

Physics Honours Syllabus under CBCS (2018) University of Calcutta

3 Years B.Sc. Honours Programme

- Programme Outcome (PO)
- Programme Specific Outcome (PSO)
- Course Outcome (CO)
- CO-PO Mapping
- CO-PSO Mapping



• Programme Outcome (PO)

PO 1: Disciplinary knowledge: Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate programme of study.

PO 2: Problem solving (Ap): Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, apply one's learning to real life situations.

PO 3: Critical thinking (An): Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims.

PO 4: Research-related skills / Scientific reasoning: A sense of inquiry and capability for asking relevant/appropriate questions, problematizing, synthesizing and articulating; Ability to recognize cause-and-effect relationships.

PO 5: Communication Skills (U/A): Ability to express thoughts and ideas effectively in writing and orally.

PO 6: Cooperation/Teamwork: Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group.

PO 7: Information/digital literacy: Capability to use ICT in a variety of learning situations. PO 8: Self-directed learning: Ability to work independently, identify appropriate resources required for a project.

PO 9: Multicultural competence: Possess knowledge of the values and beliefs of multiple cultures and a global perspective.

PO 10: Moral and ethical awareness/reasoning: Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives.

PO 11: Leadership readiness/qualities: Capability for mapping out the tasks of a team or an organization and setting direction, formulating an inspiring vision, building a team.

PO 12: Lifelong learning: Ability to acquire knowledge and skills, including "learning how to learn", that are necessary for participating in learning activities throughout life.



• Programme Specific Outcome (PSO)

PSO 1: Imparting in students detailed knowledge in diverse premises of physics that includes classical mechanics, thermal physics, acoustics, wave optics, advanced mathematical physics, electricity & magnetism, quantum mechanics, statistical mechanics, electromagnetic theory, electronics, special theory of relativity and atomic physics, modern physics and modern communication electronics.

PSO 2: Developing capabilities of oral and written scientific communication skill and scientific thinking to appreciate advancement of modern physics in diverse areas.

PSO 3: Knowledge gained through theoretical, computational and lab-based experiments will generate technical personnel in various priority areas of research on basic, applied and interdisciplinary science.

Course Type	Description	Credit
Core Course	Compulsory Basic course	6
(CC)	from Physics	
Generic Elective Course	Elective course	6
(GE)	other than Phyiscs	
	[In first four semesters]	
Skill Enhancement Course	Skill based elective course	2
(SEC)	from Physics	
	In 3rd and 4th Semesters for Hons	
	[In 3rd, 4th, 5th, 6th Semesters for Gen]	
Discipline Specific Elective Course	Specialised elective course	6
(DSE)	from Physics	
	[In 5th and 6th Semester]	
Ability Enhancement Compulsory Course	Not related to Physics	2
(AECC)		
AECC-1 In 1st Semester	Language	
AECC-2 [In 2nd Semester]	Environment Science	

Basic Course Types and Credits under CBCS

A. Teaching Methods

For any course, one of the following modes of teaching will be used

- 1. Theory + Practical
- 2. Theory + Tutorial
- 3. Theory + Project
- 4. Theory only

B. Class Assignments

The class assignment for different course segments (theory, practical, tutorial) are as follows:

- Theory: 1 credit = 1 hour / week
- Practical: 1 credit = 2 hours / week
- Tutorial: 1 credit = 1 hour /week
- Project: 1 credit = 1 hour/week

C. Duration of the Semesters: The semesters will comprise $15\,$ Weeks.

D. The total number of classes

The number of classes for each part is summarised below:

asses for each part is summarised below.	
• Theoretical module (Credit 4)	= 60 Classes
• Practical module (Credit 2)	= 60 Classes
• Tutorial (Credit 1)	= 15 Classes
• Theoretical module, SEC (Credit 2)	= 30 Classes
• Theoretical module, (project type) SEC (credit 1)	= 15 Classes
• Project module, (project type) SEC (credit 1)	= 15 Classes
• Theoretical module, DSE (Credit 5)	= 75 Classes





E. Marks Distribution

The total number for evaluation of each course is 100. Twenty (20) out of hundred (100) is reserved as internal marks where 10 marks come from attendance and 10 from internal assessment examination. The other 80 marks are distributed among different components in different ways for a particular courses. The number distributions are mentioned below.

- CC/GE
 - Attendance 10
 - Internal Assessment 10
 - Theory Examination 50
 - Practical 30
- DSE
 - Attendance 10
 - Internal Assessment 10
 - Theory Examination 65
 - Tutorial 15
- SEC type **1** (Knowledge skill Theory based)
 - Attendance 10
 - Internal Assessment 10
 - Theory Examination 65
 - Tutorial 15
- SEC type 2 (Technical Skill Theory & Project based)
 - Attendance 10
 - Internal Assessment 10
 - Theory Examination 20
 - Project 60

CC1: Mathematical Physics I

CO1: After undergoing this course, the students will be able to Understand Vector algebra and Vector calculus using its laws.

CO2: Formulate matrix problems using matrix addition, multiplication rules.

CO3: Analyze calculus problems using derivatives and partial derivatives.

CO4: Solve differential equations with various levels of difficulty.

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	əcific ə
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	1	3	3	2	1	0	3	0	2	3	0	2	1	3
CO2	2	0	1	2	0	0	2	0	2	1	2	0	0	2	0
CO3	2	2	1	0	3	2	3	1	3	2	2	1	1	0	0
CO4	1	2	1	2	3	3	1	2	3	2	0	2	1	3	1
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.50	1.67	1.50	2.33	2.67	2.00	2.00	2.00	2.67	1.75	2.33	1.50	1.33	2.00	2.00



CC2: Mechanics

CO1: After undergoing the course, the students will be able to Understand the basics laws of kinematics, gravitation etc.

CO2: Apply knowledge of classical mechanics to explain various physical phenomena.

CO3: Analyze how any mechanical system works with the help of laws of mechanics.

CO4: Understand how fluid motion and its kinematics follow Euler's equation, Bernoulli's theorem.

CO5: Differentiate between inertial and non-inertial systems using relativistic laws.

CO-PO-PSO-Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	0	2	0	1	2	3	1	1	3	1	1	2	0	2	0
CO2	2	2	0	0	3	1	0	2	0	2	0	0	0	2	1
CO3	3	3	3	1	1	3	3	3	0	0	2	1	3	3	3
CO4	2	3	0	2	2	2	0	2	0	0	3	2	2	3	2
CO5	1	2	3	3	2	0	3	0	3	2	3	2	3	1	3
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.00	2.40	3.00	1.75	2.00	2.25	2.33	2.00	3.00	1.67	2.25	1.75	2.67	2.20	2.25

CC3: Electricity and Magnetism

CO1: After undergoing this course, the students will be able to Understand the basic principles of electrostatics.

CO2: Calculate the electric field, potential, dipole moments inside a dielectric material.

CO3: Solve Laplace's and Poisson's equation in various situations.

CO4: Understand basic magnetostatics principles and electro-magnetic properties.



CO5: Derive resonance parameters like power dissipation, bandwidth, quality factor for LCR circuits.

CO-PO-PSO-Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	0	3	0	2	2	3	0	3	3	3	1	2	1	1	0
CO2	2	3	1	2	0	0	3	0	3	3	3	3	1	3	2
CO3	1	2	2	3	1	3	1	0	3	2	0	2	1	2	3
CO4	3	3	2	1	0	0	2	1	2	1	1	1	1	2	0
CO5	1	1	3	2	1	3	3	2	3	2	1	3	2	1	2
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.75	2.40	2.00	2.00	1.33	3.00	2.25	2.00	2.80	2.20	1.50	2.20	1.20	1.80	2.33

CC4: Waves and Optics

CO1: After undergoing this course, the students will be able to understand the harmonic oscillations and its mathematical interpretation under various damped conditions.

CO2: Interpret wave motion and superposition of waves for both transverse and longitudinal waves.

CO3: Distinguish between interference and diffraction using wave nature of optics.

CO4: Solve problems related to wave motion, optical interference and diffraction with the help of mathematical inter-relationships.

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	2	3	0	0	0	1	2	2	3	1	1	3	2	1	3
CO2	2	0	2	2	1	2	3	1	2	1	3	0	1	3	0
CO3	3	2	2	0	2	2	1	0	1	0	2	0	1	2	2
CO4	2	3	2	1	3	1	0	1	1	1	0	3	2	1	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.25	2.67	2.00	1.50	2.00	1.50	2.00	1.33	1.75	1.00	2.00	3.00	1.50	1.75	2.50



CC 5: Mathematical Physics-II

CO1: After undergoing this course, the students will be able to Understand how to expand a function in a Fourier series.

CO2: Solve differential equation using power law expansion (so called Frobenius method).

CO3: Solve partial differential equation under different physical conditions.

CO4: Appy probability and various distribution functions in Physics.

CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	2	2	2	2	3	3	3	3	3	0	1	0	1	0	3
CO2	1	0	2	2	1	3	0	2	3	3	0	1	1	0	3
CO3	2	2	2	2	1	1	2	2	3	2	0	3	1	1	2
CO4	1	1	3	2	0	2	1	2	1	2	0	1	1	1	2
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.50	1.67	2.25	2.00	1.67	2.25	2.00	2.25	2.50	2.33	1.00	1.67	1.00	1.00	2.50

CC 6: Thermal Physics

CO1: After undergoing this course, the students will be able to Understand the basic principle and laws of Thermodynamics.

CO2: Interpret microscopic behavior of systems in explaining pressure, transport properties, viscosity, diffusion etc.

CO3: Understand the concepts of Entropy, various thermodynamic potentials and their applications in various systems.

CO4: Differentiate first and second order phase transition with examples.



CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific ∋
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	0	1	3	0	2	3	1	1	0	3	0	3	1	2
CO2	1	2	2	1	3	1	1	3	1	1	3	2	2	1	2
CO3	1	2	3	3	1	3	0	0	2	2	0	2	0	0	3
CO4	2	0	3	1	0	1	0	3	3	3	2	3	1	2	2
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.25	2.00	2.25	2.00	2.00	1.75	2.00	2.33	1.75	2.00	2.67	2.33	2.00	1.33	2.25

CC 7: Modern Physics

CO1: After undergoing this course, the students will be able to Explain the Quantum mechanical phenomenon wave-particle duality, structure of atomic nucleus

CO2: apply probability interpretation in realizing matter waves & Schrodinger equation in describing particle motion at the microscopic range

CO3: analyze how laws of mathematical operators applied to carry out Physical Measurements at low dimension

CO4: Justify nonexistence of electron inside nucleus of an atom using the laws of quantum mechanics

CO5: analyze how light could be amplified and applied at diverse physical situations using photonic theory

CO6: Evaluate the substantive model to explain the structure of an atomic nucleus



Course Outcom e					F	Program	me Outc	ome		1	1		Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	3	2	1	0	1	3	0	3	1	0	0	0	2	3	0
CO2	1	2	1	1	0	2	2	2	1	0	1	0	1	1	0
CO3	1	3	0	2	0	1	1	2	2	2	0	0	1	1	0
CO4	2	1	2	1	0	3	1	0	0	0	1	2	1	2	3
CO5	2	0	1	0	1	0	1	1	2	3	1	0	0	2	3
CO6	1	3	2	1	1	0	1	1	3	2	1	2	1	0	0
CO	1.67	2.20	1.40	1.25	1.00	2.25	1.20	1.80	1.80	2.33	1.00	2.00	1.20	1.80	3.00

SEC A 1: Scientific Writing

CO1: After undergoing the course, the students will be able to Recall the different code syntax of LaTeX for different article types and page layout

CO2: Choose proper syntax for inserting image in a latex document.

CO3: Write scientific equations in a LaTeX document.

CO4: Prepare scientific documents using LaTeX.

CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	3	3	3	2	1	3	0	0	0	0	1	2	3	1
CO2	3	0	3	3	3	3	2	2	1	1	2	3	0	3	1
CO3	2	1	1	0	3	0	2	2	3	3	3	2	1	1	0
CO4	1	0	2	1	1	2	1	3	3	0	2	2	2	2	2
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.75	2.00	2.25	2.33	2.25	2.00	2.00	2.33	2.33	2.00	2.33	2.00	1.67	2.25	1.33

CC 8: Mathematical Physics - III

CO1: After undergoing this course, the students will be able to Apply the knowledge of Euler's formula, Cauchy-Rieman Condition, Residue theorem in case of problems related to functions of complex variables.



CO2: Formulate Euler's equation of motion for harmonic oscillator, simple and spherical pendulum etc.

CO3: Understand Special Theory of Relativity using its postulates, Michelson-Morley experiment and Lorentz transformation.

CO4: Derive simple formulations related to covariant tensors, contravariant vector, four vector, Minkowski Force.

CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	3	0	0	0	3	2	3	0	0	3	3	2	3	1	3
CO2	3	0	2	2	1	0	0	3	0	2	2	2	2	3	2
CO3	3	3	2	2	1	2	0	2	0	0	1	2	0	0	1
CO4	1	3	2	3	3	1	0	1	2	2	1	0	1	2	2
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.50	3.00	2.00	2.33	2.00	1.67	3.00	2.00	2.00	2.33	1.75	2.00	2.00	2.00	2.00

CC 9: Analog Electronics

CO1: After undergoing the course, the students will be able to Understand basic laws and electronics components.

CO2: Apply knowledge of analog electronics using active and passive elements.

CO3: Analize and design circuit diagram based on the requirement.

CO4: Develop hands on skills through laboratory experiments.



Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	əcific ə
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	3	3	3	3	0	2	3	2	1	1	0	2	3	0
CO2	2	2	3	1	1	1	0	3	1	2	3	0	1	1	2
CO3	2	1	1	1	3	1	0	2	3	2	0	3	1	0	3
CO4	2	3	0	1	0	2	0	1	1	1	3	1	2	3	3
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.75	2.25	2.33	1.50	2.33	1.33	2.00	2.25	1.75	1.50	2.33	2.00	1.50	2.33	2.67

CC 10: Quantum Mechanics

CO1: After undergoing this course, the students will be able to Formulate Schrodinger's equation and its solution for the case of simple harmonic oscillator.

CO2: Understand the quantum theory of hydrogen like atoms for Schrodinger Equation in spherical polar coordinate.

CO3: Calculate the spin and generalized angular momentum of an electron using Bohr magneton and g-factor.

CO4: Explain the Zeeman effect, Paschen Back and Stark effect using quantum theory.

Course Outcom e					F	Program	me Outc	ome		9. T			Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	0	2	1	1	3	3	1	2	2	1	0	3	1	2
CO2	3	3	0	1	0	0	2	2	0	2	1	2	3	0	1
CO3	2	1	0	3	3	3	2	1	2	3	2	1	2	1	2
CO4	3	0	1	1	0	3	3	1	2	2	2	0	3	1	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.25	2.00	1.50	1.50	2.00	3.00	2.50	1.25	2.00	2.25	1.50	1.50	2.75	1.00	1.67



SEC B1: Arduino

CO1: After undergoing this course, the students will be able to Understand the basic idea of Arduino with hands on experience on Arduino Board and its software.

CO2: Develop various programs for Arduino board using loops, functions and control elements.

CO3: Construct different Arduino circuit using different types of sensors.

CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	3	0	3	1	3	3	0	0	2	0	1	3	0	3
CO2	2	1	2	0	2	1	1	1	3	2	2	1	0	3	0
CO3	1	3	2	1	1	2	3	3	3	0	1	3	1	1	0
CO4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.33	2.33	2.00	2.00	1.33	2.00	2.33	2.00	3.00	2.00	1.50	1.67	2.00	2.00	3.00

CC 11: Electromagnetic Theory

CO1: After undergoing this course, the students will be able to Understand the basics of Electromagnetic theory in view of Maxwells Equation.

CO2: Explain the propagation of EM wave in bounded and unbounded media.

CO3: Understand the polarization and optical rotation using laws of polarization and Biot's laws for rotatory Polarization.



Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	2	2	3	1	1	1	3	2	0	2	3	0	1	3
CO2	1	0	1	2	2	1	2	3	2	1	3	3	2	3	3
CO3	3	2	3	1	1	3	2	3	3	0	0	2	0	2	3
CO4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.67	2.00	2.00	2.00	1.33	1.67	1.67	3.00	2.33	1.00	2.50	2.67	2.00	2.00	3.00

CC 12: Statistical Physics

CO1: After undergoing this course, the students will be able to Understand classical statistical mechanics with the help of theory of canonical, micro-canonical and grand canonical ensemble.

CO2: Derive Maxwell-Boltzmann distribution for non-interacting identical particles.

CO3: Apply Bose-Einstein Statistics for Bose gas, liquid He IV.

CO4: Formulate Fermi-Dirac Statistics for Fermi gas, Electron gas in metal.

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	2	0	0	1	2	1	1	2	2	1	0	0	2	0	0
CO2	3	0	1	2	1	0	1	1	1	1	3	0	2	3	3
CO3	2	2	1	0	3	3	0	3	3	2	1	1	2	3	0
CO4	3	0	0	2	3	3	3	1	2	2	0	0	1	3	2
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.50	2.00	1.00	1.67	2.25	2.33	1.67	1.75	2.00	1.50	2.00	1.00	1.75	3.00	2.50



DSE A1 (b): LASER and Fiber Optics

CO1: After undergoing this course, the students will be able to Understand the basic operation and structure of LASER and Fiber Optics.

CO2: Apply the knowledge of LASER principles for the case of three level and four level LASER systems.

CO3: Interpret the concept of light properties in fiber optics communication system.

CO4: Solve various problems related to fiber optics design.

CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	2	0	2	0	0	1	2	2	0	0	0	3	1	2
CO2	2	1	2	3	3	0	2	1	3	0	3	2	2	1	2
CO3	2	1	3	0	2	3	2	1	3	2	0	1	3	3	0
CO4	2	1	1	3	2	3	3	3	1	3	3	0	3	3	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.75	1.25	2.00	2.67	2.33	3.00	2.00	1.75	2.25	2.50	3.00	1.50	2.75	2.00	2.00

DSE B1 (b): Nuclear and particle Physics

CO1: After undergoing this course, the students will be able to Understand the basics of nuclear reaction in view of conservation law, kinematics of reactions, Q value and reaction cross section.

CO2: Calculate energy loss due to ionization using Bethe-Block formula.

CO3: Derive detailed formulation of Gamma ray interaction, Photoelectric effect, Compton scattering.

CO4: Explain how the particle accelerator works with the help of theoretical concept of Van-de Graaf generator, Cyclotron, Betatron etc.

CO5: Conceptualize the fundamentals of particle physics with the help of Quark model, spin, parity, lepton number, baryon number etc.





CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome		1	1		Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	2	2	3	2	0	0	3	1	3	1	1	2	0	1	3
CO2	2	3	2	1	2	2	1	0	1	2	3	1	2	0	1
CO3	1	2	1	2	1	3	0	1	2	0	2	3	1	0	1
CO4	1	3	1	0	0	1	0	1	2	1	2	1	3	3	1
CO5	2	3	3	3	2	0	1	2	3	2	1	1	0	3	1
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.60	2.60	2.00	2.00	1.67	2.00	1.67	1.25	2.20	1.50	1.80	1.60	2.00	2.33	1.40

CC 13: Digital Electronics

CO1: After undergoing this course, the students will be able to Understand basics of Boolean algebra to apply in case of digital circuits.

CO2: Identify different types of Logic Gates with the help of circuit diagrams and truth tables.

CO3: Apply the knowledge of digital circuits in case of combinational and sequential circuits.

CO4: Implement the skill gained in digital electronics to design adders, multiplexors, flipflop, counter, register, A/D and D/A converter etc.

Course Outcom e					F	Program	me Outc	ome			1		Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	2	3	1	3	2	1	1	3	3	3	0	0	2	0
CO2	1	1	1	2	3	2	0	3	0	1	1	1	2	3	3
CO3	2	2	2	1	1	0	1	0	0	0	2	3	1	3	0
CO4	3	0	0	3	2	2	3	2	1	3	1	1	3	3	2
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.75	1.67	2.00	1.75	2.25	2.00	1.67	2.00	2.00	2.33	1.75	1.67	2.00	2.75	2.50



CC 14: Solid State Physics

CO1: After undergoing this course, the students will be able to Understand the internal structure of a crystal in the light of X-ray diffraction using Bragg's law.

CO2: Explain the elementary lattice dynamics with the help of phonon theory.

CO3: Differentiate the various properties of dielectric material in view of solidstate physics.

CO4: Interpret the phenomena like superconductivity using the elementary band theory.

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	1	2	0	3	1	2	0	2	0	1	2	3	2	0	2
CO2	3	1	3	3	2	0	0	2	2	3	0	0	3	2	2
CO3	1	2	2	0	0	0	1	3	1	3	3	3	1	3	1
CO4	2	1	3	2	0	0	0	0	2	3	3	2	3	0	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	1.75	1.50	2.67	2.67	1.50	2.00	1.00	2.33	1.67	2.50	2.67	2.67	2.25	2.50	1.67

CO-PO-PSO Mapping:

DSE A1(a): Nanomaterials

CO1: After undergoing this course, the students will be able to Understand the properties of materials in the nano scale systems.

CO2: Differentiate between 1D, 2D and 3D nano material with the help of size effect and using Quantum properties.

CO3: Explain the process of synthesis of Nanomaterials using top-down and bottom-up approach.

CO4: Characterize nanomaterials using SEM, TEM, AFM and STM.

CO5: Apply the knowledge of nanomaterials in the physical system like CNT based transistor, Quantum dot heterostructure LASER, MEMS, NEMS etc.



Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific e
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	2	1	3	0	1	0	0	1	3	3	0	2	3	0	3
CO2	3	1	3	0	0	3	1	2	1	1	0	1	2	1	3
CO3	3	1	3	2	3	1	3	0	3	3	1	3	2	2	3
CO4	1	1	0	2	2	1	1	1	2	2	2	3	0	0	0
CO5	1	1	3	0	1	3	2	3	2	0	1	3	0	3	2
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.00	1.00	3.00	2.00	1.75	2.00	1.75	1.75	2.20	2.25	1.33	2.40	2.33	2.00	2.75

DSE B1(a): Communication Electronics

CO1: After undergoing this course, the students will be able to Understand the basic building blocks of analog and digital communication and formatting analog and digital signal.

CO2: Apply the knowledge of analog and digital communication in case of wireless and mobile communication.

CO3: Analyze and differentiate analog modulation and demodulation techniques.

CO4: Analyze different types of digital transmission and digital modulation techniques.

Course Outcom e					F	Program	me Outc	ome					Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	2	0	0	0	2	1	2	1	1	1	0	2	3	2	3
CO2	1	0	2	1	1	1	3	0	1	3	3	3	0	1	3
CO3	2	1	0	2	3	2	0	1	0	0	3	1	2	1	1
CO4	3	2	0	0	1	0	3	2	3	0	2	2	0	2	0
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.00	1.50	2.00	1.50	1.75	1.33	2.67	1.33	1.67	2.00	2.67	2.00	2.50	1.50	2.33



GE1: Mathematics I

CO1: After undergoing this course, the students will be able to Solve the problems of Algebra using the detailed knowledge of complex numbers, polynomials and matrix.

CO2: Understand the basics of differential calculus to apply in different practical problems.

CO3: Apply differential equations in the problems of first order, second order equations.

CO4: Formulate geometrical problems using the methods of coordinate geometry.

CO-PO-PSO Mapping:

Course Outcom e					F	Program	me Outc	ome	_				Prog (ram Spe Dutcome	ecific
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03
CO1	3	0	2	0	3	0	2	3	3	2	1	3	1	3	2
CO2	2	3	2	0	2	1	1	0	3	2	0	2	2	0	1
CO3	3	1	0	0	1	0	0	2	0	3	2	2	3	1	3
CO4	2	1	1	2	3	0	0	0	0	3	2	0	1	1	1
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CO	2.50	1.67	1.67	2.00	2.25	1.00	1.50	2.50	3.00	2.50	1.67	2.33	1.75	1.67	1.75

GE2: Mathematics II

CO1: After undergoing this course, the students will be able to Solve the problems of vector algebra using rules of addition, multiplication of vector etc.

CO2: Understand the advanced topics of differential calculus to apply in different practical problems.

CO3: Formulate problems of discrete mathematics using the methods mathematical induction, congruence relations and Boolean algebra.

CO4: Apply differential equations in the problems of homogeneous, non-homogeneous and partial differential equations.



Course Outcom e		Programme Outcome													Program Specific Outcome			
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03			
CO1	3	0	2	2	2	0	2	2	1	0	2	2	3	1	1			
CO2	1	1	0	3	0	3	1	3	2	2	3	1	1	0	2			
CO3	1	0	0	3	1	1	0	1	0	3	3	0	3	3	2			
CO4	3	0	2	0	0	3	0	1	2	2	3	3	3	3	2			
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
CO	2.00	1.00	2.00	2.67	1.50	2.33	1.50	1.75	1.67	2.33	2.75	2.00	2.50	2.33	1.75			

GE3: Chemistry III

CO1: After undergoing this course, the students will be able to Understand the general characteristics of ionic and covalent bonding with the help of lattice energy, solvation energy, VSEPR and hybridization and concept of resonance in compounds.

CO2: Compare the elements of p-block of the periodic table in view of the oxidization state, inert pair effect etc.

CO3: Interpret chemical energetics with the help of the laws of thermochemistry.

CO4: Explain the chemical and ionic equilibrium using appropriate applicable principles like Le Chatelier's principle and solubility product principle.

Course Outcom e		Programme Outcome													Program Specific Outcome			
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03			
CO1	1	3	2	3	2	3	2	3	1	0	3	0	0	3	1			
CO2	2	1	2	0	3	3	1	1	0	1	1	3	1	2	1			
CO3	2	1	2	0	3	0	2	0	0	1	1	2	3	2	0			
CO4	2	1	2	0	3	0	0	2	0	3	2	0	0	1	2			
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
CO	1.75	1.50	2.00	3.00	2.75	3.00	1.67	2.00	1.00	1.67	1.75	2.50	2.00	2.00	1.33			



GE4: Chemistry IV

CO1: After undergoing this course, the students will be able to Understand the basics of organic chemistry having different functional groups.

CO2: Formulate the organic reactions applying appropriate rules of organic chemistry.

CO3: Analyse different types of error in quantitative calculations applying methods of least square and standard deviation with the help of computer applications.

CO4: Classify various chemicals used in industrial applications as used in fuels and fertilizers.

1	Course		L				Programma Outcome								Program Specific				
	e		Frogramme Outcome													Outcome			
		PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03			
	CO1	1	0	0	0	2	0	0	3	0	1	1	3	3	2	2			
	CO2	3	0	1	3	1	3	0	2	3	0	2	2	2	2	0			
	CO3	1	2	2	2	1	2	2	3	1	0	1	2	3	0	2			
	CO4	3	1	2	0	0	3	0	2	0	1	2	2	0	0	0			
	CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	CO	2.00	1.50	1.67	2.50	1.33	2.67	2.00	2.50	2.00	1.00	1.50	2.25	2.67	2.00	2.00			

CO-PO-PSO Mapping:

AECC-1: English

CO1: After undergoing this course, the students will be able to Rectify grammatical errors in sentences using appropriate grammatical rules.

CO2: Transform the sentences from one form to another.

CO3: Identify true/false statements from a given passage.



Course Outcom e					F	Programme Outcome								Program Specific Outcome		
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03	
CO1	3	3	1	2	1	3	0	2	1	3	3	3	3	2	1	
CO2	1	2	0	1	2	3	0	1	3	0	2	2	2	0	0	
CO3	3	3	3	3	1	2	3	0	3	1	0	1	3	3	0	
CO4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CO	2.33	2.67	2.00	2.00	1.33	2.67	3.00	1.50	2.33	2.00	2.50	2.00	2.67	2.50	1.00	

AECC-2: Environmental Science

CO1: After undergoing this course, the students will be able to Develop the concept of ecology and ecosystem using various characteristics features.

CO2: Differentiate renewable and non-renewable sources of energy with their effect on the land and the waterbodies.

CO3: Understand the need of biodiversity conservation to save the environment.

					1						1					
Course Outcom e					Programme Outcome								Program Specific Outcome			
	PO 1: Disciplinar y knowledge :	PO 2: Proble m solving	PO 3: Critical thinkin g	PO 4.Research- related skills / Scientific reasoning	PO 5: Commu nication Skills	PO 6: Cooper ation/T eam work	PO 7: Informa tion/digi tal literacy:	PO 8: Self-dire cted learning	PO 9: Multicultur al competence	PO 10: Moral and ethical awareness /reasoning	PO 11: Leadership readiness/qu alities	PO 12: Lifelon g learnin g	PS 01	PS 02	PS 03	
CO1	2	2	3	3	1	0	1	2	3	3	1	0	1	1	1	
CO2	2	3	1	2	2	1	1	1	1	2	1	0	0	2	3	
CO3	1	2	1	0	1	3	1	2	3	3	2	0	1	1	2	
CO4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CO5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CO6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
CO	1.67	2.33	1 67	2 50	1.33	2 00	1 00	1.67	2.33	2.67	1.33	0.00	1 00	1.33	2 00	