SLC(University of Delhi)
Shyam Lal College

Programme Specific Outcomes and Course Outcomes

B.SC Physical Science (Physics & Elec.)

B.Sc. Physical Science Discipline: Physics			
Semester	**Papers**	**Course Learning Outcomes**	**Methodology (to achieve specific outcomes)**
Sem-I	Mechanics	• Understand the role of vectors and their application to various dynamical situations. • Learn the concept of Inertial reference frames. • Learn the concept of conservation of energy, momentum, angular momentum and apply them to basic problems. • Understand special theory of relativity - special relativistic effects and their effects on the mass and energy of a moving object.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.
Sem-II	Electricity & Magnetism	• Demonstrate Gauss law, Coulomb's law for the electric field, and apply it to systems of point charges as well as line, surface, and volume distributions of charges. • Apply Gauss's law of electrostatics to solve a variety of problems. Articulate knowledge of electric current, resistance and capacitance in terms of electric field and electric potential. • Calculate the magnetic forces that act on moving charges and the magnetic fields due to currents (Biot- Savart and Ampere laws) • Have brief idea of magnetic materials, understand the concepts of induction, solve problems using Faraday's and Lenz's laws	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Sem III	Thermal Physics & Statistical Mechanics	• Learn the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations. They are also expected to learn Maxwell's thermodynamic relations. • Know the fundamentals of the kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion. • Learn about the black body radiations, Stefan-Boltzmann's law, Rayleigh-Jean's law and Planck's law and their significances. • Learn the quantum statistical distributions, viz., the Bose-Einstein statistics and the Fermi-Dirac statistics.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.
Sem- IV	Waves & Optics	classical wave equation in transverse and longitudinal waves and solving a range of physical systems on its basis. • Understand Concept of normal modes in transverse and longitudinal waves: their frequencies and configurations. • Understand Interference as superposition of waves from coherent sources derived from same parent source. Demonstrate understanding of Interference experiments: Young's Double Slit, Fresnel's biprism, Llyod's Mirror, Newton's Rings. • Demonstrate basic concepts of Diffraction: Superposition of wavelets diffracted from apertures. Understand Fraunhoffer Diffraction from a slit. Concept of Polarization.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Sem- IV	Basic Instrumentation Skill	• Course learning begins with the basic understanding of the measurement and errors in measurement. It then familiarizes about each and every specification of a multimeter, multimeters, multivibrators, rectifiers, amplifiers, oscillators and high voltage probes and their significance with hands on mode. • Explanation of the specifications of CRO and their significance. Complete explanation of CRT. • Students learn the use of CRO for the measurement of voltage (DC and AC), frequency and time period. Covers the Digital Storage Oscilloscope and its principle of working. • Students learn principles of voltage measurement. Students should be able to understand the advantages of electronic voltmeter over conventional multimeter in terms of sensitivity etc. Types of AC millivoltmeter should be covered. • Covers the explanation and specifications of Signal and pulse Generators: low frequency signal generator and pulse generator. Students should be familiarized with testing and specifications. • Students learn about the working principles and specifications of basic LCR bridge. Hands on ability to use analog and digital instruments like digital multimeter and frequency counter	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Sem- IV	Electrical Circuits &Network Skills	• Demonstrate good comprehension of basic principles of electricity including ideas about voltage, current and resistance. • Develop the capacity to analyse and evaluate schematics of power efficient electrical circuits while demonstrating insight into tracking of interconnections within elements while identifying current flow and voltage drop. • Gain knowledge about generators, transformers and electric motors. The knowledge would include interfacing aspects and consumer defined control of speed and power. • Acquire capacity to work theoretically and practically with solid-state devices. • Delve into practical aspects related to electrical wiring like various types of conductors and cables, wiring-Star and delta connections, voltage drop and losses. • Measure current, voltage, power in DC and AC circuits, acquire proficiency in fabrication of regulated power supply. • Develop capacity to identify and suggest types and sizes of solid and stranded cables, conduit lengths, cable trays, splices, crimps, terminal blocks and solder.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Sem-V	Elements of Modern Physics	• Explain how quantum mechanical concepts answer some of unanswered questions of Classical mechanics such as photoelectric effect, Compton scattering etc. • Explain inadequacy of Rutherford model, discrete atomic spectra from hydrogen like atoms and its explanation on quantum mechanical basis. • Demonstrate ability to apply wave-particle duality and uncertainty principle to solve physics problems. •Explain two slit interference experiment with photons, atoms and particles establishing non-deterministic nature of QM. • Set up Schrodinger equation for behavior of a particle in a field of force for simple potential and find wave solutions establishing wave-like nature of particles. • Demonstrate ability to solve 1-D quantum problems including the quantum particle in a box, a well and the transmission and reflection of waves. • Explain nuclear structure, binding energy, nuclear models and impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. • Understand radioactivity, radioactive decays, apply radioactive laws to solve related physics problems and Pauli's prediction of neutrino, and the subsequent discovery	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Sem-V	Digital, Analog & Instrumentation	• Differentiating the Analog and Digital circuits, the concepts of number systems like Binary, BCD, Octal and hexadecimal are developed to elaborate and focus on the digital systems. • Characteristics and working of pn junction. · Two terminal devices: Rectifier diodes, Zener diode, photodiode etc. • NPN and PNP transistors: Characteristics of different configurations, biasing, stabilization and their applications. • CE and two stage RC coupled transistor amplifier using h-parameter model of the transistor. • Designing of different types of oscillators and their stabilities. · Ideal and practical op-amps: Characteristics and applications. • Timer circuits using IC 555 providing clock pulses to sequential circuits and develop multivibrators.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.
Sem-VI	Solid State Physics	• Elucidate the concept of lattice, crystals and symmetry operations. • Understand the elementary lattice dynamics and its influence on the properties of materials. • Describe the main features of the physics of electrons in solids: origin of energy bands, and their influence electronic behavior. • Explain the origin of dia-, para-, and ferro-magnetic properties of solids. Explain the origin of the dielectric properties exhibited by solids and the concept of polarizability. • Learn the properties of superconductivity in solid.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Programme Specific Outcomes and Course Outcomes
B.Sc. (Physical Sciences) Electronics

Semester 1:

Course Name	Learning Outcomes	How Course Learning Outcomes Are Attained
CC-1B: Network Analysis and Analog Electronics	CO1: To understand the concept of voltage and current sources, Network theorems, Mesh and Node Analysis. CO2: To develop an understanding of the basic operation and characteristics of different type of diodes and familiarity with its working and applications. CO3: Become familiar with Half-wave, Full-wave center tapped and bridge rectifiers. To be able to calculate ripple factor and efficiency. CO4: To be able to recognize and explain the characteristics of a PNP or NPN transistor. CO5: Become familiar with the load-line analysis of the BJT configurations and understand the hybrid model (h- parameters) of the BJT transistors. CO6: To be able to perform small signal analysis of Amplifier and understand its classification. CO7: To be able to perform analysis of two stages R-C coupled Amplifier.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

	CO8: To understand the concept of positive and negative feedback along with applications of each type of feedback and the working of Oscillators. CO9: To become familiar with construction, working and characteristics of JFET and UJT	

Semester 2:

Course Name	Learning Outcomes	How Course Learning Outcomes Are Attained
CC-2B: Linear and Digital Integrated Circuits	CO1: To understand Op- Amp basics and its various applications. CO2: To become familiar with number systems and codes, Logic Gates, Boolean Algebra Theorems. CO3: To understand the minimization techniques for designing a simplified logic circuit. CO4: To design a half Adder, Full Adder, Half-Subtractor, Full Subtractor. CO5: To understand the working of Data processing circuits Multiplexers, DE multiplexers, Decoders, Encoders. CO6: To become familiar with the working of flip-flop circuits, its working and applications	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Semester 3:

Course Name	Learning Outcomes	How Course Learning Outcomes Are Attained
CC-3B : Communication Electronics	CO1: The concepts of electronics in communication, introduction to the principle, performance and applications of communication systems. CO2: Various means and modes of communication, electromagnetic communication spectrum with an idea of frequency allocation for radio communication system in India. CO3: An insight on the use of different modulation and demodulation techniques used in analog communication CO4: Analyze different parameters of analog communication techniques. CO5: Learn the generation and detection of a signal through pulse and digital modulation techniques and multiplexing. CO6: In-depth understanding of different concepts used in a satellite communication system, Mobile radio propagation, cellular system design and understand mobile technologies like GSM and CDMA, mobile communication generations 2G, 3G, and 4G with their characteristics and limitations.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

SEC: Electrical Circuits and Network Skills	CO1: Demonstrate good comprehension of basic principles of electricity including ideas about voltage, current and resistance. CO2: Develop the capacity to analyze and evaluate schematics of power efficient electrical circuits while demonstrating insight into tracking of interconnections within elements while identifying current flow and voltage drop. CO3: Gain knowledge about generators, transformers and electric motors. The knowledge would include to interfacing aspects and consumer defined control of speed and power. CO4: Acquire capacity to work theoretically and practically with solid-state devices. CO5: Delve into practical aspects related to electrical wiring like various types of conductors and cables, wiring-Star and delta connections, voltage drop and losses. CO6: Measure current, voltage, power in DC and AC circuits acquire proficiency in fabrication of regulated power supply. CO7: Develop capacity to identify and suggest types and sizes of solid and stranded cables, conduit lengths, cable trays, splices, crimps, terminal blocks and solder.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Semester 4:

Course Name	Learning Outcomes	How Course Learning Outcomes Are Attained
CC-4B: Microprocessor and Microcontroller	CO1: Designing and developing embedded systems. CO2: Major components that constitute an embedded system. CO3: The architecture of a 8085 Microprocessor. CO4: Assembly language programming essentials CO5: A microcontroller, microcomputer embedded system. CO6: The architecture of a 8051 microcontroller and its concepts like I/O operations, interrupts, programming of timers and counters. CO7: Interfacing of 8051 microcontroller with peripherals CO8: Implementing small programs to solve well-defined problems on an embedded platform.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Semester 5:

Course Name	Learning Outcomes	How Course Learning Outcomes are attained
DSE-1B: Semiconductor Devices Fabrication	CO1: Learn to distinguish between single crystal, polycrystalline and amorphous materials based on their structural morphology and learn about the growth of single crystals of silicon, using Czocharalski technique, on which a present day electronics and IT revolution is based.	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.)

	CO2: Students will understand about the various techniques of thin film growth and processes. CO3: Gain knowledge about characteristics of semiconductor devices (p-n junction diode, MOS, MOSFET, TUNNEL diode) CO4: Understanding of characteristics of Volatile and Non Volatile memory element and their classifications. CO5: Appreciate the various VLSI fabrication technologies and learn to design the basic fabrication process of R, C, P- N Junction diode, BJT, JFET, MESFET, MOS, NMOS, PMOS and CMOS technology. CO6: Gain basic knowledge on overview of MEMS (Microelectromechanical System) CO7: MEMS based transducers.	5. Correlation of concepts with Experiments in Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.

Semester 6:

Course Name	**Learning Outcomes**	**How Course Learning Outcomes are attained**
DSE-2B: Photonic devices and Power Electronics	CO1: Develop understanding of application of fundamental laws of physics in such optoelectronics areas as telecommunications and power electronics for automation in industries. CO2: Acquire essential laboratory skills in designing experiments, assembling standard optical tools for	1. Blended mode of teaching with flip classroom approach 2. In place of traditional chalk and board method we adopt JAM board. 3. Video lectures from SWAYAM and NPTEL 4. Virtual Labs (Amrita Lab etc.) 5. Correlation of concepts with Experiments in

	optical experimentation and power electronics and analyzing acquired data. CO3: Identify the critical areas in application levels and derive typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus. CO4: Develop understanding to compare performance and basic operation of various power semiconductor devices, passive components and various switching circuits. CO5: Develop understanding of Basic circuit of power rectifiers and inverters.	Laboratory 6. Hands on training with various instruments (CRO, DSO, Function generator etc.) 7. Virtual tour of industries. 8. Assessment based upon continuous evaluation including quizzes, assignments projects, presentations, and class test.