionals.

DEPARTMENT MISSION

The Department has following Missions:

- DM₁** To offer quality education in computing.
- DM₂** To provide an environment that enables overall development of all the stakeholders.
- DM₃** To impart training on emerging technologies like data analytics , artificial intelligence and internet of things.
- DM₄** To encourage participation of stake holders in research and development.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- PEO1:** **Higher studies:** Graduates with an ability to pursue higher studies and get employment in reputed institutions and organization.
- PEO2:** **Domain knowledge:** Graduates with an ability to design and develop a product.
- PEO3:** **Professional career:** Graduates with excellence by multidisciplinary approach to achieve successful professional career.
- PEO4:** **Life Long Learning:** Graduates with an ability to learn advanced skills to face professional competence through life long learning.



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

Department of Electronics and Communication Engineering

PROGRAM OUTCOMES (POs) & PROGRAM SPECIFIC OUTCOMES (PSOs)

PO	Description
PO 1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design / development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	The engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological Change
Program Specific Outcomes	
PSO 1	Develop software projects using standard practices and suitable programming environment.
PSO 2	Identify , formulate and solve the real life problems faced in the society, industry and other areas by applying the skills of the programming languages, networks and databases learned.
PSO 3	To apply computer science knowledge in exploring and adopting latest technologies in different co-curricular activities.



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

Department of Humanities & Sciences

Academic Year: 2021-22 B.Tech IYear ISem

COs MAPPING WITH POs & PSOs

(R20EAP1101) APPLIED PHYSICS

Course outcomes	Statements
C112.1	The concepts would be able to learn the fundamental concepts on Quantum behavior of matter in its micro state (L2-Understand)
C112.2	The knowledge of fundamentals of the semiconductors, semiconductor diodes and transistors.(L2- Understand)
C112.3	Apply the various systems of optoelectronic devices like solar cell, photo cells and so on.(L3-Apply)
C112.4	Study about characteristics of lasers and construction of optical fiber.(L6-Create)
C112.5	Explain various properties and application of dielectrics Explain the various properties and applications of magnetic materials.(L4-Analyse)
C112.6	Design and characterization and study of properties of materials help the students to prepare new materials for engineering applications.(L6- Create)

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C112.1	3	3	3	2	-	-		-	-	-	-	-	3	2	-
C112.2	3	-	2	1	-	-		-	-	-	-	-	3	-	-
C112.3	3	-	2	1	-	-		-	-	-	-	-	3	-	-
C112.4	3	3	3	-	-	-	1	-	-	-	-	-	3	3	-
C112.5	3	2	3	2	-	-	2	-	-	-	-	-	3	3	-
C112.6	3	3	3	3	-	-	-	-	-	-	-	-	3	2	-
C112	3	2.7	2.7	1.8	-	-	1.5	-	-	-	-	-	3	2.5	-

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY
(An Autonomous Institution under UGC, New Delhi)

B.Tech. - I Year – I Semester

L T P C
3 1 0 4

(R20EAP1101) APPLIED PHYSICS

Course Objectives:

- Students will demonstrate skills in scientific inquiry, problem solving and laboratory techniques.
- Students will be able to demonstrate competency and understanding of the concepts found in Quantum Mechanics, Fiber optics and lasers, Semiconductor physics and Electromagnetic theory and a broad base of knowledge in physics.
- The graduates will be able to solve non-traditional problems that potentially draw on knowledge in multiple areas of physics.
- To study applications in engineering like memory devices, transformer core and electromagnetic machinery.

Course Outcomes: Upon graduation:

- a. The student would be able to learn the fundamental concepts on Quantum behaviour of matter in its micro state.
- b. The knowledge of fundamentals of Semiconductor physics, Optoelectronics, Lasers and fibre optics enable the students to apply to various systems like communications, solar cell, photo cells and so on.
- c. Design, characterization and study of properties of material help the students to prepare new materials for various engineering applications.
- d. The course also helps the students to be exposed to the phenomena of electromagnetism and also to have exposure on magnetic materials and dielectric materials.

UNIT-I: Quantum Mechanics

Introduction to quantum physics, Black body radiation, Planck's law, Photoelectric effect, Compton effect, de-Broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg's Uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, Particle in one dimensional box.

UNIT-II: Semiconductor Physics

Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.

UNIT-III: Optoelectronics

Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.

ELECTRONICS & COMMUNICATION ENGINEERING

UNIT-IV: Lasers and Fibre Optics

Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO₂) laser, He-Ne laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.

UNIT-V: Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, Electric current and the continuity equation, Ampere's and Faraday's laws, Maxwell's equations, Polarisation, Permittivity and Dielectric constant, Internal fields in a solid, Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials.

TEXT BOOKS:

- i. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.
- ii. Halliday and Resnick, Physics - Wiley.
- iii. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCES:

- a) Richard Robinett, Quantum Mechanics
- b) J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
- c) Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Guptha on NPTEL



SRI INDU COLLEGE OF ENGG & TECH
LESSON PLAN
(Regulation :R21)
Department of Electronics and Communication
Engineering

Prepared on
Rev1:

Sub. Code & Title	R20EAP1101 & APPLIED PHYSICS
Academic Year: 2021-22	Year/Sem./Section I/I ECE A, B, C, D
Faculty Name & Designation	N SHAILAJA / CH ASHOK KUMAR/ Dr.P BALASUBHRAMANYAM / E BALRAJU

Unit/ Item No.	Topic (s)	Book Referen ce	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
			From	To				
UNIT – I								
I	QUANTUM MECHANICS					12		
1.1	Quantum Mechanics: Introduction to quantum physics, Black body radiation	T- 1,T-2	1.1	1.2	Black Board	1		CO1,L2
1.2	Planck’s radiation law	T – 2	1.4	1.6	Black Board	2		CO1,L2
1.3	Photoelectric effect and Einstein photo electric equation	T – 2,T-3	1.7	1.13	Black Board	2		CO1,L2
1.4	Compton effect and expression for Compton shift	T – 2,T-3	1.14	1.18	Black Board	2		CO1,L2
1.5	de-Broglie’s hypothesis, Wave-particle duality, Davisson and Germer experiment,	T – 2	1.19	1.25	Black Board	2		CO1,L2
1.6	Heisenberg’s Uncertainty principle, Born’s interpretation of the wave function	T – 2	1.26	1.26	Black Board	1		CO1,L2
1.7	Schrodinger’s time independent wave equation	T – 2,T-3	1.27	1.28	Black Board	1		CO1,L2
1.8	Particle in one dimensional box.	T – 2,T-3	1.31	1.32	Black Board	1		CO1,L2
	Review	Signature of the HOD/Coordinator						
Unit/ Item No.	Topic (s)	Book Reference	Page (s)		Teaching Methodology	Proposed No. of Periods	Actual Date of Handled	CO/RBT
UNIT –II								
II	SEMICONDUCTOR PHYSICS					15		
2.1	Semiconductor Physics: Intrinsic semiconductors	T – 1, T-3	2.46	2.46	Black board	1		CO2,L2
2.2	Density of electrons in Intrinsic semiconductor	T – 1,T-3	2.49	2.50	Black board	1		CO2,L2
2.3	Density of holes in Intrinsic semiconductor	T – 1,T-3	2.50	2.51	Black board	1		CO2,L2
2.4	Dependence of Fermi level on carrier-concentration and temperature	T – 1,T-3	2.50	2.53	Black board	1		CO2,L2
2.5	Intrinsic carrier concentration	T – 1,T-3	2.53	2.56	Black board	1		CO2,L2
2.6	Extrinsic semiconductors: N-type Semiconductor	T – 1,T-3	2.58	2.61	Black board	2		CO2,L2
2.7	P-type semiconductor	T – 1,T-3	2.62	2.63	Black board	2		CO2,L2
2.8	Fermi level variation with temperature in extrinsic semiconductor, Carrier generation and recombination	T – 1,T-3	2.69	2.71	Black board	1		CO2,L2

2.9	Carrier transport: diffusion and drift	T – 1,T3	2.71	2.71	Black board	1		CO2,L2
2.10	Hall Effect	T – 1,T-3	2.72	2.77	Black board	1		CO2,L2
2.11	p-n junction diode, Zener diode and their V-I Characteristics	T – 1,T-3	2.78	2.86	Black board	2		CO2,L2
2.12	Bipolar Junction Transistor (BJT): Construction, Principle of operation	T-1,T-3	2.87	2.91	Black board	1		CO2,L2
Review		Signature of the HOD/Coordinator						
UNIT- III								
III	OPTOELECTRONICS					7		
3.1	Optoelectronics: Radiative and non-radiative recombination mechanisms in semiconductors	T-3	3.98	3.98	Black board	1		CO3,L3
3.2	LED: Device structure, Materials, Characteristics and figures of merit	T-3	3.99	3.101	Black board	1		CO3,L3
3.3	Semiconductor lasers: Device structure, Materials, Characteristics and figures of merit	T-3	3.102	3.108	Black board	1		CO3,L3
3.4	Semiconductor photo detectors	T-3	3.108	3.110	Black board	1		CO3,L3
3.5	Solar cell: structure, Materials, working principle and characteristics.	T-3	3.111	3.113	Black board	1		CO3,L3
3.6	PIN Diode: structure, Materials, working principle and characteristics.	T-3	3.114	3.115	Black board	1		CO3,L3
3.7	Avalanche Photodiode: structure, Materials, working principle and characteristics.	T-3	3.116	3.117	Black board	1		CO3,L3
UNIT-IV								
IV	LASERS & FIBER OPTICS					10		
4.1	Lasers: Lasers: Introduction to interaction of radiation with matter	T – 1	4.113	4.114	Black board	1		CO4,L6
4.2	Coherence, Principle and working of Laser, Population inversion, Pumping	T – 1	4.118	4.122	Black board	1		CO4,L6
4.3	Types of Lasers: Ruby laser	T – 1	4.123	4.124	Black board	1		CO4,L6
4.4	Carbon dioxide (CO2) laser	T – 1	4.127	4.129	Black board	1		CO4,L6
4.5	He-Ne laser, Applications of lasers in various fields	T – 1	4.125	4.139	Black board	1		CO4,L6
4.7	Fiber Optics: Acceptance angle, Acceptance cone and Numerical aperture	T – 1	4.141	4.145	Black board	2		C CO4,L6
4.8	Types of optical fibers	T – 1	4.147	4.152	Black board	1		CO4,L6
4.9	Losses associated with optical fibers, Applications of optical fibers.	T – 1	4.152	4.155	Black board	2		CO4,L6
Review		Signature of the HOD/Coordinator						
UNIT-V								
V	ELECTROMAGNETISM & MAGNETIC PROPERTIES OF MATERIALS					12		
5.1	Electromagnetism and Magnetic Properties of Materials: Laws of electrostatics, Ampere's and Faraday's laws / Fundamental laws of electromagnetism	T – 1,T-2	5.177	5.179	Black board	1		CO5,CO6,L4, L6

5.2	Electric current and the continuity equation	T – 1, T-2	5.178	5.178	Black board	1		CO5,CO6,L4, L6
5.3	Maxwell's equations	T – 1	5.180	5.182	Black board	2		CO5,CO6,L4, L6
5.4	Polarization, Permittivity and Dielectric constant	T-1	5.186	5.187	Black board	1		CO5,CO6,L4, L6
5.3	Types of Polarizations	T-1	5.194	5.200	Black board	1		CO5,CO6,L4, L6
5.5	Internal fields in a solid	T-1	5.189	5.193	Black board	1		CO5,CO6,L4, L6
5.6	Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics	T-1	5.201	5.209	Black board	1		CO5,CO6,L4, L6
5.7	Magnetization, permeability and susceptibility	T-1	5.210	5.213	Black board	1		CO5,CO6,L4, L6
5.8	Classification of magnetic materials, Ferromagnetism	T-1, T-2	5.214	5.218	Black board	1		CO5,CO6,L4, L6
5.9	Domain theory of Ferromagnetism & Hysteresis curve	T-1	5.219	5.221	Black board	1		CO5,CO6,L4, L6
5.10	Soft and Hard magnetic materials and applications of magnetic materials	T-1	5.222	5.223	Black board	1		CO5,CO6,L4, L6
	Review	Signature of the HOD/Coordinator						

LIST OF TEXT BOOKS AND REFERENCES

TEXT BOOKS:

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.
2. Halliday and Resnick, Physics - Wiley.
3. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand

REFERENCE BOOKS:

1. Richard Robinett, Quantum Mechanics
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL

Subject Code: R20EAP1201

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

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I B.Tech – I Semester Model Question Paper

APPLIED PHYSICS

(Electronics & Communication Engineering)

Duration: 3 Hrs

Max Marks: 70M

Section - A

Answer All the following questions

Marks: 5Qx4M = 20M

1. Explain de Broglie concept of matter waves.
2. Discuss Fermi level dependence on temperature in intrinsic semiconductor
3. Write a short note on radiative and non-radiative recombination mechanism in semiconductors.
4. What is population inversion and how does it achieve? Explain.
5. Write note on Ferroelectricity.

Section - B

Answer any FIVE questions choosing at least one from each Unit

Marks: 5Qx10M = 50M

UNIT - I

6. Discuss photo electric effect and derive the Einstein photo electric equation.

(OR)

7. Write down the Schrodinger's wave equation for a particle in a box. Solve it to obtain eigen function and show that Eigen values are discrete.

UNIT - II

8. Derive an expression for carrier concentration in an n-type semiconductor.

(OR)

9. Explain the Hall effect in metal? Derive the formulae to determine hall coefficient and mobility of electrons.

UNIT - III

10. Explain with neat diagram, the construction and working of solar cell. State few disadvantages of solar cell.

(OR)

11. What is an LED? Explain the construction and working of LED.

UNIT - IV

12. a) Describe the construction and working of Ruby laser with relevant energy level diagram.
b) Explain in detail applications of lasers in various fields.

(OR)

13. a) Define acceptance angle of an optical fiber and derive an expression for it in terms of refractive indices of the core and cladding.

- b) Find the numerical aperture and acceptance angle of a fiber with core of index 1.4 and fractional refractive index change of 0.02.

UNIT - V

14. a) State and explain Maxwell's equations and express them in differential form.
b) Explain how the dielectric constant of a ferroelectric crystal varies with temperature.

(OR)

15. Explain the different types of magnetic material.

BR-18

Subject Code: R18EAP1201

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

I B.Tech – I Semester –End Examinations (Regular) December - 2018**APPLIED PHYSICS**

(Electronics & Communication Engineering)

Duration: 3 Hrs**21.12.2018****Max Marks: 70M****Section - A****Answer All the following questions****Marks: 5Qx4M = 20M**

1. Explain photoelectric effect in brief.
2. Discuss Fermi level dependence on temperature.
3. Write a short note on radiative recombination mechanism in semiconductors.
4. What is population inversion and how does it achieve? Explain.
5. State and explain Ampere's and Faraday's laws.

Section - B**Answer any FIVE questions choosing at least one from each Unit****Marks: 5Qx10M = 50M****UNIT - I**

6. Discuss Compton effect and derive the expression for Compton shift.

(OR)

7. Write down the Schrodinger's wave equation for a particle in a box. Solve it to obtain eigen function and show that Eigen values are discrete.

UNIT - II

8. Derive an expression for carrier concentration in an n-type semiconductor.

(OR)

9. Explain the Hall effect in metal? Derive the formulae to determine hall coefficient and mobility of electrons.

UNIT - III

10. Explain with neat diagram, the construction and working of solar cell. State few disadvantages of solar cell.

(OR)

11. What is an LED? Explain the construction and working of LED.

UNIT - IV

12. a) Describe the construction and working of Ruby laser with relevant energy level diagram.
b) Explain in detail applications of lasers in various fields.

(OR)

13. a) Define acceptance angle of an optical fiber and derive an expression for it in terms of refractive indices of the core and cladding.
- b) Find the numerical aperture and acceptance angle of a fiber with core of index 1.4 and fractional refractive index change of 0.02.

UNIT - V

14. a) State and explain Maxwell's equations and express them in differential form.
- b) Explain how the dielectric constant of a ferroelectric crystal varies with temperature.

(OR)

15. Explain the different contributions for the formation of domains in a ferromagnetic material.

BR-18

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

D4

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

I B.Tech - I Semester - I Mid Term Examinations, September - 2018

(R18EAP1101) APPLIED PHYSICS - (Electronics & Communication Engineering)

Duration: 90Mins

I Day - AN

Max Marks: 25M

Section – A

Answer All the questions

Marks: 5Qx1M = 5M

1. Write the equation for de Broglie's wavelength.
2. State Heisenberg's uncertainty Principle.
3. What is semiconductor? Write the types of semiconductors.
4. Define n-type semiconductor.
5. What is non-radiative recombination?

Section – B

Answer any FOUR questions

Marks: 4Qx5M = 20M

6. What is Compton shift? Derive the expression for Compton shift.
7. Obtain Schrodinger's time Independent wave equation for matter waves.
8. Deduce an expression for Density of electrons in the conduction band of an intrinsic
9. Explain the principle and construction of BJT.
10. Deduce an expression for majority charge carriers in p-type semiconductor.
11. Explain V-I characteristics of LED.

BR-18

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

D4

(An Autonomous Institution Under 2(f) and 12(B) of UGC Act 1956, New Delhi)

I B.Tech - I Semester - II Mid Term Examinations, Nov/Dec- 2018

(R18EAP1201) APPLIED PHYSICS - (Electronics & Communication Engineering)

Duration: 90Mins

Date: 29.11.2018 AN

Max Marks: 25M

Section – A

Answer All the questions

Marks: 5Qx1M = 5M

1. Write short notes on photo diode.
2. What is Population Inversion and Meta stable state?
3. Define Total Internal Reflection.
4. State the laws of electrostatics.
5. What is Hysteresis?

Section – B

Answer any FOUR questions

Marks: 4Qx5M = 20M

6. Explain construction and discuss I-V characteristics of Avalanche photo diode.
7. Explain semiconductor Laser diode.
8. Discuss the applications of optical fibers.
9. Deduce an expression for Numerical aperture of an Optical fiber.
10. Write fundamental laws of electromagnetism and derive equation of continuity.
11. a) Define the terms i) Permeability ii) Susceptibility iii) Magnetization.
b) Write the applications of magnetic materials.

SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

(An Autonomous Institution under UGC, New Delhi)

Recognized under 2(f) and 12(B) of UGC Act 1956

I B.Tech – I Semester –End Examinations (Regular) December - 2018**APPLIED PHYSICS****(Electronics & Communication Engineering)****Duration: 3 Hrs****21.12.2018****Max Marks: 70M****Section - A****Answer All the following questions****Marks: 5Qx4M = 20M**

16. Explain photoelectric effect in brief.
17. Discuss Fermi level dependence on temperature.
18. Write a short note on radiative recombination mechanism in semiconductors.
19. What is population inversion and how does it achieve? Explain.
20. State and explain Ampere's and Faraday's laws.

Section - B**Answer any FIVE questions choosing at least one from each Unit****Marks: 5Qx10M = 50M****UNIT - I**

21. Discuss Compton effect and derive the expression for Compton shift.

(OR)

22. Write down the Schrodinger's wave equation for a particle in a box. Solve it to obtain eigen function and show that Eigen values are discrete.

UNIT - II

23. Derive an expression for carrier concentration in an n-type semiconductor.

(OR)

24. Explain the Hall effect in metal? Derive the formulae to determine hall coefficient and mobility of electrons.

UNIT - III

25. Explain with neat diagram, the construction and working of solar cell. State few disadvantages of solar cell.

(OR)

26. What is an LED? Explain the construction and working of LED.

UNIT - IV

27. a) Describe the construction and working of Ruby laser with relevant energy level diagram.
b) Explain in detail applications of lasers in various fields.

(OR)

28. a) Define acceptance angle of an optical fiber and derive an expression for it in terms of refractive indices of the core and cladding.

- b) Find the numerical aperture and acceptance angle of a fiber with core of index 1.4 and fractional refractive index change of 0.02.

UNIT - V

29. a) State and explain Maxwell's equations and express them in differential form.
b) Explain how the dielectric constant of a ferroelectric crystal varies with temperature.

(OR)

30. Explain the different contributions for the formation of domains in a ferromagnetic material.

Section – A**Answer All the questions****Marks: 5Qx1M = 5M**

1. Write the equation for de Broglie's wavelength.
2. State Heisenberg's uncertainty Principle.
3. What is semiconductor? Write the types of semiconductors.
4. Define n-type semiconductor.
5. What is non-radiative recombination?

Section – B**Answer any FOUR questions****Marks: 4Qx5M = 20M**

6. What is Compton shift? Derive the expression for Compton shift.
7. Obtain Schrodinger's time Independent wave equation for matter waves.
8. Deduce an expression for Density of electrons in the conduction band of an intrinsic
9. Explain the principle and construction of BJT.
10. Deduce an expression for majority charge carriers in p-type semiconductor.
11. Explain V-I characteristics of LED.

Section – A**Answer All the questions****Marks: 5Qx1M = 5M**

1. Write short notes on photo diode.
2. What is Population Inversion and Meta stable state?
3. Define Total Internal Reflection.
4. State the laws of electrostatics.
5. What is Hysteresis?

Section – B**Answer any FOUR questions****Marks: 4Qx5M = 20M**

6. Explain construction and discuss I-V characteristics of Avalanche photo diode.
7. Explain semiconductor Laser diode.
8. Discuss the applications of optical fibers.
9. Deduce an expression for Numerical aperture of an Optical fiber.
10. Write fundamental laws of electromagnetism and derive equation of continuity.
11. a) Define the terms i) Permeability ii) Susceptibility iii) Magnetization.
b) Write the applications of magnetic materials.



Weblinks

1. <http://www.people.fas.harvard.edu/~djmorin/waves/quantum.pdf>
2. [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Map%3A_Physical_Chemistry_\(McQuarrie_and_Simon\)/01%3A_The_Dawn_of_the_Quantum_Theory/1.3%3A_Photoelectric_Effect_Explained_with_Quantum_Hypothesis](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Map%3A_Physical_Chemistry_(McQuarrie_and_Simon)/01%3A_The_Dawn_of_the_Quantum_Theory/1.3%3A_Photoelectric_Effect_Explained_with_Quantum_Hypothesis)
3. [https://phys.libretexts.org/Bookshelves/University_Physics/Book%3A_University_Physics_\(OpenStax\)/Map%3A_University_Physics_III_-_Optics_and_Modern_Physics_\(OpenStax\)/6%3A_Photons_and_Matter_Waves/6.3%3A_The_Compton_Effect](https://phys.libretexts.org/Bookshelves/University_Physics/Book%3A_University_Physics_(OpenStax)/Map%3A_University_Physics_III_-_Optics_and_Modern_Physics_(OpenStax)/6%3A_Photons_and_Matter_Waves/6.3%3A_The_Compton_Effect)
4. <https://nptel.ac.in/courses/122101002/downloads/lec-25.pdf>
5. <http://www3.imperial.ac.uk/pls/portallive/docs/1/2475915.PDF>
6. http://www.optique-ingenieur.org/en/courses/OPI_ang_M05_C02/co/Contenu_04.html
7. <https://www2.mvcc.edu/users/faculty/jfiore/Linear/SemiconductorDevices.pdf>
8. <https://www.allaboutcircuits.com/technical-articles/an-introduction-to-optoelectronics/>
9. file:///C:/Users/sri%20indu/Downloads/190_Sample-Chapter.pdf
10. http://gn.dronacharya.info/ECE2Dept/Downloads/question_papers/ISem/Engg-Physics/UNIT-II/Dielectric-Magnetic-Properties.pdf
11. <https://allbtechblog.files.wordpress.com/2016/08/dielectrics-lecture-notes.pdf>
12. <https://www.toppr.com/guides/physics/semiconductor-electronics-materials-device-and-simple-circuits/special-purpose-p-n-junction-diode/>



SRI INDU COLLEGE OF ENGINEERING & TECHNOLOGY

B.TECH – DEPARTMENT OF HUMANITIES & SCIENCES

Academic Year: 2021-2022 B.Tech I Year I Sem

(R20EAP1101)APPLIED PHYSICS

Content beyond the Syllabus

S.No	Topics	Proposed Actions	Date	Resource Person/Mode	POs	PSOs
1	GP Thomson Experiment	Seminar		Guest lecture/ Virtual class	PO1	PSO1
2	Electron microscope Method	PPT		Guest lecture/ Virtual class	PO1	PSO1
3	Applications of Heisenberg's uncertainty principle	Seminar		Guest lecture/ Virtual class	PO2	PSO1
4	Full wave & Half wave Rectifiers	PPT		Guest lecture/ Virtual class	PO2,PO5	PSO2,PSO3
5	Superconductivity	Seminar		Guest lecture/ Virtual class	PO2	PSO2,PSO3



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(R20EAP1101)APPLIED PHYSICS

ASSIGNMENT

S.No.	Assignment Questions	Course Outcome	Books To be Referred	Date Of Announcement	Date Of Submission
1	Explain de-Broglie concept of matter waves & Explain how Davisson-Germer experiment verifies dual nature of matter	CO1	T1		
2	Define Photo electric effect. Explain Einsteins Photoelectric equation.	CO1	T1		
3	Define Wave function. Obtain Schrodinger time independent wave equation	CO1	T1		
4	Obtain Eigen values & Eigen function for a free particle in one dimensional potential box/infinite square well potential	CO1	T1		
5	Distinguish between intrinsic and extrinsic semiconductors	CO2	T1		
6	State and explain Hall effect. Derive Hall coefficient	CO2	T1		
7	Explain V-I Characteristics of P-N junction diode & Zener diode	CO2	T1		
8	Explain the principle & working of BJT	CO2	T1		
9	State the principle and working of LED	CO3	T1		
10	Distinguish radiative & non-radiative recombination of charge carriers	CO3	T1		
11	State & explain Hall effect	CO3	T1		



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(R20EAP1101)APPLIED PHYSICS

QUESTION BANK WITH BLOOMS TAXONOMY LEVEL (BTL)

UNIT-1 QUANTUM MECHANICS			
4 MARKS QUESTIONS		BT Level	Course Outcome
1.	State & Explain Photo electric effect (Dec-2018)	2	CO1
2.	What are de-Broglie waves. Derive debrogile wavelength for an electron (July-2021)	2	CO1
3.	State and explain Heisenberg's uncertainty principle (July-2021, Sep-2020)	1	CO1
4.	What is Compton shift? (July-2021)	2	CO1
5.	Explain Black body radiation(Sep-2020)	2	CO1
10 MARKS QUESTIONS			
1.	Explain Black body radiation. Derive Planck's radiation law (Sep-2021)	2	CO1
2.	State and explain Photo electric effect (Dec-2018)	2	CO1
3.	Illustrate Davisson-Germer experiment which supports the existence of matter waves. (JULY-2021)	2	CO1
4.	Derive Schrodinger's time Independent wave equation for matter waves starting from wave function. (July-2021)	3	CO1
5.	What is Compton shift? Derive the expression for Compton shift. (DEC-2018)	3	CO1
6.	State and explain Photo electric effect and derive Einstein's photo electric equation. (Dec-2018, July-2021)	4	CO1
7.	State the basic postulates of Planck's quantum theory and determine the energy density of a black body radiation. (Sep-2021)	3	CO1
8.	Explain de-Broglie matter waves for a particle. (July-2021)	2	

9	Photo electric effect is a frequency dependent phenomenon and not intensity dependent one explains. (Dec-2018, July-2021)	2	CO1
Unit -II : SEMICONDUCTOR PHYSICS			
4 MARKS QUESTIONS			
1.	Explain carrier generation and recombination process in semiconductors(Sep-2021)	2	CO2
2.	Distinguish diffusion and drift of charge carriers in semiconductors. (July-2021, Sep-2020)	2	CO2
3.	Explain zener diode as voltage regulator (Dec-2018)	4	CO2
4.	Explain the Avalanche diode (Sep-2021)	2	CO2
5.	Distinguish between intrinsic and extrinsic semiconductor(Sep-2021)	2	CO2
6.	Explain the significance of hall coefficient. (Dec-2018, Nov-2020)	1	CO2
10 MARKS QUESTIONS			
1	Distinguish between intrinsic and extrinsic semiconductor (Sep-2021)	2	CO2
2.	Deduce an expression for Density of electrons in the conduction band of an intrinsic semiconductor.(May-2019)	5	CO2
3.	State Hall Effect. Derive Hall coefficient for a semiconductor and write its applications.(Dec-2018, Nov-2020)	2	CO2
4.	Deduce an expression for density of holes in the valence band of an intrinsic semiconductor. (July-2021)	5	CO2
5.	Deduce an expression for majority charge carriers in p-type semiconductor. (Nov-2020)	2,5	CO2
6.	Explain the variation Fermi level with temperature in intrinsic and extrinsic semiconductors. (Sep-2021)	2	CO2
7.	Deduce an expression for majority charge carriers in n-type semiconductor.(Dec-2018)	2,5	CO2
8	What is p-n junction diode? Explain V-I characteristics of p-n junction diode	2	CO2
9	Explain the construction and working of Bipolar Junction Transistor (BJT). (Nov-2020,July-2021, Sep-2021)	2	CO2
10	Explain the Avalanche and Zener Breakdowns in PN junction diode(July-2021)	2	CO2
Unit – III : OPTOELECTRONICS			
4 MARKS QUESTIONS			
1.	Write a short note on radiative recombination mechanism in semiconductors(Dec-2018)	1	CO3

2.	Discuss the working of Avalanche of photo diode.(July-2021, Sep-2021)	1	CO3
3	Explain the principle of LED(Dec-2018, Nov-2020,July-2021)	2	CO3
4.	Write a short note on Solar cell(Dec-2018,July-2021, Sep-2021)	2	CO3
5	Explain the working of semiconductor laser diode(Dec-2018, Nov-2020)	2	CO3

10 MARK QUESTIONS

1.	Distinguish between direct and indirect band gap semiconductors. (Dec-2018,June-2019, Nov-2020)	2	CO3
2	Write the characteristics of a PIN diode. Explain its working.(Nov-2020)	2	CO3
3.	Explain the construction and working of LED(Dec-2018, Nov-2020,July-2021)	2	CO3
4	Discuss the working of Semiconductor Laser. (Dec-2018, Nov-2020)	2	CO3
5	Explain working principle of Solar cell. Draw and explain V-I characteristics of a solar cell. (Dec-2018,July-2021, Sep-2021)	2	CO3
6	Define Avalanche Break down and the working of Avalanche photo diode.(July-2021, Sep-2021)	4	CO3

Unit-IV LASERS & FIBER OPTICS

4 MARKS QUESTIONS

1.	Explain the lasing action (May-2019)	2	CO4
2.	Define Acceptance angle and Acceptance cone (Dec-2018)	2	CO4
3.	Explain the principle of optical fiber (July -2021)	1	CO4
4.	Write the applications of lasers (Dec-2020)	1	CO4
5.	Explain characteristics of Lasers (Sep-2021)	1,2	CO4
6.	Define population inversion, pumping mechanism, meta stable state(Dec-2018)	2	CO4

10 MARK QUESTIONS

1.	Explain the interaction of radiation with matter (July-2021)	2	CO4
2.	Discuss the construction and working of a Ruby laser. (Dec-2018)	2	CO4
3.	How lasing action is achieved in He- Ne gas laser. Explain. (Nov-2020,Dec-2020,July-2021)	2	CO4
4.	Explain the construction and working of Carbon Dioxide laser (CO ₂ Laser)(July-2021)	2	CO4

5.	Define Acceptance angle and Acceptance cone. Deduce the expression for acceptance angle and numerical aperture for an optical fiber. (dec-2018, Nov-2020, Sep-2021))	2,4	CO4
6.	Categorize the applications on lasers in various fields. (July-2021)	2	CO4
7.	Explain losses associated with optical fibers.(July-2021)	2	CO4
8.	Explain the types of optical fibers.(Sep-2021)	4	CO4
9.	Write short note population inversion, pumping mechanism, meta stable state(Dec-2018)	2	CO4
Unit-V: ELECFROMAGNETISM & PROPERTIES OF MAGNETIC MATERIALS			
4 MARKS QUESTIONS			
1.	Define the terms i) Permeability ii) Susceptibility iii) Magnetization iv) Magnetic moment (Dec-2018)	2	CO5
2.	Define electric current. Explain continuity equation (Sep-2021)	1	CO5
3.	State the laws of electrostatics.(Nov-2020)	1	CO5
4.	Define i) dielectric constant ii) dielectric susceptibility iii) polarization (Nov-2020)	1	CO5
5.	State and explain Amperes law and Faradays law (Nov-2020)	1	CO5
6.	Write a short note on Hysteresis? (Sep-2021)	2	CO5
7.	Write the applications of magnetic materials.(Sep-2021)	2	CO5
10 MARK QUESTIONS			
1.	State and explain Maxwell's equations and express them in differential form. (Dec-2018 , Nov-2020)	4	CO5
2.	Explain how the dielectric constant of a ferroelectric crystal varies with temperature(Nov-2020)	2	CO5
3.	Explain the different contributions for the formation of domains in a ferromagnetic material.(Dec-2018)	3	CO5
4.	Deduce an expression for Internal field in a solid (Nov-2020)	2,5	CO5
5.	Explain the classification of magnetic materials with examples (May-2019)	1,2	CO5
6.	Derive Clausius-Mossotti relation (May-2019)	5	CO5
7.	Give an account on domain theory of ferromagnetism(Dec-2018,Nov-2020)	3	CO5
8.	Explain the phenomena of Ferro electricity and peizo electricity(Dec-2018)	2	CO5

(1. Remembering 2. Understanding 3. Applying 4. Analyzing 5. Evaluating 6. Creating)



Sri Indu College of Engineering and Technology

(An Autonomous Institution Under UGC)

Department of HUMANITIES & SCIENCES

INDIVIDAL TIME TABLE

NAME OF THE FACULTY	CH.ASHOK KUMAR	SUBJECTS	APPLIED PHYSICS(ECE-D) APPLIED PHYSICS LAB
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TIME	09:40am To 10:30am	10:30am To 11:20pm	11:20am To 12:10pm	L U N C H	12:40pm To 1:45pm	1:45pm To 2:50pm	2:50pm To 4:00pm	
DAY	1	2	3		4	5	6	
MON							ECE-D	
TUE	ECE-D							
WED		ECE-D				ECE-D(AP LAB)		
THU						ECE-A(AP LAB)		
FRI						ECE-D		
SAT		ECE-D						

HOD

PRINCIPAL