

# AAI ATC (Technical)



# DETAILED SYLLABUS

# 2023-24



/PrashantChaturvedi

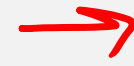


/PrashantChaturvediOfficial



prashantchaturvedi.com

11, 12



Math  
Physics



NCERT

# 11<sup>th</sup> Mathematics

1. Sets

- 1.1 Introduction
- 1.2 Sets and their Representations
- 1.3 The Empty Set
- 1.4 Finite and Infinite Sets
- 1.5 Equal Sets
- 1.6 Subsets
- 1.7 Universal Set
- 1.8 Venn Diagrams
- 1.9 Operations on Sets
- 1.10 Complement of a Set

2. Relations and Functions

- 2.1 Introduction
- 2.2 Cartesian Product of Sets
- 2.3 Relations
- 2.4 Functions

3. Trigonometric Functions

- 3.1 Introduction
- 3.2 Angles
- 3.3 Trigonometric Functions
- 3.4 Trigonometric Functions of Sum and Difference of Two Angles

4. Complex Numbers and Quadratic Equations

- 4.1 Introduction
- 4.2 Complex Numbers

- 4.3 Algebra of Complex Numbers
- 4.4 The Modulus and the Conjugate of a Complex Number
- 4.5 Argand Plane and Polar Representation

5. Linear Inequalities

- 5.1 Introduction
- 5.2 Inequalities
- 5.3 Algebraic Solutions of Linear Inequalities in One Variable and their Graphical Representation

6. Permutations and Combinations

- 6.1 Introduction
- 6.2 Fundamental Principle of Counting
- 6.3 Permutations
- 6.4 Combinations

7. Binomial Theorem

- 7.1 Introduction
- 7.2 Binomial Theorem for Positive Integral Indices

8. Sequences and Series

- 8.1 Introduction
- 8.2 Sequences
- 8.3 Series
- 8.4 Geometric Progression (G.P.)
- 8.5 Relationship Between A.M. and G.M.

9. Straight Lines

- 9.1 Introduction
- 9.2 Slope of a Line
- 9.3 Various Forms of the Equation of a Line
- 9.4 Distance of a Point From a Line

10. Conic Sections

- 10.1 Introduction
- 10.2 Sections of a Cone
- 10.3 Circle



- 10.4 Parabola
- 10.5 Ellipse
- 10.6 Hyperbola



## 11. Introduction to Three Dimensional Geometry

- 11.1 Introduction
- 11.2 Coordinate Axes and Coordinate Planes in Three Dimensional Space
- 11.3 Coordinates of a Point in Space
- 11.4 Distance between Two Points

## 12. Limits and Derivatives

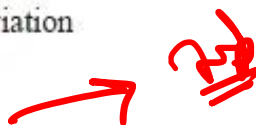
- 12.1 Introduction
- 12.2 Intuitive Idea of Derivatives
- 12.3 Limits
- 12.4 Limits of Trigonometric Functions
- 12.5 Derivatives

## 13. Statistics

- 13.1 Introduction
- 13.2 Measures of Dispersion
- 13.3 Range
- 13.4 Mean Deviation
- 13.5 Variance and Standard Deviation

## 14. Probability

- 14.1 Event
- 14.2 Axiomatic Approach to Probability





/PrashantChaturvedi



/PrashantChaturvediOfficial



prashantchaturvedi.com

# I 2<sup>th</sup> Mathematics

## Part- 01



**Contents of**  
**MATHEMATICS PART I**  
**For Class XII**

- Chapter 1** Relations and Functions
- Chapter 2** Inverse Trigonometric Functions
- Chapter 3** Matrices
- Chapter 4** Determinants
- Chapter 5** Continuity and Differentiability
- Chapter 6** Application of Derivatives



1. **Relations and Functions**

- 1.1 Introduction
- 1.2 Types of Relations
- 1.3 Types of Functions
- 1.4 Composition of Functions and Invertible Function

12<sup>th</sup>

2. **Inverse Trigonometric Functions**

- 2.1 Introduction
- 2.2 Basic Concepts
- 2.3 Properties of Inverse Trigonometric Functions

✓

3. **Matrices**

- 3.1 Introduction
- 3.2 Matrix
- 3.3 Types of Matrices
- 3.4 Operations on Matrices
- 3.5 Transpose of a Matrix
- 3.6 Symmetric and Skew Symmetric Matrices
- 3.7 Invertible Matrices

✓

4. **Determinants**

- 4.1 Introduction
- 4.2 Determinant
- 4.3 Area of a Triangle
- 4.4 Minors and Cofactors
- 4.5 Adjoint and Inverse of a Matrix
- 4.6 Applications of Determinants and Matrices

✓

5. **Continuity and Differentiability**

- 5.1 Introduction
- 5.2 Continuity
- 5.3 Differentiability
- 5.4 Exponential and Logarithmic Functions
- 5.5 Logarithmic Differentiation
- 5.6 Derivatives of Functions in Parametric Forms
- 5.7 Second Order Derivative

✓

6. **Application of Derivatives**

- 6.1 Introduction
- 6.2 Rate of Change of Quantities
- 6.3 Increasing and Decreasing Functions
- 6.4 Maxima and Minima

✓

12<sup>th</sup> (Part-01)



/PrashantChaturvedi



/PrashantChaturvediOfficial



prashantchaturvedi.com

# I 2<sup>th</sup> Mathematics

## Part- 02





7. Integrals ✓

- 7.1 Introduction
- 7.2 Integration as an Inverse Process of Differentiation
- 7.3 Methods of Integration
- 7.4 Integrals of Some Particular Functions
- 7.5 Integration by Partial Fractions
- 7.6 Integration by Parts
- 7.7 Definite Integral
- 7.8 Fundamental Theorem of Calculus
- 7.9 Evaluation of Definite Integrals by Substitution
- 7.10 Some Properties of Definite Integrals

8. Application of Integrals ✓

- 8.1 Introduction
- 8.2 Area under Simple Curves

9. Differential Equations ✓

- 9.1 Introduction
- 9.2 Basic Concepts
- 9.3 General and Particular Solutions of a Differential Equation
- 9.4 Methods of Solving First Order, First Degree Differential Equations

10. Vector Algebra ✓

- 10.1 Introduction
- 10.2 Some Basic Concepts
- 10.3 Types of Vectors
- 10.4 Addition of Vectors
- 10.5 Multiplication of a Vector by a Scalar
- 10.6 Product of Two Vectors

11. Three Dimensional Geometry ✓

- 11.1 Introduction
- 11.2 Direction Cosines and Direction Ratios of a Line
- 11.3 Equation of a Line in Space
- 11.4 Angle between Two Lines
- 11.5 Shortest Distance between Two Lines

12. Linear Programming

- 12.1 Introduction
- 12.2 Linear Programming Problem and its Mathematical Formulation

13. Probability ✓

- 13.1 Introduction
- 13.2 Conditional Probability
- 13.3 Multiplication Theorem on Probability
- 13.4 Independent Events
- 13.5 Bayes' Theorem

Mmmmb

21<sup>st</sup> Feb 2023

PYQ

12<sup>th</sup>

12<sup>th</sup>

Mathematics

~~Mathematics~~ Physics



/PrashantChaturvedi



/PrashantChaturvediOfficial



prashantchaturvedi.com



# 11<sup>th</sup> Physics Part-I



## CONTENTS OF PHYSICS PART I

CHAPTER 1  
UNITS AND MEASUREMENTS ✓

CHAPTER 2  
MOTION IN A STRAIGHT LINE ✓

CHAPTER 3  
MOTION IN A PLANE ✓

CHAPTER 4  
LAWS OF MOTION ✓

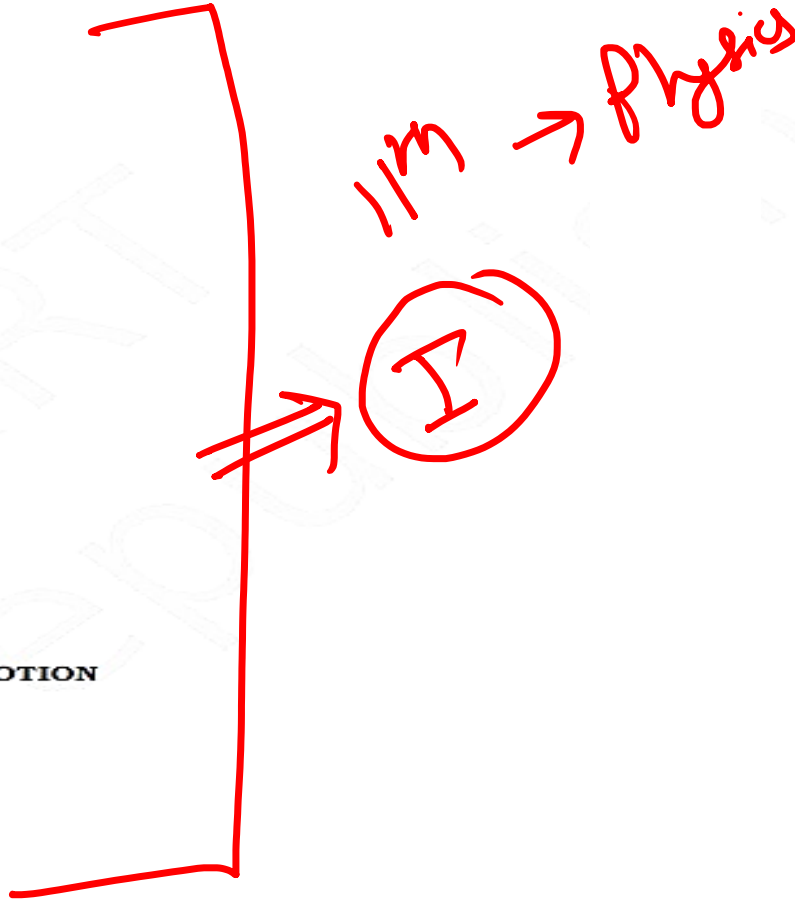
CHAPTER 5  
WORK, ENERGY AND POWER ✓

CHAPTER 6  
SYSTEM OF PARTICLES AND ROTATIONAL MOTION

CHAPTER 7  
GRAVITATION ✓

APPENDICES

ANSWERS



## CHAPTER 1

### UNITS AND MEASUREMENTS

- 1.1 Introduction
- 1.2 The international system of units
- 1.3 Significant figures
- 1.4 Dimensions of physical quantities
- 1.5 Dimensional formulae and dimensional equations
- 1.6 Dimensional analysis and its applications

## CHAPTER 2

### MOTION IN A STRAIGHT LINE

- 2.1 Introduction
- 2.2 Instantaneous velocity and speed
- 2.3 Acceleration
- 2.4 Kinematic equations for uniformly accelerated motion

## CHAPTER 3

### MOTION IN A PLANE

- 3.1 Introduction
- 3.2 Scalars and vectors
- 3.3 Multiplication of vectors by real numbers
- 3.4 Addition and subtraction of vectors – graphical method
- 3.5 Resolution of vectors
- 3.6 Vector addition – analytical method
- 3.7 Motion in a plane
- 3.8 Motion in a plane with constant acceleration
- 3.9 Projectile motion
- 3.10 Uniform circular motion

## CHAPTER 4

### LAWS OF MOTION

- 4.1 Introduction
- 4.2 Aristotle's fallacy
- 4.3 The law of inertia
- 4.4 Newton's first law of motion
- 4.5 Newton's second law of motion
- 4.6 Newton's third law of motion



NLM



- 4.7 Conservation of momentum
- 4.8 Equilibrium of a particle
- 4.9 Common forces in mechanics
- 4.10 Circular motion
- 4.11 Solving problems in mechanics

**C H A P T E R 5**

**WORK, ENERGY AND POWER**

- 5.1 Introduction
- 5.2 Notions of work and kinetic energy : The work-energy theorem
- 5.3 Work
- 5.4 Kinetic energy
- 5.5 Work done by a variable force
- 5.6 The work-energy theorem for a variable force
- 5.7 The concept of potential energy
- 5.8 The conservation of mechanical energy
- 5.9 The potential energy of a spring
- 5.10 Power
- 5.11 Collisions ✓

**C H A P T E R 6**

**SYSTEM OF PARTICLES AND ROTATIONAL MOTION**

- 6.1 Introduction
- 6.2 Centre of mass
- 6.3 Motion of centre of mass
- 6.4 Linear momentum of a system of particles
- 6.5 Vector product of two vectors
- 6.6 Angular velocity and its relation with linear velocity
- 6.7 Torque and angular momentum
- 6.8 Equilibrium of a rigid body
- 6.9 Moment of inertia
- 6.10 Kinematics of rotational motion about a fixed axis
- 6.11 Dynamics of rotational motion about a fixed axis
- 6.12 Angular momentum in case of rotations about a fixed axis

**C H A P T E R 7**

**GRAVITATION**

- 7.1 Introduction
- 7.2 Kepler's laws
- 7.3 Universal law of gravitation
- 7.4 The gravitational constant ✓
- 7.5 Acceleration due to gravity of the earth ✓
- 7.6 Acceleration due to gravity below and above the surface of earth ✓

7.7 Gravitational potential energy

7.8 Escape speed ✓

7.9 Earth satellites

7.10 Energy of an orbiting satellite

Gravitation

Post-1



/PrashantChaturvedi



/PrashantChaturvediOfficial



prashantchaturvedi.com

# 11<sup>th</sup> Physics Part-2



## CHAPTER 8

### MECHANICAL PROPERTIES OF SOLIDS ✓

- 8.1 Introduction
- 8.2 Stress and strain
- 8.3 Hooke's law
- 8.4 Stress-strain curve
- 8.5 Elastic moduli
- 8.6 Applications of elastic behaviour of materials

## CHAPTER 9

### MECHANICAL PROPERTIES OF FLUIDS ✓

- 9.1 Introduction
- 9.2 Pressure
- 9.3 Streamline flow
- 9.4 Bernoulli's principle
- 9.5 Viscosity
- 9.6 Surface tension

## CHAPTER 10

### THERMAL PROPERTIES OF MATTER

- 10.1 Introduction
- 10.2 Temperature and heat
- 10.3 Measurement of temperature
- 10.4 Ideal-gas equation and absolute temperature
- 10.5 Thermal expansion
- 10.6 Specific heat capacity
- 10.7 Calorimetry
- 10.8 Change of state
- 10.9 Heat transfer
- 10.10 Newton's law of cooling

## CHAPTER 11

### THERMODYNAMICS

- 11.1 Introduction
- 11.2 Thermal equilibrium
- 11.3 Zeroth law of thermodynamics
- 11.4 Heat, internal energy and work
- 11.5 First law of thermodynamics
- 11.6 Specific heat capacity



- 11.7 Thermodynamic state variables and equation of state
- 11.8 Thermodynamic processes
- 11.9 Second law of thermodynamics ✓
- 11.10 Reversible and irreversible processes
- 11.11 Carnot engine

## C H A P T E R 12

### KINETIC THEORY

- 12.1 Introduction
- 12.2 Molecular nature of matter
- 12.3 Behaviour of gases
- 12.4 Kinetic theory of an ideal gas
- 12.5 Law of equipartition of energy
- 12.6 Specific heat capacity
- 12.7 Mean free path

## C H A P T E R 13

### OSCILLATIONS

- 13.1 Introduction
- 13.2 Periodic and oscillatory motions
- 13.3 Simple harmonic motion
- 13.4 Simple harmonic motion and uniform circular motion
- 13.5 Velocity and acceleration in simple harmonic motion
- 13.6 Force law for simple harmonic motion
- 13.7 Energy in simple harmonic motion
- 13.8 The Simple Pendulum

## C H A P T E R 14

### WAVES

- 14.1 Introduction
- 14.2 Transverse and longitudinal waves
- 14.3 Displacement relation in a progressive wave
- 14.4 The speed of a travelling wave
- 14.5 The principle of superposition of waves
- 14.6 Reflection of waves
- 14.7 Beats



/PrashantChaturvedi



/PrashantChaturvediOfficial



prashantchaturvedi.com

# 12<sup>th</sup> Physics Part-I



## Contents of Physics Part I Class XII

### CHAPTER ONE

ELECTRIC CHARGES AND FIELDS ✓

### CHAPTER TWO

ELECTROSTATIC POTENTIAL AND CAPACITANCE

### CHAPTER THREE

CURRENT ELECTRICITY

### CHAPTER FOUR

MOVING CHARGES AND MAGNETISM

### CHAPTER FIVE

MAGNETISM AND MATTER

### CHAPTER SIX

ELECTROMAGNETIC INDUCTION

### CHAPTER SEVEN

ALTERNATING CURRENT

### CHAPTER EIGHT

ELECTROMAGNETIC WAVES

ANSWERS

01/11/2020

## CHAPTER ONE

### ELECTRIC CHARGES AND FIELDS

- 1.1 Introduction
- 1.2 Electric Charge
- 1.3 Conductors and Insulators
- 1.4 Basic Properties of Electric Charge
- 1.5 Coulomb's Law
- 1.6 Forces between Multiple Charges
- 1.7 Electric Field
- 1.8 Electric Field Lines
- 1.9 Electric Flux
- 1.10 Electric Dipole
- 1.11 Dipole in a Uniform External Field
- 1.12 Continuous Charge Distribution
- 1.13 Gauss's Law
- 1.14 Applications of Gauss's Law

## CHAPTER TWO

### ELECTROSTATIC POTENTIAL AND CAPACITANCE

- 2.1 Introduction
- 2.2 Electrostatic Potential
- 2.3 Potential due to a Point Charge
- 2.4 Potential due to an Electric Dipole
- 2.5 Potential due to a System of Charges
- 2.6 Equipotential Surfaces
- 2.7 Potential Energy of a System of Charges
- 2.8 Potential Energy in an External Field
- 2.9 Electrostatics of Conductors
- 2.10 Dielectrics and Polarisation
- 2.11 Capacitors and Capacitance
- 2.12 The Parallel Plate Capacitor
- 2.13 Effect of Dielectric on Capacitance
- 2.14 Combination of Capacitors
- 2.15 Energy Stored in a Capacitor

**CHAPTER THREE**  
**CURRENT ELECTRICITY**

- 3.1 Introduction
- 3.2 Electric Current
- 3.3 Electric Currents in Conductors
- 3.4 Ohm's law
- 3.5 Drift of Electrons and the Origin of Resistivity
- 3.6 Limitations of Ohm's Law
- 3.7 Resistivity of Various Materials
- 3.8 Temperature Dependence of Resistivity
- 3.9 Electrical Energy, Power
- 3.10 Cells, emf, Internal Resistance
- 3.11 Cells in Series and in Parallel
- 3.12 Kirchhoff's Rules
- 3.13 Wheatstone Bridge

**CHAPTER FOUR**  
**MOVING CHARGES AND MAGNETISM**

- 4.1 Introduction
- 4.2 Magnetic Force
- 4.3 Motion in a Magnetic Field
- 4.4 Magnetic Field due to a Current Element, Biot-Savart Law
- 4.5 Magnetic Field on the Axis of a Circular Current Loop
- 4.6 Ampere's Circuital Law
- 4.7 The Solenoid
- 4.8 Force between Two Parallel Currents, the Ampere
- 4.9 Torque on Current Loop, Magnetic Dipole
- 4.10 The Moving Coil Galvanometer

**CHAPTER FIVE**  
**MAGNETISM AND MATTER**

- 5.1 Introduction
- 5.2 The Bar Magnet
- 5.3 Magnetism and Gauss's Law
- 5.4 Magnetisation and Magnetic Intensity
- 5.5 Magnetic Properties of Materials



**CHAPTER SIX**  
**ELECTROMAGNETIC INDUCTION** ✓

- 6.1 Introduction
- 6.2 The Experiments of Faraday and Henry
- 6.3 Magnetic Flux
- 6.4 Faraday's Law of Induction
- 6.5 Lenz's Law and Conservation of Energy
- 6.6 Motional Electromotive Force
- 6.7 Inductance
- 6.8 AC Generator

**CHAPTER SEVEN**  
**ALTERNATING CURRENT** ✓

AC

- 7.1 Introduction
- 7.2 AC Voltage Applied to a Resistor
- 7.3 Representation of AC Current and Voltage by Rotating Vectors — Phasors
- 7.4 AC Voltage Applied to an Inductor
- 7.5 AC Voltage Applied to a Capacitor
- 7.6 AC Voltage Applied to a Series LCR Circuit
- 7.7 Power in AC Circuit: The Power Factor
- 7.8 Transformers

**CHAPTER EIGHT**  
**ELECTROMAGNETIC WAVES** ✓

- 8.1 Introduction
- 8.2 Displacement Current
- 8.3 Electromagnetic Waves
- 8.4 Electromagnetic Spectrum



/PrashantChaturvedi



/PrashantChaturvediOfficial



prashantchaturvedi.com

# 12<sup>th</sup> Physics Part-2



## CHAPTER NINE

### RAY OPTICS AND OPTICAL INSTRUMENTS ✓

- 9.1 Introduction
- 9.2 Reflection of Light by Spherical Mirrors
- 9.3 Refraction
- 9.4 Total Internal Reflection
- 9.5 Refraction at Spherical Surfaces and by Lenses
- 9.6 Refraction through a Prism
- 9.7 Optical Instruments

## CHAPTER TEN

### WAVE OPTICS

- 10.1 Introduction
- 10.2 Huygens Principle
- 10.3 Refraction and Reflection of Plane Waves using Huygens Principle
- 10.4 Coherent and Incoherent Addition of Waves
- 10.5 Interference of Light Waves and Young's Experiment
- 10.6 Diffraction ✓
- 10.7 Polarisation ✓

## CHAPTER ELEVEN

### DUAL NATURE OF RADIATION AND MATTER ✓

- 11.1 Introduction ✓
- 11.2 Electron Emission

*M Modern Physics*



- 11.3 Photoelectric Effect ✓
- 11.4 Experimental Study of Photoelectric Effect ✓
- 11.5 Photoelectric Effect and Wave Theory of Light ✓
- 11.6 Einstein's Photoelectric Equation: Energy Quantum of Radiation ✓
- 11.7 Particle Nature of Light: The Photon ✓
- 11.8 Wave Nature of Matter ✓

**CHAPTER TWELVE**

**ATOMS**

- 12.1 Introduction ✓
- 12.2 Alpha-particle Scattering and Rutherford's Nuclear Model of Atom ✓
- 12.3 Atomic Spectra ✓
- 12.4 Bohr Model of the Hydrogen Atom ✓
- 12.5 The Line Spectra of the Hydrogen Atom ✓
- 12.6 DE Broglie's Explanation of Bohr's Second Postulate of Quantisation ✓

**CHAPTER THIRTEEN**

**NUCLEI**

- 13.1 Introduction ✓
- 13.2 Atomic Masses and Composition of Nucleus ✓
- 13.3 Size of the Nucleus ✓
- 13.4 Mass-Energy and Nuclear Binding Energy ✓
- 13.5 Nuclear Force ✓
- 13.6 Radioactivity ✓
- 13.7 Nuclear Energy ✓

**CHAPTER FOURTEEN**

**SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS**

- 14.1 Introduction ✓
- 14.2 Classification of Metals, Conductors and Semiconductors ✓
- 14.3 Intrinsic Semiconductor ✓
- 14.4 Extrinsic Semiconductor ✓

- 14.5 p-n Junction ✓
- 14.6 Semiconductor Diode ✓
- 14.7 Application of Junction Diode as a Rectifier ✓

