BANKURA ZILLA SARADAMANI MAHILA MAHAVIDYAPITH
Nutanchati, Opposite Axis Bank, Bankura,
West Bengal, Pin-722101

ACADEMIC AUDIT REPORT
For the Academic year 2018 - 2019

Academic Audit of Department : PHYSICS

Period of Audit: 2018-2019

I - COLLEGE PROFILE (To be filled in by the IQAC Co-ordinator)

1	Name of the Department, Website, email and Ph. No.		Department: Physics, http://bzsmcollege.org/, E-mail id: sarada_6@yahoo.co.in ; Ph. No.: 03242-251194
2	Name of the HOD, email & Mob. No.		Goutam Mandal ,E-mail: phy.gmandal@gmail.com; Mobile No: 9474806931
3	Name of the IQAC Coordinator, email & Mob. No.		Dr.Nityananda Patra, nityananda.patra1967@gmail.com Mobile No.: 9474144885
4	Year of Establishment/ Year of Affiliation		1973/1975
5	NAAC Grade with Cycle, Accredited Year (if not Accredited Status of Preparations)		Grade A (3.04) Cycle 2 2015
6	UGC Recognition (2F & 12 B)		YES
7	Departmental Working Hours (if shift system mention details of both shifts & give reasons for shift system)		10.00 a.m-5.00 p.m (Monday to Saturday)

				Teaching	Non Teaching
8	No. of Posts Sanctioned:				
	Teaching -		Govt. approved :	1	1
	Non Teaching-		Management approved :	-	-
	Supportive Staff -		Govt. approved Contractual :	-	-
	Other if any -		Management approved Contractual :	-	-
			Guest Working:	5	2

			No of Students	**Sem-I**	**Sem-II**	**Sem-III**	**Sem-IV**	**Sem-V**	**Part-II**	**Part-III**
				Bankura University					**Burdwan University**	
9	Course wise & Year wise Students strength particulars		**Honours**	11	11	11	11		-	05
			General	-	-	-	-		-	06

II - CURRICULAR ASPECTS		**Statement**	**Impression/Recommendation/ Remark by Academic Advisors**	**Status**	**Grade**
1	Departmental Annual Curricular Plans	Distribution of syllabus in modules and unitization of syllabus were prepared well before the commencement of classes and executed in a planned and systematic manner. PO, CO & PSO is also formulated (**Annexure-I**).	Practical experience on theoretical knowledge be given importance through the introduction of Internship, if possible.	Good	A
2	Departmental Activities and Records of students' and Teachers' participation for the Academic Year 2018 to 2019	Every activity is recorded such as Departmental meetings, Departmental Seminar, Student-Seminar, Class Tests, Meetings of committees related to Parent-Student -Teacher formed by the department etc.	Database on the pass out students for making alumni association more dynamic and productive be made an integral part of the departmental activities every year.	Good	A
3	Add-on Courses completed during Academic Year 2018 to 2019	NIL	At least introduction of some vocational training courses be made compulsory every year to impart practical knowledge.	Poor	C
4	Plan for introduction of new Add-on Courses in Academic Year 2018 to 2019	NIL	Efforts be made for the introduction of some vocational training courses or at least hands on training be made compulsory every year to impart practical knowledge.	Poor	C
5	Coverage of Syllabus (Average Percentage)	More than 90% syllabus is covered for all courses of UG program. Records are kept in the individual Teacher's Diary.	100% coverage of the syllabus should be made mandatory because it will help the advanced students immensely.	Good	A
6	Maintenance of Student Attendance Registers	Day to day attendance is recorded in the Student Attendance Registers.	Poor attendance (i.e. less than 50%) of the students be compulsorily intimated to the parents.	Good	A

7	Feedback forms on Curriculum from students	Feedback is taken and analyzed (**Annexure –II**). Attempts are being made to submit the Feedback online by the students from the current session. Suggestions and Proposals from students have been carefully analyzed. Some of the demands have been fulfilled by the department in the interest of the students.	Online feedback procedure should be made compulsory.	Satisfactory	B

** Grade A (Good) / B (Satisfactory) / C (Poor)

III - TEACHING, LEARNING & EVALUATION		**Statement**	**Impression/Recommendation/Remark by Academic Advisors**	**Status**	**Grade**
1	Teaching Diaries & Plans in the Prescribed Formats	The teaching diaries and plans are maintained by all the teachers of the department and those are verified and signed by the Principal.	Well maintained.	Good	A
2	Co-Curricular Activities (Departmental Level)	Students of each year/ semester organized Teachers' Day celebration program every year in the department. They used to participate in the "Physics Quiz" Contest, "Concept Test In Physics" conducted by the Department.	Arrangement of Exhibition at least once a year is recommended.	Good	A
3	Degrees offered	UG programs run by the department.	Job-oriented programmes be introduced, if possible.	Good	A
4	Conduct of Internal Examinations-continuous assessment & Mid-Term Test	Continuous assessment is carried out by the department in the form of Class Test, Mid-term test, Concept Test, Surprise Test, Practical Test and Internal Assessment.	Well maintained and documented.	Good	A
5	Remedial Classes	Remedial classes are conducted for each semester as and when required subject to the availability of time and convenience of student and teachers. Sometimes in the remedial classes, evaluated and assessed answer scripts are shown to the students for their self-assessment and better understanding of the	Assessed answer scripts reflecting the academic improvement of the students be given to the students to show their parents.	Good	A

		subject.			
6	Record of Mentoring of students by teachers	Record of mentoring of students by teachers is maintained by the department. However, mentoring is also provided outside the class.	Performances of the students in all respects be intimated to the parents periodically, if possible.	Good	A
7	Result Analysis for the years 2018 & 2019	Result analysis is done according to result sheet provided by the University **(Annexure-III).**After critical analysis of the results; the students are advised about how to improve both the theoretical and practical marks.	Final result sheet should be well-circulated through college prospectus, website etc.	Good	A

IV - RESEARCH AND CONSULTANCY		**Statement**	**Impression/Recommendation/Remark by Academic Advisors**	**Status**	**Grade**
1	No. of Research Guides in the Department	Nil	All Departmental teachers be encouraged to complete their Ph.D.	Poor	C
2	No. of Faculty registered for Ph. D (attach details)	One permanent faculty enrolled in Ph D under BKU.	All Departmental teachers be encouraged to complete their Ph.D.	Poor	C
3	Number of Major/Minor/Other Research Projects (attach details)	Major: Nil Minor: Nil Others: Nil	Other funding agencies may be explored.	Poor	C
4	Number of Research Papers Published in Academic year (Internationals/Nationals Journals) (attach details)	National : 0 International: 4 (**Annexure-IV**)	Inadequate.	Satisfactory	B
5	Number of Papers Presented in Academic year 2018 to 2019 (International/National/State Level Conference) (attach details)	International: Nil National : 1 (**Annexure-IV**) State Level Conference: Nil	Inadequate.	Satisfactory	B
6	Number of Books Published in Academic year 2018 to 2019 (Single Author/Co Author) (attach details)	As a Single Author – Nil As a Co-Author – Nil	Inadequate.	Satisfactory	B
7	Number of Seminars / Workshops / Training Program Conducted in the Academic year (International / National / State) (attach details)	Nil	Efforts to be made to conduct National/International Seminars	Satisfactory	B

** Grade A (Good) / B (Satisfactory) / C(Poor)

8	Student Seminars/ Workshop/ Exhibition/ Project in the Academic Year (other than University)	03	Arrangement of Exhibition at least once a year is recommended.	Satisfactory	B
9	Record of Consultancy in Academic year 2018 to 2019 (attach details)	Nil	Initiative should be taken by the college to invite various companies for placement, if possible.	Poor	C
10	Record of MOUs in Academic year 2018 to 2029 (attach details)	Initiatives are being taken by the Department to sign MOUs with adjacent institutions of Bankura University for Faculty exchange, Collaborative Seminars.	Initiative should be taken by the college, if possible.	Poor	C

** Grade A (Good) / B (Satisfactory) / C (Poor)

V - EXTENSION ACTIVITIES		**Statement**	**Impression/Recommendation/ Remark by Academic Advisors**	**Status**	**Grade**
1	Record of Subject/Department Related Extension Activities (attach details)	Wall magazine (**Annexure-V**)	Adequate	Good	A
2	Field Visit (attach records)	Santiniketan (**Annexure-VI**)	Adequate	Good	A
3	Industry Visit (attach records)	NIL	Initiative may be taken by the Department.	Poor	C
4	Any Other Club (attach records)	NIL	Initiative may be taken by the Department.	Poor	C
5	Any other social service activity undertaken by the students and teachers/students/teachers of the department (attach records)	Awareness camp (**Annexure-VII**)	Adequate	Good	A

** Grade A (Good) / B (Satisfactory) / C (Poor)

Recommendation/Suggestions by Academic Advisors

	Suggestions for improvement/progress of the department	Sheet attached		
			Signatures of Academic Advisor with designation	Seal
	Declaration by the Department	1	(Superintendent of Colleges)	Inspector of Colleges (Addl. Charge) Bankura University
		2		
		3		
	Signature of the HOD with date			
	Signature of the Principal with date			

Declaration by the Principal

On behalf of the College Governing Body and as Institutional Head, I will forward the observations by the Academic Advisors to IQAC and also to the Governing Body of the Institution for further necessary action regarding Academic development of the department.

Date:

Signature of Principal
Principal
Bankura Zilla Saradamani Mahila Mahavidyapith

P O , C O, P S O

Department of Physics

ACADEMIC YEAR :2017-18

B. Sc. PHYSICS HONOURS

Department of Physics	After successful completion of three year degree Honours course in physics a student should be able to:
Programme Outcomes	PO-1. Get a brief idea about the various fields of physics. PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion. PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of Physics experiments. PO-4. Create an awareness of the impact of Physics on the society, and development outside the scientific community. PO-5. PO-6. To inculcate the scientific temperament in the students and outside the scientific community. PO-5. Exhibit disciplined work habits as an individual.
Programme Specific Outcomes	PSO-1. Gain the knowledge of Physics through theory and practical. PSO-2. Understand good laboratory practices and safety. PSO-3. Gain capability of oral and written scientific communication, and will prove that they can think critically and work independently. PSO-4. Make aware and handle the sophisticated instruments/equipments.

Course Outcomes B. Sc Physics SEM-I	
Core/SEC/DSE	**Outcomes** After completion of these courses students will:
Core-T1 Mathematical Physics (4 Credits)	**CO-1.** Know about First Order Differential Equations and Integrating Factor. Calculus of functions of more than one variable. **CO-2**. Know about Recapitulation of vectors. Vector Differentiation. Vector Integration. **CO-3.** Study about the Orthogonal Curvilinear Coordinates. Spherical and Cylindrical Coordinate Systems. **CO-4.** Learn about gamma function, beta function , relation between them , Dirichlet's integral . **CO-5.** Understand Complex representation of Fourier series, Parseval Identity, method of separation of variables. **CO-6.** Learn about Frobenius method and its applications to differential equations. Properties of Legendre Polynomials. Bessel Functions. **CO-7.** Study on Beta and Gamma Functions. Error Function. **CO-8.** Understand Laplace's Equation, Wave equation, Diffusion Equation.
Core-P1 Mathematical Physics Lab (2 Credits)	**CO-1.** Know about Computer architecture and organization. **CO-2**. Know about Basics of scientific computing. **CO-3.** Discuss about the Errors and error Analysis. **CO-4.** Know about plotting graphs with Gnuplot , 2D & 3D plot, data plot, polar & parametric plot etc. **CO-5.** Know how to fit a curve using Least square fit method in Gnuplot, Goodness of fit, standard deviation.
Core-T2 Mechanics (4 Credits)	**CO-1.** Know about Reference frames, Galilean transformations; motion of rocket, motion of a projectile in Uniform gravitational field Dynamics of a system of particles, centre of Mass, Principle of conservation of momentum, Impulse.

	CO-2. Study on Work and Kinetic Energy Theorem. Conservative and non- conservative forces. Potential Energy, stable and unstable equilibrium, Elastic potential energy. Force as gradient of potential energy, Work done by non-conservative forces. Law of conservation of Energy. **CO-3.** Learn about the motion of ideal fluids, the continuity equation. Euler's equation for an incompressible fluid. Steady flow. Bernoulli's theorem, Venturimeter. Kinematics of Moving Fluids, Poiseuille's Equation. **CO-4.** Understand Hooke's law, Elastic moduli and their interrelationship. Strain-energy in a stretched wire, Torsion of a wire, Loaded beams. Bending moment. Stresses induced by bending, cantilever. **CO-5.** Know about gravitational potential energy, central force field, Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). **CO-6.** Know about Non-inertial frames and fictitious forces, centrifugal force. coriolis force and its applications, components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. **CO-7**. Learn about Michelson-Morley Experiment, postulates of special theory of relativity, Lorentz Transformations, Length contraction. Time dilation, Relativistic transformation of velocity, frequency and wave number, relativistic addition of velocities, variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect, Relativistic Kinematics. Transformation of Energy and Momentum.
Core- P2 Mechanics Lab (2 Credits)	**CO-1.** Experimentally determine length (or diameter) using verniercaliper, screw gauge and travelling microscope. **CO-2**. Experimentally determine Motion of Spring and calculate, (a) Spring constant, (b) g and (c) Modulus of rigidity. **CO-3.** Experimentally determine the Young's modulus of a material in the

	form of a bar by the method of flexure. **CO-4.** Experimentally determine the coefficient of viscosity of water by capillary flow method (Poiseuille's method). **CO-5.** Experimentally determine the coefficient of viscosity of highly viscous liquid by Stoke's method. **CO-6.** Experimentally determine the value of g using Bar Pendulum. **CO-7.** Experimentally determine the acceleration due to gravity with the help of Kater's pendulum. **CO-8.** Experimentally determine the Moment of Inertia of a Flywheel.
Course Outcomes B. Sc Physics **SEM-II**	
Core/SEC/DSE	**Outcomes** After completion of these courses students will:
Core-T3 **Electricity & Magnetism** **(4 Credits)**	**CO-1.** Know about Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry, Capacitance. **CO-2**. Learn about Polarization, Electrical Susceptibility and Dielectric Constant. Capacitor filled with dielectric. Displacement vector D. Relations between E, P and D. Gauss' Law in dielectrics. **CO-3.** Learn about Biot-Savart's Law and its simple applications. Ampere's Circuital Law and its application. **CO-4.** Know about Faraday's Law, Lenz's Law, Self-Inductance and Mutual Inductance, Introduction to Maxwell's Equations, Charge Conservation and Displacement current **CO-5.** Understand Magnetization vector (M). Magnetic Intensity (H). Magnetic Susceptibility and permeability. Relation between B, H, M. Ferromagnetism. B-H curve and hysteresis. **CO-6.** Learn about Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit, Parallel LCR Circuit.

	CO-7. Learn about Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem and Maximum Power Transfer theorem.
Core-P3 **Electricity & Magnetism Lab** **(2 Credits)**	**CO-1.** Experimentally determine Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses. **CO-2**. Experimentally verify the Thevenin, Norton and Maximum power transfer theorems. **CO-3.** Experimentally determine self-inductance of a coil by Anderson's bridge. **CO-4.** Experimentally study response curve of a Series LCR circuit and determine its (a) Resonant frequency (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width. **CO-5.** Experimentally determine the ECE of copper. **CO-6.** Experimentally construct the one Ohm coil.
Core-T4 **Waves & Optics** **(4 Credits)**	**CO-1.** Discuss about Simple Harmonic Oscillations, Differential equation of SHM and its solution, Damped oscillation. Forced oscillations, sharpness of resonance, Quality Factor. **CO-2.** Know about superposition of two collinear oscillations, Superposition of N collinear Harmonic Oscillations, Superposition of two perpendicular Harmonic Oscillations, Graphical and Analytical Methods. Lissajous Figures. **CO-3.** Know about plane and spherical Waves, Longitudinal and Transverse Waves, Plane Progressive Waves, Wave Equation. Particle and Wave Velocities, Energy Transport, Water Waves, Gravity Waves. **CO-4.** Learn about waves in a String, Vibrating String, Normal Modes of Stretched Strings. Plucked and Struck Strings. Melde's Experiment. Longitudinal Standing Waves, Open and Closed Pipes, Superposition of N Harmonic Waves. **CO-5.** Think about Electromagnetic nature of light, wave front, Huygens Principle, Coherence, Young's double slit experiment. Lloyd's Mirror,

	Fresnel's Biprism, Stokes' treatment, parallel and wedge-shaped films, Haidinger Fringes, Fringes of equal thickness, Newton's Rings, Michelson Interferometer, Fabry-Perot interferometer. **CO-6.** Understand about Fraunhofer diffraction, Resolving Power of a telescope, Diffraction grating, Fresnel's Half-Period Zones for Plane Wave, Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire. Holography, Recording and Reconstruction Method. Theory of Holography as Interference between two Plane Waves. Point source holograms.
Core-P4 **Waves & Optics Lab** **(2 Credits)**	**CO-1.** Experimentally determine the angle of prism. **CO-2.** Experimentally determine refractive index of the Material of a prism using sodium source. **CO-3.** Experimentally determine dispersive power and Cauchy constants of the material of a prism using mercury source. **CO-4.** Experimentally determine wavelength of sodium light using Fresnel Biprism. **CO-5.** Experimentally determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating. **CO-6.** Experimentally determine dispersive power and resolving power of a plane diffraction grating.
Course Outcomes B. Sc Physics **SEM-III**	
Core/SEC/DSE	**Outcomes** After completion of these courses students will:
Core-T5 **Mathematical Physics-II** **(4 Credits)**	**CO-1.** Learn about Functions of a complex variable. Single- and multivalued functions. Analytic functions. Cauchy-Riemann equations. **CO-2.** Take concepts on Cauchy's integral theorem, Cauchy's integral formula. Jordan's Lemma, The Taylor, Laurent expansion, Singular points, Removable singularity, Poles, Essential singularity. Residue at a pole of order m, Cauchy's residue theorem.

	CO-3. Know about Hermitian, orthogonal and unitary matrices, inverse of a matrix. Solution by matrix method. Eigenvalues and eigenvectors of a matrix. Matrix representations of Linear operators. Similarity transformation. **CO-4.** Think on Probability distribution functions; binomial, Gaussian, and Poisson, Mean and variance, Conditional Probability. Bayes' Theorem. **CO-5.** Understand about Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function. **CO-6.** Learn about Functionals, Basic ideas of functional, Extremization of action as a basic principle in mechanics, Lagrangian formulation, Euler's equations of motion for simple systems, Cyclic coordinates. Symmetries and conservation laws. Legendre transformations and the Hamiltonian formulation of mechanics. Canonical equations.
Core-P5 **Mathematical Physics-II Lab** **(2 Credits)**	**CO-1.** Learn about an introduction to programming in python. **CO-2.** Learn about an introduction to Computer Programming using python. **CO-3.** Learn about Numerical Computation in python.
Core-T6 **Thermal Physics** **(4 Credits)**	**CO-1.** Discuss about Zeroth and First Law of Thermodynamics, Second Law of Thermodynamics, Heat Engines. Carnot's Cycle, Refrigerator & coefficient of performance, 2nd Law of Thermodynamics: Kelvin-Planck and Clausius Statements, Carnot's Theorem, Concept of Entropy, Clausius Theorem, Principle of Increase of Entropy,Third Law of Thermodynamics. Unattainability of Absolute Zero. **CO-2.** Take concept on Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Cooling due to adiabatic demagnetization, First and second order Phase Transitions with examples, Clausius Clapeyron Equation, Ehrenfest equations **CO-3.** Learn about Maxwell's Thermodynamic Relations.

	CO-4. Know about behavior of real gas. The Virial Equation.Van der Waal's Equation of State for Real Gases. Joule- Thomson Cooling.
Core-P6 **Thermal Physics Lab** **(4 Credits)**	**CO-1.** Experimentally determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. **CO-2.** Experimentally determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus. **CO-3.** Experimentally determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. **CO-4.** Experimentally determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT). **CO-5.** Experimentally determine the variation of Thermo-emf of Thermocouple with Difference of Temperature of its Two Junctions. with the help of Fresnel's bi-prism.
Core-T7 **Digital Systems and Applications** **(4 Credits)**	**CO-1.** Learn about Integrated Circuits(SSI, MSI, LSI , VLSI and ICs) **CO-2.** Learn about Binary Numbers, conversion between number systems, AND, OR and NOT Gates, NAND and NOR Gates as Universal Gates, XOR and XNOR Gates, De Morgan's Theorems, Minterms and Maxterms, Karnaugh Map, Multiplexers, De-multiplexers, Decoders, Encoders, Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor. **CO-3.** Learn about SR, D, and JK Flip-Flops, M/S JK Flip- Flop, 555, Timer, Astable multivibrator and Monostable multivibrator, Shift registers,Counters , Ring Counter. Asynchronous counters, Decade Counter. Synchronous Counter. **CO-4.** Learn about Computer Organization, Data storage, Computer memory. Memory organization & addressing. Memory Interfacing. Memory Map.
Core- P7 **Digital Systems and**	**CO-1.** Experimentally measure (a) Voltage, and (b) Time period of a periodic waveform using CRO.

Applications Lab **(2 Credits)**	**CO-2.** Experimentally test a Diode and Transistor using a Multimeter. **CO-3.** Experimentally design a switch (NOT gate) using a transistor. **CO-4.** Experimentally verify and design AND, OR, NOT and XOR gates using NAND gates. **CO-5.** Experimentally design a combinational logic system for a specified Truth Table. **CO-6.** Experimentally convert a Boolean expression into logic circuit and design it using logic gate ICs. **CO-7.** Experimentally study Half Adder, Full Adder and 4-bit binary Adder. **CO-8.** Experimentally build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.
SEC-T2 **Renewable Energy and Energy Harvesting** **(2 Credits)**	**CO-1.** Learn about Fossil fuels and alternate Sources of energy. **CO-2.** Learn about Solar energy and related topics. **CO-3.** Know about Wind Energy and its utility on energy harvesting. **CO-4.** Understand the fact and uses of Ocean Energy. **CO-5.** Take clear understanding about the using of Geothermal energy. **CO-6.** Learn about hydro-energy. **CO-7.** Know about Piezoelectric Energy harvesting. **CO-8.** Discuss about Electromagnetic Energy Harvesting.
Course Outcomes B. Sc Physics **SEM-IV**	
Core/SEC/DSE	**Outcomes** After completion of these courses students will:
Core-T8 **Mathematical Physics-III** **(4 Credits)**	**CO-1.** Know about Linear Vector Spaces, Abstract Systems, Binary Operations, Groups, Fields, Vector Spaces and Subspaces. Linear Transformations, Orthogonal and unitary Transformations. **CO-2.** Know about Fourier Transforms, its properties, Convolution theorem,

	application of FT in differential equation, Laplace Transform, Inverse LT, application of FT in differential equation. **CO-3.** Know about the Cayley- Hamiliton Theorem, diagonalization of Matrices, solutions of Coupled Linear Ordinary Differential Equations. Functions of a Matrix.
Core- P8 **Mathematical Physics-III lab** **(2 Credits)**	**CO-1.** Know how to solve differential equations in MATLAB or Scilab. **CO-2.** Able to derive Fourier Series to evaluate the Fourier coefficients of a given periodic function in Scilab. **CO-3.** Able to do calculation of least square fitting manually without giving weightage to error. Confirmation of least square fitting of data through Scilab program. **CO-4.** Able to know how to compute the nth roots of unity for n = 2, 3, and 4. **CO-5.** Know how to find the square roots of different function.
Core-T9 **Elements of Modern Physics** **(4 Credits)**	**CO-1.** Learn about Planck's quantum, Blackbody Radiation, Photo-electric effect and Wave amplitude and wave functions. **CO-2.** Know about Wave-particle duality, Heisenberg uncertainty principle, Energy-time uncertainty principle Schrodinger equation. **CO-3.** Understand on the One dimensional infinitely rigid box, energy eigenvalues and eigenfunctions, Quantum mechanical scattering and tunnelling in one dimension- across a step potential & rectangular potential barrier. Nature of nuclear force, NZ graph, Liquid Drop model, Nuclear Shell Model. **CO-4.** Take concept on Radioactivity, Fission and fusion , Lasers: Three-Level and Four-Level Lasers, Ruby Laser and He-Ne Laser.
Core- P9 **Elements of Modern Physics Lab** **(2 Credits)**	**CO-1.** Experimentally determine work function of material of filament of directly heated vacuum diode. **CO-2.** Experimentally determine the wavelength of H-alpha emission line of Hydrogen atom. **CO-3.** Experimentally determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.

	CO-4. Experimentally determine the wavelength of laser source using diffraction of single slit. **CO-5.**Experimentally determine the Boltzmann constant using I-V characteristics of PN junction diode.
Core-T10 **Analog Systems and Applications** **(4 Credits)**	**CO-1.** Learn about semiconductor junction, junction diodes, junction related phenomenon, different types of junvtions. **CO-2.** Know about rectifier diodes, rectification procedure and circuit modifications, LED, photodiodes, solar cell. **CO-3.** Understand the basic mechanism of BJT & FET, biasing of transistors, stability of biasing, I-V Characteristics, different regions of operation. **CO-4.** Take concept on transistor amplifier, types of amplifier, amplification factors, feedback in amplifier, its uses. **CO-5.** Learn on Barkhausen criteria, basic of oscillators circuits, sinusoidal oscillators. **CO-6.** Take concepts on Operational Amplifier, its characteristics, constructions and its uses.
Core- P10 **Analog Systems and Applications Lab** **(2 Credits)**	**CO-1.** Experimentally study the characteristics of a Bipolar Junction Transistor in CE configuration and designing a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias. **CO-2.** Experimentally study the frequency response of voltage gain of a RC-coupled transistor amplifier. **CO-3.** Experimentally design a digital to analog converter (DAC) of given specifications. **CO-4.** Experimentally design inverting amplifier and non-inverting using Op-amp (741,351) for dc voltage of given gain. **CO-5.** Experimentally design inverting amplifier and non-inverting amplifier using Op-amp (741,351) and study its frequency response.

	CO-6. Experimentally study the zero-crossing detector and comparator. **CO-7.** Experimentally investigate the use of an op-amp as adder inverting and non-inverting mode, Differentiator and Integrator.
SEC-T3 **Radiation Safety** **(2 Credits)**	**CO-1**. Know about the Interaction of Radiation with matter and related topics. **CO-2.** Know about radiation detection, detectors and monitoring devices. **CO-3.** Understand about radiation safety management. **CO-4.** Know about application of nuclear techniques.
Course Outcomes B. Sc Physics **SEM-V**	
Core/SEC/DSE	**Outcomes** After completion of these courses students will:
Core-T11 **Quantum Mechanics and Applications**	**CO-1:** Understand the basic requirement and fundamentals of quantum Mechanics. **CO-2:** Know the importance of the uncertainty principle and the acceptable Wave functions. **CO-3:** Discuss bound states in arbitrary potentials. **CO-4:** Study the quantum theory of hydrogen-like atoms. **CO-5:** Analyze the effects of electric and magnetic fields on atoms. **CO-6:** Apply the concepts of Pauli's exclusion principle and spin-orbit couplings in dealing with many electron atoms.
Core-T11 **Quantum Mechanics and Applications Lab** **(4 Credits)**	**CO-1:** Experimentally determine the ionization potential of mercury. **CO-2:** Experimentally show the tunneling effect in tunnel diode using I-V characteristics. **CO-3:** Experimentally measure Planck's constant using black body radiation and photo-detector. **CO-4:** Experimentally determine the Planck's constant using LEDs of at least

	4 different colours. **CO-5:** Experimentally determine the absorption lines in the rotational spectrum of Iodine vapour.
Core-T11 **Solid State Physics** **(4 Credits)**	**CO-1:** Understand the basic difference between crystalline and amorphous solids and analyze x-ray diffraction by crystals and the structural properties of different solids such as inter-atomic spacing, Brillouin zones. **CO-2:** Deal with lattice vibrations to make out phonons behavior in explaining the propagation of solid waves and hence lattice specific heat. **CO-3:** Classify materials on the basis of the process of magnetization. **CO-4:** Know various contributions to the net polarizability, understand ferroelectric properties of materials. **CO-5:** Describe the formation of energy band in solids, to explain Hall Effect. **CO-6:** Familiar with various factors on the process of transition to the superconducting phase of matter.
Core-T11 **Solid State Physics Lab** **(2 Credits)**	**CO-1:** Experimentally measure the "Dielectric Constant" of dielectric Materials with frequency. **CO-2:** Experimentally draw the BH curve of Fe using Solenoid & determine "energy-loss" from Hysteresis. **CO-3:** Experimentally measure the resistivity of a semiconductor (Ge) with temperature by "four-probe method" (room temperature to 150^{o}C) and determine its band- gap. **CO-4:** Experimentally determine the "Hall coefficient" of a semiconductor sample.
DSE-1 **Classical Dynamics** **(6 Credits)**	**CO-1:** Understand the applications of Newton's Laws of motion in describing the motion of a charged particle in electric and magnetic fields.

	CO-2: Find the importance of Lagrangian and Hamiltonian mechanics, which are the two main branches of analytical mechanics with an emphasis on system energy, rather than on forces and solve various problems using Lagrangian and Hamiltonian formulations. **CO- 3:** Deal with the motion of a particle in a "central force field" . **CO-4.** Acquire knowledge about "small amplitude oscillations". **CO-5:** Study detailed description of "special theory of relativity". **CO-6:** Distinguish streamline and turbulent flows of fluids, derive the equations of motion for incompressible fluid flows, i.e., the Navier-Stokes equations.
DSE-2 **Nuclear and Particle Physics** **(6 Credits)**	**CO-1:** Gain the concept of general properties of nuclei, various nuclear models and nuclear force. **CO-2:** Learn various aspects and mechanisms of α, β and γ-decays from radioactive nuclei. **CO-3:** Understand various types of nuclear reactions and conservation laws. **CO-4:** Know about the ways of interaction of nuclear radiations with matters. **CO-5:** Acquainted with the working principles of nuclear radiation counters and detectors. **CO-6:** Distinguish particle accelerators on the basis of their properties. **CO-7:** Classify particles and their interactions into a number of easily identifiable categories and establish a number of empirical rules leading to a fundamental theory of the strongly interacting particles' properties and structure on the basis of "quark model".

B. Sc. PHYSICS GENERIC/ PROGRAMME

Department of Physics	After successful completion of three year degree general course in physics a student should be able to:
Programme Outcomes	PO-1. Get a brief idea about the various fields of physics. PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion. PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of Physics experiments. PO-4. Create an awareness of the impact of Physics on the society, and development outside the scientific community. PO-5. PO-6. To inculcate the scientific temperament in the students and outside the scientific community. PO-5. Exhibit disciplined work habits as an individual.
Programme Specific Outcomes	PSO-1. Gain the knowledge of Physics through theory and practical. PSO-2. Understand good laboratory practices and safety. PSO-3. Gain capability of oral and written scientific communication, and will prove that they can think critically and work independently. PSO-4. Make aware and handle the sophisticated instruments/equipments.
Course Outcomes U.G. Physics **SEM-I**	
Core/GE	**Outcomes** After completion of these courses students will:
T1 – Physics I **(4 Credits)**	**CO-1.** Know vector Calculus and some related theorems. **CO-2**. Clear understanding Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. **CO-3.** Concept about Work and energy. Conservation of energy, Motion of rockets, Torque, Conservation of angular momentum. **CO-4.** Concept about Newton's Law of Gravitation. Motion of a particle in a central force field, Kepler's Laws, Satellite in circular orbit. **CO-5.** Discussion on Elastic moduli, work done in stretching twisting couple on a cylinder, Torsional pendulum, Searles method. **CO-6.** Discuss on the Postulate of special theory of relativity. Lorentz

	transformations. Simultaneity and order of events. lorentz contraction. Time dilation, relativistic transformation of velocity, relativistic addition of velocities. **CO-7.** Know about Differential equation of SHM and its solutions, Oscillations having equal frequencies, Beats, Lissajous Figures, Damped oscillations. Forced vibrations and resonance, musical notes, musical scale. Acoustics of buildings, Sabine's formula **CO-8.** Study on Gauss theorem and its applications, electric dipole, Calculation of electric field from potential. Capacitor, Dielectric medium, Polarisation, Displacement vector.
P1 – Physics I Lab (2 Credits)	**CO-1.** Experimentally determine length (or diameter) using verniercaliper, screw gauge and travelling microscope. **CO-2**. Experimentally determine the Moment of Inertia of a Flywheel. **CO-3.** Experimentally determine the Modulus of Rigidity of a Wire by Maxwell's needle. **CO-4.** Experimentally determine the Elastic Constants of a Wire by Searle's method. **CO-5.** Experimentally determine g by Kater's Pendulum. **CO-6.** Experimentally determine motion of a Spring and calculate (a) Spring Constant, (b) g. **CO-7.** Experimentally investigate the motion of coupled oscillators. **CO-8.** Experimentally study Lissajous Figures. **CO-9.** Experimentally determine the Moment of Inertia of cylindrical body about an axis passing through its centre of gravity. **CO-10.** Experimentally determine the Modulus of Rigidity of a Wire by dynamical method. **CO-11.** Experimentally determine Frequency f vs 1/l curve for a sonometer-wire and hence unknown frequency of a tuning fork.

Course Outcomes U.G. Physics SEM-II	
Core/GE	**Outcomes** After completion of these courses students will:
T2 – Physics II **(4 Credits)**	**CO-1.** Understand Biot-Savart's law and its applications, Ampere's circuital law, Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferro- magnetic materials, Faraday's laws of EM induction, Lenz's law, self and mutual inductance. **CO-2.** Know the basic concept of EM wave, Maxwells equation, displacement current, EM energy density. **CO-3.** Concept about Mean free path ,Law of equipartion of energy and its applications, Blackbody radiation, Plank's distribution law, Stefan Boltzmann Law and Wien's displacement law. **CO-4.** Study on Thermodynamic system, Zeroth Law of TDS and temperature. First law, Applications of First Law, Reversible and irreversible processes, Second law and Entropy, Carnot's cycle & theorem, Unattainability of absolute zero. **CO-6.** Concept about Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell- Boltzmann law Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose- Einstein distribution law.
P2 – Physics II Lab **(2 Credits)**	**CO-1.** Experimentally determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.. **CO-2.** Experimentally determine Stefan's Constant. **CO-3.** Experimentally use a Multimeter for measuring, Resistances, AC and DC Voltages, DC Current, Checking electrical fuses. **CO-4.** Experimentally determine the Characteristics of a Series RC Circuit. **CO-5.** Experimentally determine a Low Resistance by Carey Foster's Bridge. **CO-6.** Experimentally verify the Thevenin and Norton theorems . **CO-7.** Experimentally verify the maximum power transfer theorem.

	CO-8. Experimentally study a series LCR circuit. **CO-9.** Experimentally determine the coefficient of linear expansion of the material of a rod using Optical Lever Method. **CO-9.** Experimentally determine Potential difference across a low resistance and hence the current through it with the help of a meter bridge.
Course Outcomes U.G. Physics **SEM-III**	
Core/GE	**Outcomes** After completion of these courses students will:
T3 – Physics III **(4 Credits)**	**CO-1.** Learn about Electromagnetic nature of light, wave front, Huygens Principle. **CO-2.** Take concepts on Young's Double Slit experiment, Lloyd's Mirror, Fresnel's Biprism, Stokes' treatment, Fringes of equal inclination , Fringes of equal thickness, Newton's Rings, diffraction- Single slit, Double Slit, Diffraction grating, Half-period zones. Zone plate. **CO-3.** Know about Transverse nature of light waves. Plane polarized light – production and analysis, Circular and elliptical polarization. **CO-4.** Take concepts on amorphous and crystalline Materials, Unit Cell. Miller Indices, Reciprocal Lattice,Bragg's Law. **CO-5.** Understand about Heisenberg uncertainty principle,Time dependent Schrodinger equation, Properties of Wave Function, Wave Function , Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators, Expectation values of position and momentum. Wave Function of a Free Particle. **CO-6.** Learn about Packing fraction, mass defect, binding energy, systematics of stable nuclei, Radioactivity, Fission and fusion. Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons.

P3 – Physics III (2 Credits)	**CO-1.** Experimentally measure angle of prism with spectrometer. **CO-2.** Experimentally determine Resolving Power of a Plane Diffraction Grating. **CO-3.** Experimentally determine wavelength of sodium light using Newton's Rings **CO-4.** Experimentally determine value of Boltzmann constant using V-I characteristic of PN diode. **CO-5.** Experimentally value of Planck's constant using LEDs of at least 4 different colours. **CO-6.** Experimentally Refractive index of water by travelling microscope . **CO-7.** Experimentally determine Refractive index of the material of a lens by lens mirror method . **CO-8.** Experimentally determine Refractive index of the liquid by lens-mirror method. **CO-9.** Experimentally determine Focal length of a convex lens by combination method and calculation of its power.
SEC-T2 Renewable Energy and Energy Harvesting (2 Credits)	**CO-1.** Learn about Fossil fuels and alternate Sources of energy. **CO-2.** Learn about Solar energy and related topics. **CO-3.** Know about Wind Energy and its utility on energy harvesting. **CO-4.** Understand the fact and uses of Ocean Energy. **CO-5.** Take clear understanding about the using of Geothermal energy. **CO-6.** Learn about hydro-energy. **CO-7.** Know about Piezoelectric Energy harvesting. **CO-8.** Discuss about Electromagnetic Energy Harvesting.

Course Outcomes U.G. Physics SEM-IV	
Core/GE	**Outcomes** After completion of these courses students will:
T4 – Physics IV **(4 Credits)**	**CO-1.** Know about Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect (only statement), Hall coefficient. **CO-2.** Know about PN junction and its properties, current flow in PN junction, LEDs, Photodiode, Solar CellBipolar Junction transistors, CB, CE and CC Configurations. Active, Cutoff& Saturation regions, Current gains α and β, DC Load line,Voltage Divider Bias Circuit for CE Amplifier. H-parameter, Equivalent Circuit. Analysis of single-stage CE amplifier using hybrid Model and gain calculations, Class A, B & C Amplifiers. **CO-3.** Know about the Characteristics of an Ideal and Practical Op-Amp, Open-loop and closed- loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps. **CO-4.** Know about Binary Numbers, AND, OR and NOT gate ,NAND and NOR Gates as Universal Gates. XOR and XNOR Gates, De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra, Karnaugh Map, Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. **CO-5.** Know about Half-wave Rectifiers, Full-wave Rectifiers, Zener Diode and Voltage Regulation.
P4 – Physics IV **(2 Credits)**	**CO-1.** Experimentally verify and design AND, OR, NOT and XOR gates using NAND gates **CO-2.** Experimentally minimize a given logic circuit. **CO-3.** Experimentally study zener diode characteristics and its application as voltage regulator. **CO-4.** Experimentally design an inverting amplifier of given gain using Op-amp 741 and study its frequency response. **CO-5.** Experimentally draw the I-V characteristics of a suitable resistance and

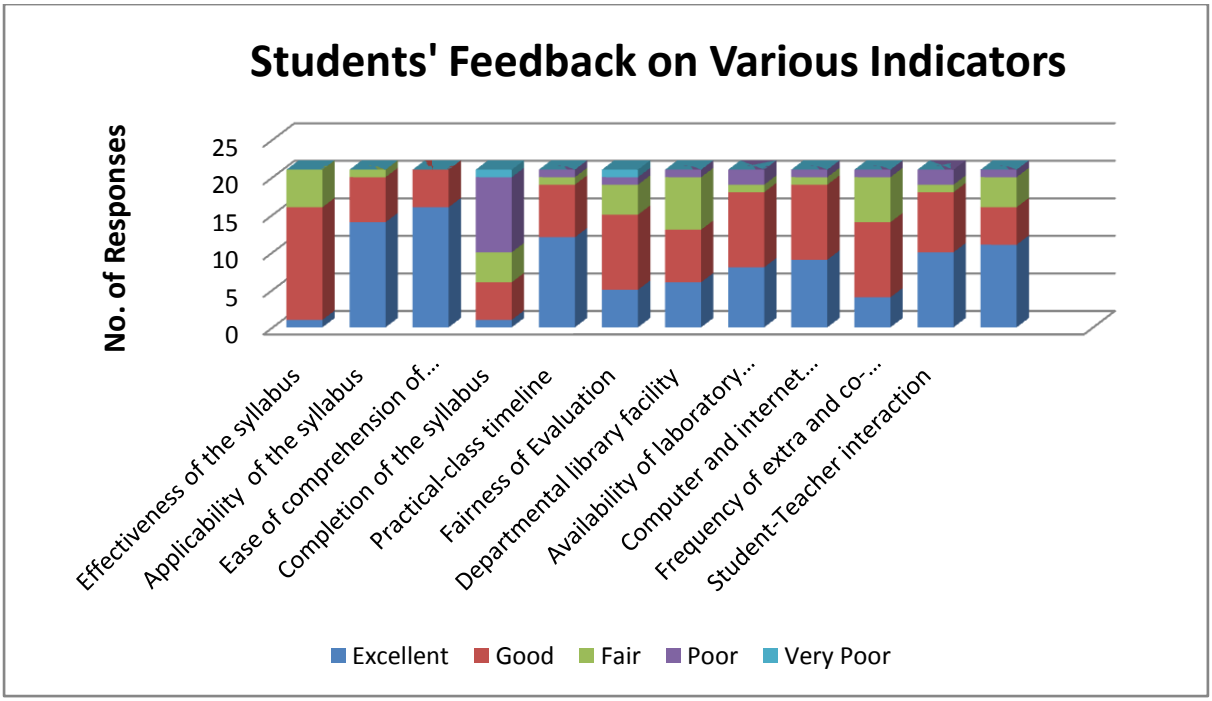
	that of a junction diode within specified limit on a graph, and hence to find d.c. and a.c. resistance of both the elements at the point of intersection. **CO-6.** Experimentally design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
SEC-T3 **Radiation Safety** **(2 Credits)**	**CO-1**. Know about the Interaction of Radiation with matter and related topics. **CO-2.** Know about radiation detection, detectors and monitoring devices. **CO-3.** Understand about radiation safety management. **CO-4.** Know about application of nuclear techniques.
Course Outcomes U.G. Physics **SEM-V**	
Core /DSE	**Outcomes** After completion of these courses students will:
DSE-2 **Classical Dynamics** **(6 Credits)**	**CO-1:** Understand the applications of Newton's Laws of motion in describing the motion of a charged particle in electric and magnetic fields. **CO-2:** Find the importance of Lagrangian and Hamiltonian mechanics, which are the two main branches of analytical mechanics with an emphasis on system energy, rather than on forces and solve various problems using Lagrangian and Hamiltonian formulations. **CO- 3:** Deal with the motion of a particle in a "central force field" . **CO-4.** Acquire knowledge about "small amplitude oscillations". **CO-5:** Study detailed description of "special theory of relativity". **CO-6:** Distinguish streamline and turbulent flows of fluids, derive the equations of motion for incompressible fluid flows, i.e., the Navier-Stokes equations.
SEC-T6 **Electrical circuits and network skills** **(2 Credits)**	**CO-1**. Know about the Basic Electricity Principles. **CO-2.** Know about Understanding Electrical Circuits. **CO-3.** Understand about Electrical Drawing and Symbols. **CO-4.** Know about Generators and Transformers.

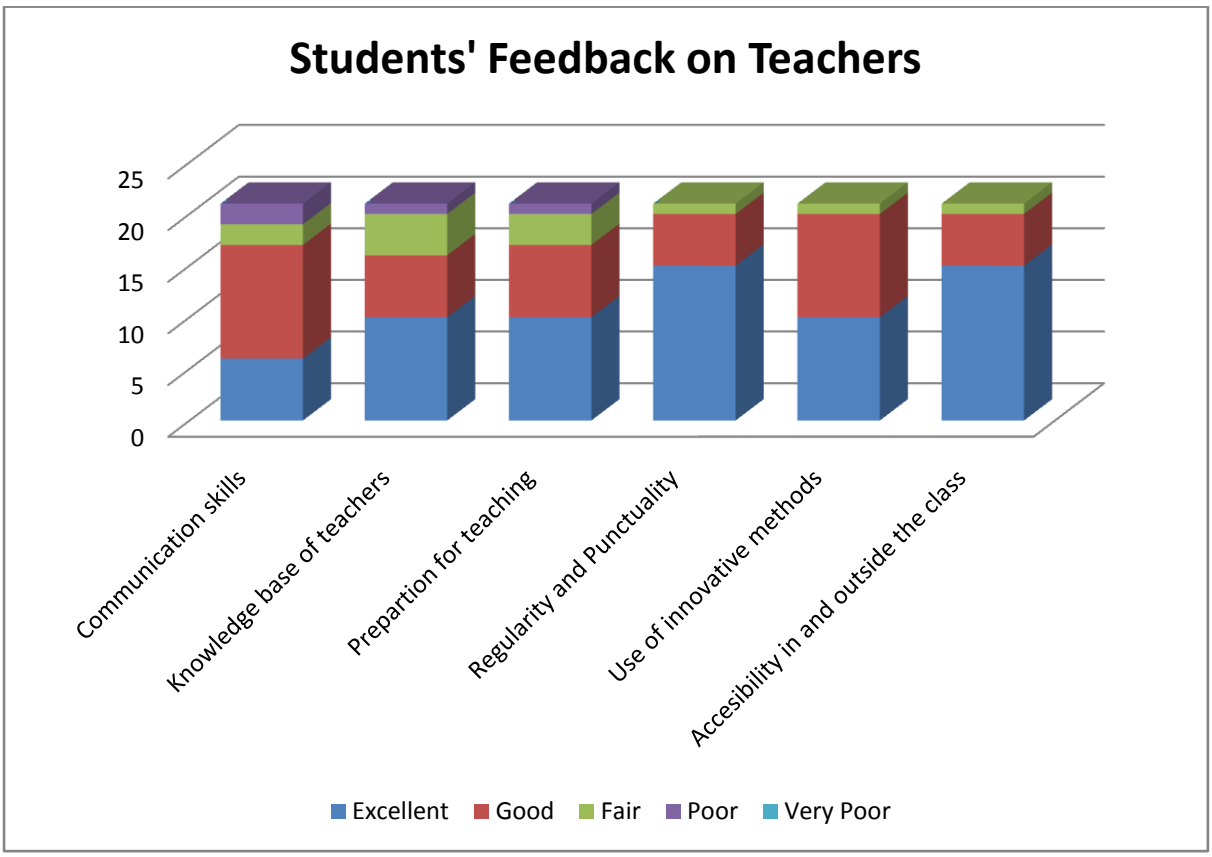
	CO-5. Know about Electric Motors. **CO-6.** Know about Solid-State Devices. **CO-7.** Know about Electrical Protection. **CO-8.** Know about Electrical Wiring.

Annexure-II
Feedback Analysis
Department of Physics
Session: 2018 -19

Semester		No. of student participated	Total no. of student participated
1st Year	1st Sem Hons.	…….	21
	2nd Sem Hons.	11	
2nd Year	3rd Sem Hons.	…….	
	4th Sem Hons.	10	
3rd Year	5th Sem Hons.	…….	
	6th Sem Hons.	…….	

No. of Responses						
Questions	**Excellent**	**Good**	**Fair**	**Poor**	**Very Poor**	**Total**
Effectiveness of the syllabus	1	15	5	0	0	21
Applicability of the syllabus	14	6	1	0	0	21
Ease of comprehension of the subject thought	16	5	0	0	0	21
Completion of the syllabus	1	5	4	10	1	21
Practical-class timeline	12	7	1	1	0	21
Fairness of Evaluation	5	10	4	1	1	21
Departmental library facility	6	7	7	1	0	21
Availability of laboratory equipments	8	10	1	2	0	21
Computer and internet facilities	9	10	1	1	0	21
Frequency of extra and co-curricular activities	4	10	6	1	0	21
Student-Teacher interaction	10	8	1	2	0	21
Student-Lab attendant interaction	11	5	4	1	0	21
On Teachers						
Communication skills	6	11	2	2	0	21
Knowledge base of teachers	10	6	4	1	0	21
Prepartion for teaching	10	7	3	1	0	21
Regularity and Punctuality	15	5	1	0	0	21
Use of innovative methods	10	10	1	0	0	21
Accesibility in and outside the class	15	5	1	0	0	21


Students' Feedback on Various Indicators
No. of Responses
25
20
15
10
5
0
Effectiveness of the syllabus
Applicability of the syllabus
Ease of comprehension of...
Completion of the syllabus
Practical-class timeline
Fairness of Evaluation
Departmental library facility
Availability of laboratory...
Computer and internet...
Frequency of extra and co-...
Student-Teacher interaction
Excellent
Good
Fair
Poor
Very Poor


Students' Feedback on Teachers
25
20
15
10
5
0
Communication skills
Knowledge base of teachers
Prepartion for teaching
Regularity and Punctuality
Use of innovative methods
Accesibility in and outside the class
Excellent
Good
Fair
Poor
Very Poor

Action Taken Report on Feedback Analysis

Year-wise feedbacks are collected from the students at four levels: institutional level, department level, teacher level and curriculum-based. The received data are analysed, the suggestions of the students are discussed in the college council and then, corrective measures are taken. Department and teacher feedbacks are discussed in the department council. The student-centred programmes are mostly conducted based on their suggestions.

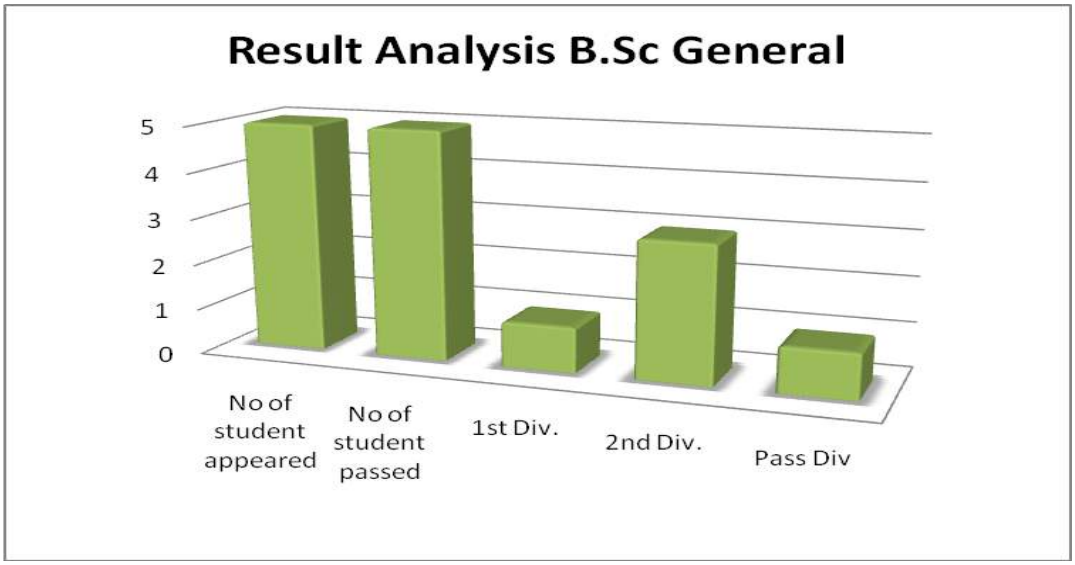
- To resolve the complaints by the students regarding the insufficient books more grants are issued by the college authority.
- Numerous academic initiatives have been taken in this academic year to enrich the academic capabilities of students as well as teachers. Seminars, workshops, exhibitions, quiz competitions, etc. was conducted.
- As part of tapping the external resources, eminent personalities have been invited to the institution and students get opportunities to interact with them.
- Some of the students were dissatisfied with the office assistance. Due to the administrative delay in sanctioning posts by the government, there were unfilled vacancies in the office. This affected the smooth functioning of the office.
- The students were satisfied with the academic initiatives of the institution in this academic year.
- Students suggested improvement of library facilities. Due to the administrative delay in the appointment of full-time library staff, the smooth functioning of the library was affected
- The students pointed out the lack of time to cover the topics prescribed in the syllabus. The teachers too, almost all raised the same complaint. The department took initiatives to arrange special classes to cover the syllabus fully.
- Students wanted initiatives to enrich academic activities. The Department took initiatives to organize more class tests. The Department also made a decision which ensures that the students get their papers valued in time. Those students who delivered low academic performance were given remedial classes.
- Students, teachers and parents had the previous complaint that there was shortage of time to cover the syllabus in detail. Some of the students were dissatisfied with the contents of the syllabi as they do not meet the

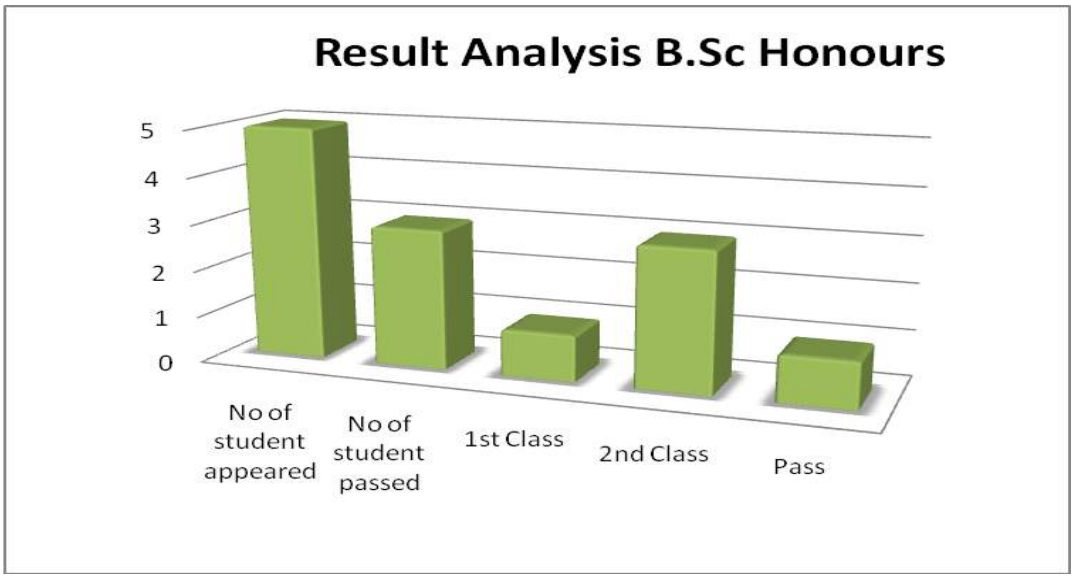
requirements. These grievances were keenly considered during the syllabus revisions.

- As part of strengthening the co-curricular activities, the college council, with the guidance of the Principal, ensured the conduct of inter-departmental arts and sports competitions. Department exhibitions, conferences, inter-departmental competitions, etc. facilitated the expressions of varied talents inherent in students, taking into consideration the individual differences in abilities and aptitudes.
- In order to improve IT facilities, more computers with internet facility were provided to the lab.

Annexure-III
Result Analysis
Department of Physics
Session: 2018 -19

Catagory	No. of Students Appear	No. of Student Passed	Division/Class		No. of Student Fail
Honours	05	03	1st	01	02
			2nd	02	
			Pass	----	
General	05	05	1st	01	Nil
			2nd	03	
			Pass	01	





Analysis:

1. Updated information regarding the subject should be provided in the class hours.
2. Some special classes apart from the regular classes should be taken in certain week.
3. Students should be inspired to take online classes for better knowledge and perfection.
4. Analyze the previous year's questions and follow the question pattern accordingly the preparation should be started and thoroughly practice more and more question answers.
5. The number of reference books, journals, and magazines and text books should be increased in the library.

Annexure - IV

Publications & Presentations

Academic year 2018-19

Department of Physics

Sl. No.	Name of the faculty	Designstion	Research Publication		Book Publication
			National	International	
1	Goutam Mandal	Asst. Professor	0	04	0
2	Apurba Paramanik	Guest Teacher	0	0	0
3	Sagarika Mandal	Guest Teacher	0	0	0
4	Sanchita de	Guest Teacher	0	0	0
5	Anirban Goswami	Guest Teacher	0	0	0
6	Sampa Mondal	Guest Teacher	0	0	0

Details of Publications:

(A) Research Article :

Sl. No.	Title of the paper	Journal name	ISSN No.	Date of publication
1	STUDY ON OPTICAL FREQUENCY ENCODED TRI-STATE S-R FLIP FLOP [Page No:2214-2221]	JASC	1076-5131 [I.F.:5.8]	VOL- 5, ISSUE- 11 (November 2018)
2	A BRIEF REVIEW ON SYNTHESIS TECHNIQUES OF NANOPARTICLE [Page No:172-175]	JASRAE	2230-7540 [I.F: 3.46]	VOL- 15, ISSUE- 12 (Dec-2018)
3	AN OVERVIEW OF TRI-STATE LOGIC IN ALL OPTICAL LOGIC SYSTEM [Page No:559-569]	IJSRR	2279-543X [I.F:6.1]	VOL- 8, ISSUE- 3 (March-2019)
4	X-RAY DIFFRACTION FOR CHARACTERIZATION OF NANOMATERIALS [Page No:2906-2912]	IJSRR	2279-0543 [I.F: 6.9]	VOL- 8, ISSUE- 1 (Jan-Mar, 2019)

(B)Paper Presentations :

Sl. No.	Title of the invited lecture /paper presented	Title of Conference/ Seminar with date	Organized by	Whether International/ National/State or University level
1	Uses of UV spectroscopy in study of nanomaterials	History of periodic table 18.03.19-19.03.19	Bankura Sammilani College	National