



## ST. ALOYSIUS COLLEGE (AUTONOMOUS) JABALPUR

Reaccredited 'A+' Grade by NAAC (CGPA:3.68/4.00)

College with Potential for Excellence by UGC

DST-FIST Supported & STAR College Scheme by DBT

## Faculty of Physical Sciences

### COURSE OUTCOMES (CO)

#### **SUBJECT: PHYSICS**

B.Sc. I year

B.Sc. I Year

#### **Paper- I: Thermodynamics and Statistical Physics**

CO No.	Course Outcomes	Cognitive Level
CO-1	Learner will be able to build and make use of Basic concepts of thermodynamics & Maxwell's thermodynamic relations.	U, R, E
CO-2	Learner will be able to outline the idea about Micro and Macro states, Ensembles, Statistical Probability and Phase Space.	R, U, An , Ap, E
CO-3	Learner will be able to create the idea of partition function and distribution function for classical and quantum statistics.	R , U , Ap, An, E
CO-4	Learner will be able to construct/imagine the Specific Contributions of Physicists in Various branches of Physics	U, C

#### **Paper- II: Mechanics and General Properties of Matter**

CO No.	Course Outcomes	Cognitive Level
CO-1	The learner will use various mathematical tools employed to study and solve problems in various fields of physics	U, R, E
CO-2	Learner will be able to understand concepts of Gradient, Divergence and Curl and their applications, recall Laws of motion and to build fundamentals of Mechanics, Significance of Kepler's Laws of Planetary Motion & Importance of Collisions	R ,U, Ap, An, R, E
CO-3	Learner will be able to understand the concept of Elasticity and various	R, U, An,

	elastic moduli, Concept of Simple, Periodic & Harmonic Oscillation.	Ap, E
CO-4	Learner will be able to extend the concept of Translational and Rotational Dynamics and their application. Learner will be able to evaluate the Moment of inertia about a given axis of symmetry for different uniform mass distributions. Principles of fluid flow and the equations governing fluid dynamics such as equation of continuity, Bernoulli's Theorem etc.	R , U , Ap, An, E
CO-5	Learner will be able to understand the concept of special theory of relativity and its consequences	Ap, E, C

**B.Sc. II year**  
**Paper-I: Optics**

CO No.	Course Outcomes	Cognitive Level*
CO-1	Students will be able to distinguish between various thin lenses, aberrations, oscillations, wave packets and will be able to apply Huygens principle	U, R, Ap, E
CO-2	Students will be able to distinguish between various types of interference patterns and interferometers	U, R, Ap, E
CO-3	Students will understand diffraction and be able to outline the use of optical instruments depending on diffraction. Will be able to apply Rayleigh's criterion to optical instruments	R, U, An, Ap, E, C
CO-4	Students will understand polarization, double refraction in anisotropic media and will be able to make use of optical instruments depending on polarization. Will be able to apply Huygen's principle to the phenomenon of polarization	U, An, Ap, E, R
CO-5	Students will know about Einstein coefficients and their relevance to the concept of lasing. They will understand the working principles of different lasers. Students will know holography, different photo sensors and their uses	R, U, Ap, An, E

**B.Sc. II year**  
**Paper-II: Electrostatics, Magnetostatics and Electrodynamics**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	The student will arrive at an understanding of electrostatics, Gauss's theorem and its application, to arrive at various mathematical models in electrostatics, method of images and its application	U, R, E, Ap
CO-2	The student will arrive at an understanding of Magnetostatics with emphasis on Lorentz force, Biot-Savart law and its application, Ampere's law, free and bound currents, magnetization vector	U, Ap, R, E
CO-3	The student will arrive at an understanding of steady and a-c current circuits, bio-electricity	R, U,
CO-4	The student will arrive at an understanding of the motion of charged particles in electric and magnetic fields, the relevant equipment and their use	U, R, Ap
CO-5	The student will arrive at an understanding of electrodynamics with emphasis on Faraday's laws, Maxwell equations and their application, Fresnel's equations, Rayleigh scattering.	U, R, Ap, C
CO-6	The student will arrive at an understanding of electromagnetic waves with emphasis on, reflection, refraction and polarization at different media	U, Ap, E, C, An

**B.Sc. III year**  
**Paper-I: Quantum Mechanics and Spectroscopy**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Learner will be able to understand aspects of the inadequacies of classical mechanics and historical development of quantum mechanics. Learner will be able to build concepts of Wave packets, Phase and Group Velocities and Uncertainty principle.	U, R, Ap, C, An, E
CO-2	Learner will be able to write the Schrodinger time dependent and time independent equations and Solve them for different cases.	U, An, Ap, E
CO-3	Learner will be able to extend the concept of Quantum Numbers and explanation of Spectra of Alkali/Alkaline Earth metals. Learner will be able to analyze the effect of Electric and Magnetic field on atoms.	R, U, Ap, An

CO-4	Learner will be able to build, compare & contrast the basic concepts of Rotational, Vibrational and Electronic spectra.	U, An, E
CO-5	Learner will be able to rephrase the properties of nuclei in Nuclear Models, Radioactive decay, Fission and Fusion, Stellar Energy in Stars.	U, Ap, E

**B.Sc. III year**  
**Paper-II: Solid State Physics and Devices**

CO No.	Course Outcomes	Cognitive Level*
CO-I	Learner will be able to outline the idea about crystalline and amorphous solids, and diffraction of X-rays by Crystalline materials.	U, R, Ap, E
CO-II	Learner will be able to illustrate Lattice vibrations, phonons, theories of specific heat of solids and different types of magnetism.	U, Ap, An, R
CO-III	Learner will be able to formulate Band Theory of Solids, originate the idea of two terminal devices & their applications.	R, U, Ap, C, E
CO-IV	Learner will be able make-up the concept of three terminal devices (BJT, FET) and their applications.	U, C
CO-V	Learner will be able to outline the 3D, 2D, 1D, 0D nanostructure materials and their synthesis.	U

**SUBJECT: COMPUTER APPLICATION**

**B.Sc. I year**

Paper-MAJOR I:

Computer System Architecture

CO No.	Course Outcomes	Cognitive Level
CO-1	Understand the basic structure, operation and characteristics of digital computer.	Create
CO-2	Be able to design simple combinational digital circuits based on given parameters.	Understand
CO-3	Familiarity with working of arithmetic and logic unit as well as the concept of pipelining.	Analyze
CO-4	Know about hierarchical memory system including cache memories and virtual memory.	Create
CO-5	Understand concept and advantages of parallelism, threading, multi-processors and multi-core processors.	Apply

CO-6	Know the contributions of Indians in the field of computer	Evaluate
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**Paper-MAJOR - II:**  
**Programming Methodologies & Data Structure**

CO No.	Course Outcomes	Cognitive Level
CO-1	Introduces Object Oriented Programming concepts using the C++ language.	Create
CO-2	Understanding the principles of data abstraction, inheritance and polymorphism	Understand
CO-3	Analyzing the handling formatted I/O and unformatted.	Analyze
CO-4	Ability to choose appropriate data structures to represent data items in real world.	Create
CO-5	Implement and know the application of algorithms for sorting and pattern matching	Apply
CO-6	Implement ADTs such as lists, graphs, search trees in C++ to solve problems.	Evaluate

**SUBJECT: COMPUTER APPLICATION**

BCA I Year

**Paper- I MAJOR: COMPUTER FUNDAMENTALS,  
ORGANIZATION AND ARCHITECTURE**

CO No.	Course Outcomes	Cognitive Level
CO-1	Understand the basic structure, operation and characteristics of digital computers	understand
CO-2	Design simple combinational digital circuits based on given parameters	Analyse & Apply
CO-3	Understand the working of arithmetic and logic unit	understand
CO-4	Know about hierarchical memory system including cache memory and virtual memory	understand
CO-5	Know the contributions of Indians in the field of computer architecture and related technologies	Understand

**B.Sc. II year**

**Paper-I: Object Oriented Programming (C++) & Conceptual Operating System**

CO No.	Course Outcomes	Cognitive Level*
CO-1	Student will be able to implement classes, object, inheritance,	C, An, Ap,

	reusability, security and many more OOPS tricks for better and effective programing in C++ .	E
CO-2	Describe the important computer system resources and the role of operating system in their management policies and algorithms.	R, U
CO-3	Student will understand what a process is and how processes are synchronized and scheduled.	C, Ap, An, E
CO-4	Students should be able to use system calls for managing processes, memory and the file system.	R,U, Ap

### B.Sc. II year

#### Paper-II: Computer Networks & Relational Database Management System

CO No.	Course Outcomes	Cognitive Level*
CO-1	Students will learn the functions of each layer in OSI and TCP/IP model.	R, U,An
CO-2	They will be able to Identify the different types of network devices and their functions within a network.	R,U
CO-3	Student will learn basic protocols of computer networks, and how they can be used to assist in network design and implementation.	R,U
CO-4	Student will learn the features of database management systems and Relational database. They will Design conceptual models of a database using ER modelling for real life applications and also construct queries in Relational Algebra.	U, Ap
CO-5	Student will be able to Create and populate a RDBMS for a real life application, with constraints and keys, using SQL. And Retrieve any type of information from a data base by formulating complex queries in SQL	C, Ap, An

### B.Sc. III year

#### Paper-I: Web Technology using ASP.NET

CO No.	Course Outcomes	Cognitive Level*
CO-1	Student will be able to apply technical knowledge and perform specific technical skills, including: Design web applications using ASP.NET, Use ASP.NET controls in web applications,	R, U, C
CO-2	Student will learn Debug and deploy ASP.NET web applications and they will able to create database driven ASP.NET web applications.	Ap, An, E

### B.Sc. III year

#### Paper-II: Cyber Security and Software Engineering

CO No.	Course Outcomes	Cognitive Level*
CO-1	Students will be able to evaluate best practices in security concepts to	U, R

	maintain confidentiality, integrity and availability of computer systems	
CO-2	Students should be able to apply software engineering principles and techniques and able to produce efficient, reliable, robust and cost-effective software solutions.	R, An

**SUBJECT: COMPUTER SCIENCE**

**B.Sc. I year**

**Paper-I: Computer Fundamentals & PC packages**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Students will be able to understand the basic operations of computer and will be able to opt for jobs as an Office Automation Clerk, Support Assistant.	U,Ap
CO-2	To understand the fundamentals of different instruction sets architecture and their relationship to the CPU design.	U, An
CO-3	To understand the principles and the implementation of computer arithmetic.	U, Ap
CO-4	To understand the operation of modern CPU's including memory systems and buses.	U, An

**B.Sc. I year**

**Paper-II: Programming in C**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Students will be able to identify and abstract the programming task.	C, An, E
CO-2	Students will be able to write pseudo-code of the task, choose the right data representation formats based on the requirements of the problem and hence use the language to efficiently solve the task.	C, An , Ap, E

**B.Sc. II year**

**Paper-I: Object Oriented Programming using c++& Java**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Student will be able to implement classes, object, inheritance, reusability, security and many more OOPS tricks for better and	C, An, Ap, E

	effective programming in C++ and Java.	
CO-2	Multithreading gives an opportunity to learning process working.	R, U
CO-3	Applet provided students to create their internet and user-friendly application.	C, Ap, An, E

**B.Sc. II year**  
**Paper-II: Data Structures and Software Engineering**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Students will learn to apply various techniques for efficient data storage structure in real world problems.	R, Ap, E
CO-2	They will be able to analyse different algorithms and their correctness and compare different techniques linear and nonlinear data structures.	An, Ap, E
CO-3	Students will have basic knowledge and understanding of the analysis and design of complex systems.	C, An,
CO-4	They develop the ability to apply software engineering principles and techniques and develop, maintain and evaluate large-scale software systems.	C, Ap, E

**B.Sc. III year**  
**Paper-I: Web Application Development using PHP and DBMS**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Students will be able to work with a basic web application and understand the Database management, web design and server connectivity.	R, U, E
CO-2	Develop skills in analysing the usability of a web site.	An, C
CO-3	Understand how to plan and conduct user research related to web usability.	U, An
CO-4	To learn to write, test, and debug web pages using HTML and JavaScript.	U, C, An, E
CO-5	Understand how server-side programming works on the web.	U,E

**B.Sc. III year**

## **Paper-II: Operating System and Computer Network**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-I	Students will be able to get the concepts of operating system and the basic knowledge of computer networks and cryptography.	R, U
CO-II	Students should be able to describe the general architecture of computers.	An
CO-III	Understand and analyse theory and implementation of: processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files.	Un, An, E
CO-IV	Understand the concepts of data communication and networks, TCP/IP and OSI reference models.	U ,An

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**SUBJECT: MATHEMATICS**

**B.Sc I year**  
**Paper- I: Algebra, Vector Analysis and Geometry**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level</b>
CO-1	Recognize consistent and inconsistent systems of linear equation by the row, echelon from the augmented matrix, using the rank of matrix	An
CO-2	To find the Eigen values and corresponding Eigen vectors for a square matrix.	EV
CO-3	Using the knowledge of vector calculus in geometry	U & An
CO-4	Enhance the knowledge of three dimensional geometrical figure(eg. Cone and cylinder)	App

**Paper- II: Calculus and Differential equations**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level</b>
CO-1	Sketch curves in a plane using its mathematical in the different coordinate system of reference.	U
CO-2	Using the derivatives in Optimization Social sciences, Physics and Life sciences etc.	U & Ev
CO-3	Formulate the Differential equations for various Mathematical models.	An & App
CO-4	Using techniques to solve and analyze various Mathematical models.	App & U

**B.Sc II year**  
**Paper-I: Abstract Algebra**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Understand important mathematical concepts in abstract algebra such as definition of a group, order of a group, order of an element, ring, integral domain and field.	U
CO-2	Comprehend different types of subgroups such as normal subgroups, cyclic subgroups and their structure and characteristics.	An
CO-3	Appreciate the concepts of permutation groups, factor groups, Abelian groups homomorphism and isomorphism in groups and rings	R
CO-4	Analyze and demonstrate examples of rings and fields.	An

CO-5	Make the students see and understand the connection and transition between previously studied mathematical concepts and more advanced mathematics	Ap
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**B.Sc II year**  
**Paper-II: Advanced Calculus**

CO No.	Course Outcomes	Cognitive Level*
CO-1	Understand of the theory of sequence and convergence of series.	U
CO-2	Appreciate principles of multi-variable calculus containing differentiability and prove.	An
CO-3	Understand the relationship between beta and Gamma function	U
CO-4	Reason abstract mathematical arguments and prove them.	Ap
CO-5	Understand the relationship between the increasing and decreasing behaviour of function.	U

**B.Sc II year**  
**Paper-III: Differential equation**

CO No.	Course Outcomes	Cognitive Level*
CO-1	Evaluate differential equations by Power Series Method. Find solution of Legendre's and Bessel's Differential Equation.	E
CO-2	Solve Laplace Transform of continuous functions, discontinuous functions, derivatives, integrals and inverse Laplace Transform	Ap
CO-3	Classify partial differential equations and transform into canonical form.	An
CO-4	Find solution of linear partial differential equations of both first and second order.	E,

**B.Sc III year**  
**Paper-I: Linear algebra and Numerical Analysis**

CO No.	Course Outcomes	Cognitive Level*
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CO-1	Identify and construct linear transformations of a matrix, their characterize attains. Evaluate linear systems represented as linear transforms, their representation as matrix equations, and vector equations.	E
CO-2	Explain concepts of inner product on vector spaces	U
CO-3	Understand the theoretical and practical aspects of the use of numerical analysis and its application.	Ap
CO-4	Establish the limitations, advantages, and disadvantages of numerical analysis. Derive numerical methods for various mathematical operations and tasks, such as interpolation, differentiation, integration and the solution of linear equations nonlinear equations and differential equations	An
CO-5	Use of numerical analysis and to obtain approximate solutions to otherwise intractable mathematical problems.	Ap

**B.Sc III year**  
**Paper-II: Real and Complex Analysis**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Understand the concept of Riemann Integration and prove generalized results and solve partial differentiation of second order , total differentiation and problem based on Young and Swartz Theorem	U
CO-2	Evaluate Fourier series of half and full intervals.	E
CO-3	Comprehend open sets, closed sets, metric spaces, convergence and their properties.	R
CO-4	Appreciate the use of continuity and compactness in metric space.	An
CO-5	Apply the concept and consequences of analyticity and the Cauchy-Riemann equations and of results on harmonic and entire functions including the fundamental theorem of algebra.	Ap

**B.Sc III year**  
**Paper-III: Discrete Mathematics (Optional)**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Write and interpret mathematical notation and mathematical definitions. Appreciate the basic principles of Boolean algebra, Logic and Set theory	E
CO-2	Formulate and interpret statements presented in Boolean logic. Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.	Ap
CO-3	Formulate short proofs using the following methods: direct proof, indirect proof, proof by contradiction and case analysis.	E
CO-4	Demonstrate a working knowledge of set notation and elementary set theory, recognize the connection between set operations and logic, prove elementary results involving sets.	Ap
CO-5	Model and solve real-world problems using graphs and trees, both quantitatively and qualitatively. Gain an historical perspective of the development of modern discrete mathematics	An

**B.Sc III year**  
**Paper-III: Statistical methods (Optional)**

<b>CO No.</b>	<b>Course Outcomes</b>	<b>Cognitive Level*</b>
CO-1	Demonstrate the ability to apply fundamental concepts in exploratory data analysis. .	Ap
CO-2	Appreciate the concepts of measure of dispersion and standard deviation of a statistics	An
CO-3	Discuss the basic concepts of probability and random variables.	E
CO-4	Describe the main properties of probability distributions and random variables.	Ap
CO-5	Understand the concept of the sampling methods of a statistics.	U
CO-6	Comprehend the foundations for classical deduction involving estimation, hypothesis testing, regression and correlation analysis.	An

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**Note: Cognitive Level**

Remembering- **R**      Understanding- **U**      Applying- **Ap**  
Analyzing- **An**      Evaluating- **E**      Creating- **C**