

# Department of Humanities & Science

F.E. (Common to all Branches) (semester I)

## Course Outcomes & Assessment Plan

Subject: Engineering Physics-I

Course Code	Course Name	Teaching Scheme (Contact Hours)			Credits Assigned					
		Theory	Pract.	Tut.	Theory	TW/Pract	Tut.	Total		
FEC102	Engineering Physics-I	02	01	--	02	0.5	--	2.5		
Course Code	Course Name	Examination Scheme								
		Theory				End Sem Exam	Term Work	Pract	Oral	Total
		Internal Assessment								
		Test1	Test2	Av of Test 1 & 2						
FEC102	Engineering Physics-I	15	15	15	60	25	--	--	100	

Module	Detailed Contents	Hrs.
01	<p><b>QUANTUM PHYSICS</b></p> <p><b>(Prerequisites : Dual nature of radiation, Photoelectric effect Matter waves-wave nature of particles, de-Broglie relation, Davisson-Germer experiment)</b></p> <p>De Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity; Wave function; Physical interpretation of wave function; Heisenberg uncertainty principle; non existence of electron in nucleus; Schrodinger's time dependent wave equation; time independent wave equation; Particle trapped in one dimensional infinite potential well, Quantum Computing.</p>	07
02	<p><b>SOLID STATE PHYSICS - CRYSTALLOGRAPHY</b></p> <p><b>(Prerequisites : Crystal Physics (Unit cell, Space lattice, Crystal structure, Simple Cubic, Body Centered Cubic, Face Centered Cubic, Diamond Structure, Production of X-rays)</b></p> <p>Miller indices; interplanar spacing; X-ray diffraction and Bragg's law; Determination of Crystal structure using Bragg's diffractometer;</p>	03

03	<p><b>SOLID STATE PHYSICS - SEMICONDUCTORS</b></p> <p><b>(Prerequisites: Intrinsic and extrinsic semiconductors, Energy bands in conductors, semiconductors and insulators, Semiconductor diode, I-V characteristics in forward and reverse bias)</b></p> <p>Direct &amp; indirect band gap semiconductor; Fermi level; Fermi dirac distribution; Fermi energy level in intrinsic &amp; extrinsic semiconductors; effect of impurity concentration and temperature on fermi level; mobility, current density; Hall Effect; Fermi Level diagram for p-n junction (unbiased, forward bias, reverse bias); Applications of semiconductors: LED, Zener diode, Photovoltaic cell.</p>	06
04	<p><b>OPTICS-I</b></p> <p><b>(Prerequisites : Wave front and Huygen's principle, reflection and refraction, Interference by division of wave front, Youngs double slit experiment)</b></p> <p>Interference by division of amplitude, Interference in thin film of constant thickness due to reflected and transmitted light; origin of colours in thin film; Wedge shaped film; Newton's rings.</p> <p>Applications of interference - Determination of thickness of very thin wire or foil; determination of refractive index of liquid; wavelength of incident light; radius of curvature of lens; testing of surface flatness; Anti-reflecting films and Highly reflecting film.</p>	06
05	<p><b>SUPERCONDUCTORS AND SUPERCAPACITORS</b></p> <p>(Prerequisites : Electric current, flow of electric charges in a metallic conductor, drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, V-I characteristics (linear and non-linear), electrical resistivity and conductivity temperature dependence of resistance)</p> <p><b>Superconductors:</b> Critical temperature, critical magnetic field, Meissner's effect, Type I and Type II and high T<sub>c</sub> superconductors;</p> <p><b>Super capacitors:</b> Principle, construction, types, materials and applications, comparison with capacitor and batteries : Energy density, Power density,</p>	02
06	<p><b>ENGINEERING MATERIALS AND APPLICATIONS</b></p> <p>(Prerequisites: Paramagnetic materials, diamagnetic materials, ferromagnetic materials, crystal physics, Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance)</p> <p><b>Liquid crystals:</b> Nematic, Smectic and cholesteric phases, Liquid crystal display.</p> <p><b>Multiferroics :</b> Type I &amp; Type II multiferroics and applications, Magnetoresistive Oxides: Magnetoresistance, GMR and CMR materials, introduction to spintronics.</p>	02

## Objectives

1. To understand basic physics concepts and founding principles of technology.
2. To develop scientific temperament for scientific observations, recording, and inference drawing essential for technology studies.



## Practical

Five practical will be conducted as per schedule.

### Rubrics for practical Grading:

Indicator	Poor	Average	Good
Punctuality(2)	Two sessions late(0)	One session late (1)	In time submission(2)
Preparedness (2)	No idea about experiment(0)	Read the manual and have some idea(1)	Read Manual and know the procedure(2)
Participation (3)	No involvement(0)	Passive involvement(2)	Active involvement(3)
Presentation(3)	Poor readability and somewhat structured (1)	Readable with one or two mistakes and structured (2)	Very well written and structured without any mistakes (3)

### Suggested Experiments: (Any five)

1. Determination of radius of curvature of a lens using Newton's ring set up
2. Determination of diameter of wire/hair or thickness of paper using Wedge shape film method.
3. Study of Miller Indices.
4. Study of Hall Effect.
5. Determination of energy band gap of semiconductor.
6. Study of Zener diode as voltage regulator.
7. Study of I/V characteristics of LED
8. Determination of 'h' using Photo cell.
9. Study of I / V characteristics of semiconductor diode
10. Charging and discharging characteristics of supercapacitor.
11. Simulation study of orientational ordering in Nematic like 2D liquid crystal.
12. Simulation experiments based on engineering materials using open source simulation softwares like Avogadro, Chimera, JMOL etc.

### The distribution of Term Work marks will be as follows –

1. Attendance (Theory and Practical) : 05 marks
2. Project Groupwise ( TOPIC Presentation) : 10 marks
3. Laboratory work (Experiments and Journal) : 10 marks

### Assessment:

#### Internal Assessment Test:

Assessment consists of two class tests of 15 marks each. The first class test is to be conducted when approx. 40% syllabus is completed and second class test when additional 35% syllabus is completed. Duration of each test shall be one hour.

### End Semester Theory Examination:

1. Question paper will comprise of total 06 questions, each carrying 15 marks.
2. Total 04 questions need to be solved.
3. Question No: 01 will be compulsory and based on entire syllabus wherein sub-questions of 2 to 3 marks will be asked.

4. Remaining questions will be randomly selected from all the modules.
5. In question paper weightage of each module will be proportional to number of respective lecture hrs as mentioned in the syllabus.

## **References**

1. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
2. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
3. Fundamentals of optics by Jenkins and White, McGrawHill
4. Solid State Electronic Devices- B. G. Streetman, Prentice Hall Publisher
5. Modern Engineering Physics – Vasudeva, S.Chand
6. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill
7. A text book of Engineering Physics-Avadhanulu & Kshirsagar, S. Chand
8. A textbook of Optics - N. Subramanyam and Brijlal, S.Chand
9. Fundamentals of optics by Jenkins and White, McGrawHill
10. Solid State Electronic Devices- B. G. Streetman, Prentice Hall Publisher
11. Modern Engineering Physics – Vasudeva, S.Chand
12. Concepts of Modern Physics- Arther Beiser, Tata McGraw Hill
13. A Text Book of Engineering Physics, S. O. Pillai, New Age International Publishers.
14. Introduction to Solid State Physics- C. Kittel, John Wiley& Sons publisher
15. Ultracapacitors: The future of energy storage- R.P Deshpande, McGraw Hill
16. Advanced functional materials – Ashutosh Tiwari, Lokman Uzun, Scrivener Publishing LLC.

Lect No	Topic Planned	Planned Date	Actual Date	Mapped CO	Content Delivery Method
1	Introduction to syllabus and University exam pattern	13/08/2019	13/08/2019	All	
2	Dual nature of radiation, Photoelectric effect Matter waves-wave nature of particles, de-Broglie relation, Davisson-Germer experiment	14/08/2019	14/08/2019	CO1	
3	De Broglie hypothesis of matter waves; properties of matter waves; wave packet, phase velocity and group velocity;	19/08/2019	20/08/2019	CO1	
4	Numericals on De Broglie Wavelength and Wave function; Physical interpretation of wave function;	20/08/2019	21/08/2019	CO1	
5	Heisenberg uncertainty principle; non existence of electron in nucleus; Numericals on H.U.P	21/08/2019	26/08/2019	CO1	
6	Schrodinger's time dependent wave equation; time independent wave equation;	26/08/2019	28/08/2019	CO1	
7	Particle trapped in one dimensional infinite potential well	28/08/2019	09/09/2019	CO1	
8	Numericals and Quantum Computing	09/09/2019	11/09/2019	CO1	
9	Crystal Physics and Miller indices;	11/09/2019	16/09/2019	CO2	
10	Interplanar spacing; X-ray diffraction and Bragg's law;	16/09/2019	18/09/2019	CO2	
11	Determination of Crystal structure using Bragg's diffractometer;	18/09/2019	23/09/2019	CO2	
12	Intrinsic and extrinsic semiconductors, Energy bands in conductors, semiconductors and insulators,	23/09/2019	28/09/2019	CO3	
13	Direct & Indirect band gap semiconductor; Fermi level; Fermi dirac distribution; Mobility, Current density;	25/09/2019	30/09/2019	CO3	
14	Fermi energy level in intrinsic & extrinsic semiconductors; effect of impurity concentration and temperature on fermi level;	30/09/2019	01/10/2019	CO3	
15	Hall Effect and Numericals.	01/10/2019	07/10/2019		
16	Fermi Level diagram for p-n junction (unbiased, forward bias, reverse bias);	07/10/2019	09/10/2019	CO3	
17	Applications of semiconductors: LED, Zener diode, Photovoltaic cell.	09/10/2019	14/10/2019	CO3	
18	Wave front and Huygen's principle, reflection and refraction, Interference by division of wave front, Youngs double slit experiment	14/10/2019	15/10/2019	CO3	
19	Interference by division of amplitude, Interference in thin film of constant thickness due to reflected and transmitted light;	15/10/2019	16/10/2019	CO4	
20	Origin of colours in thin film; Wedge shaped film; Newton's rings	16/10/2019	22/10/2019	CO4	
21	Numericals on Wedge shaped film; Newton's rings	21/10/2019	22/10/2019	CO4	
22	Applications of interference- Determination of thickness of very thin wire or foil; determination of refractive index of liquid; wavelength of incident light;	22/10/2019	23/10/2019	CO4	
23	Applications of interference- radius of curvature of lens; testing of surface flatness; Anti-reflecting films and Highly reflecting film.	23/10/2019	30/10/2019	CO4	
24	Superconductors: Critical temperature, critical magnetic field, Meissner's effect, Type I and Type II and high Tc superconductors;	30/10/2019	30/10/2019		
25	Supercapacitors: Principle, construction, types, materials and applications, comparison with capacitor and batteries : Energy density, Power density,	04/11/2019	04/11/2019	CO5	
26	Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarisation, capacitors and capacitance	05/11/2019	05/11/2019	CO5	
27	Liquid crystals: Nematic, Smectic and cholesteric phases, Liquid crystal display.	06/11/2019	06/11/2019	CO5	
28	Multiferroics : Type I & Type II multiferroics and applications,		06/11/2019		
29	Magnetoresistive Oxides: Magnetoresistance, GMR and CMR materials, Introduction to spintronics	13/08/2019	13/08/2019	CO6	