



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

Paper-I: Mathematical Physics, Mechanics and 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, E
CO-3	Learner will be able to understand the concept of Elasticity and various elastic moduli, Concept of Simple, Periodic & Harmonic Oscillation.	R, U, An, 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. Understand the 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. I year
Paper-II: 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 connect with the Specific Contributions of Physicists in Various branches of Physics	R, U, A, 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

CO No.	Course Outcomes	Cognitive Level*
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

CO No.	Course Outcomes	Cognitive Level*
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

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SUBJECT: COMPUTER APPLICATION

B.Sc. I year
Paper-I: Fundamentals of Computer and C Programming

CO No.	Course Outcomes	Cognitive Level*
CO-1	Student will Understand the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming	R, U
CO-2	Student will able to analyze a problem, develop an algorithm to solve it	U, C
CO-3	Write, compile and debug programs in C language and use different data types for writing the programs.	U, C, Ap
CO-4	Students will able to work with arrays and should understand the dynamic behaviour of memory by the use of pointers.	U, Ap, C

B.Sc. I year

Paper-II: Office Automation and Desktop Publishing

CO No.	Course Outcomes	Cognitive Level*
CO-1	Students will be able to Identify Software and Hardware and Understand the basic knowledge of Operating System	R , An, U
CO-2	Students will understand interface of fedora operating system and its related software , installation process.	An , Ap, E
CO-3	Student will work with LibreOffice package to create word document, excel file and database	C, Ap
CO-4	Students will learn to edit, manipulate and enhance graphics or images to improve their overall appearance using Inkscape. They will go through the application GIMP to edit vector graphics.	R,U,C, Ap
CO-5	Students will learn and experience GIMP to create works such as posters, flyers, brochure, magazines, id-card etc.	Ap ,An , C

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, reusability, security and many more OOPS tricks for better and effective programing in C++ .	C, An, Ap, 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	U, Ap

	database using ER modelling for real life applications and also construct queries in Relational Algebra.	
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 maintain confidentiality, integrity and availability of computer systems	U, R
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

CO No.	Course Outcomes	Cognitive Level*
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
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B.Sc. I year
Paper-II: Programming in C

CO No.	Course Outcomes	Cognitive Level*
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

CO No.	Course Outcomes	Cognitive Level*
CO-1	Student will be able to implement classes, object, inheritance, reusability, security and many more OOPS tricks for better and effective programming in C++ and Java.	C, An, Ap, E
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

CO No.	Course Outcomes	Cognitive Level*
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
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B.Sc. III year

Paper-I: Web Application Development using PHP and DBMS

CO No.	Course Outcomes	Cognitive Level*
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

CO No.	Course Outcomes	Cognitive Level*
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



SUBJECT: MATHEMATICS

B.Sc I year

Paper-I: Algebra and Trigonometry

CO No.	Course Outcomes	Cognitive Level*
CO-1	Evaluate Rank, Eigen values & Eigen vectors.	E
CO-2	Correlate Cayley-Hamilton theorem to inverse of a square matrix and rank to consistency of linear equations	An
CO-3	Relate coefficients of a polynomial to its roots to determine them	An
CO-4	Appreciate Logic, Boolean algebra, Boolean function and design switching circuits.	C
CO-5	Comprehend and apply De-Moivre's theorem, direct and hyperbolic functions.	Ap

B.Sc I year

Paper-II: Calculus and Differential Equations

CO No.	Course Outcomes	Cognitive Level*
CO-1	Apply Leibnitz theorem, Maclaurin's and Taylor's theorems in finding the expansion of function.	Ap
CO-2	Trace Cartesian and polar curves analytically.	U,
CO-3	Apply integration to find rectification and quadrature.	Ap
CO-4	Solve first order differential equations and find orthogonal trajectories.	E
CO-5	Solve linear differential equations with constant coefficient and to find the complete solution of a nonhomogeneous differential equation of second order	U

B.Sc I year

Paper-III: Vector Analysis and Geometry

CO No.	Course Outcomes	Cognitive Level*
CO-1	Understand concepts of vector field, evaluation of directional derivative, gradient and there applications.	U
CO-2	Establish the concept of vector integration in a plane and in space.	C

CO-3	Realize importance of Green, Gauss and Stokes' theorems in other branches of mathematics.	Ap
CO-4	Understand concepts of tracing of conics, system of conics.	U
CO-5	Explain the properties of three dimensional shapes.	An

B.Sc II year
Paper-I: Abstract Algebra

CO No.	Course Outcomes	Cognitive Level*
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

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*
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

CO No.	Course Outcomes	Cognitive Level*
CO-1	Understand the concept of Riemann Integration and prove	U

	generalized results and solve partial differentiation of second order , total differentiation and problem based on Young and Swartz Theorem	
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)

CO No.	Course Outcomes	Cognitive Level*
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)

CO No.	Course Outcomes	Cognitive Level*
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

Note: Cognitive Level

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