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

ACADEMIC AUDIT REPORT
For the Academic year 2016- 2017

Academic Audit of Department : PHYSICS

Period of Audit: 2016-2017

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, Year :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)		
8	No. of Posts Sanctioned: Teaching -1 Non Teaching- 1 Supportive Staff -0 Other if any - 0			Teaching	Non Teaching
			Govt. approved :	1	1
			Management approved :	-	-
			Govt. approved Contractual :	-	-
			Management approved Contractual :	-	-
			Guest Working:	2	1

9	Course wise & Year wise Students strength particulars		**No of Students**	**Part-I**	**Part-II**	**Part-III**
			Honours	08	-	-
			General	59	43	09

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. (**Annexure I**) PO, CO & PSO are also formulated.	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 2016 to 2017	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 2016 to 2017	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 2016 to 2017	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	Good	A

			parents.		
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 year 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 subject.	Assessed answer scripts reflecting the academic improvement of the students be given to the students to show their parents.	Good	A
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 2016 & 2017	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

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

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)	Nil	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: 1**(Annexure-IV)**	Inadequate.	Satisfactory	B
5	Number of Papers Presented in Academic year 2016 to 2017 (International/National/State Level Conference) (attach details)	International: Nil National : 2 **(Annexure-IV)** State Level Conference: 1 **(Annexure-IV)**	Inadequate.	Satisfactory	B
6	Number of Books Published in Academic year 2016 to 2017 (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)	National seminar (co-hosting) -01 **(Annexure-V)**	Efforts to be made to conduct National/International Seminars	Satisfactory	B
8	Student Seminars/ Workshop/ Exhibition/ Project in the Academic Year (other than University)	Student Seminar -2	Arrangement of Exhibition at least once a year is recommended.	Satisfactory	B
9	Record of Consultancy in Academic year 2016 to 2017 (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 2016 to 2017 (attach details)	Nil	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)	NIL	Initiative may be taken by the Department.	Poor	C
2	Field Visit (attach records)	NIL	Initiative may be taken by the Department.	Poor	C
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)		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	(Inspector 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 :2016-17

B. Sc. PHYSICS HONOURS

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 B. Sc Physics Part-I	
Course	**Outcomes** After completion of these courses students should be able to:
Paper-I	**CO-1.** Know about vector algebra, gradient, divergence, curl of a vector field, conservative fields. **CO-2**. Know about vector integration and related theorems like Divergence theorem, Greens theorem etc. **CO-3.** Learn about the orthogonal curvilinear coordinate systems their transformation relations with special emphasis on spherical polar system. **CO-4.** Know about gamma function, beta function , relation between them , Dirichlet's integral . **CO-5.** know about Ordinary differential equations, Wronskian, Series solution of 2^{nd} order ODE, Bessel's differential equation , Legendre's differential equation, Partial differential equations, Solution of Laplace's equation in different coordinate system by the method of separation of variables. **CO-6.** Think about the mathematical formulation of Fourier series, half range series, Fourier transformation etc. **CO-7.** Know about Superposition of two harmonic oscillations, Lissajous figures, Beat phenomenon, Normal modes and normal vibrations. **CO-8.** Study of Damped harmonic oscillator, Forced oscillations, resonance, Waves in a continuous medium, Dispersion, Phase and group velocity. Energy transport by a traveling wave, Kundt's tube.
Paper-II	**CO-1.** Know about system of variable mass, Rocket motion, Work-energy theorem, Angular momentum and torque, system of particles, Collisions. **CO-2**. Know about moment of inertia , Radius of gyration , Product of inertia, Ellipsoid of inertia, Compound pendulum, Rotating coordinate systems, Fictitious forces.

	CO-3. Learn about the gravitational potential and intensity due to spherical and other symmetrical bodies**,** Central forces, Reduced mass, motion under central force, Differential equation of the orbit, Motion of artificial satellites. **CO-4.** Know about motion of ideal fluids, Euler's equation for an incompressible fluid, Bernoulli's theorem, Venturimeter. **CO-5.** Think on elastic moduli and their interrelationship, loaded Beams, Stresses induced by bending, cantilever, flat spiral spring. **CO-6.** Know about the surface tension and its molecular origin, excess pressure on a curved liquid surface, capillary rise, vapour pressure over a curved surface **CO-7.** Take detail study of viscous flow through a capillary tube, Poiseuille's formula, Stokes' law, rotating cylinder method for the determination of the coefficient of viscosity of a liquid, production and the measurement of high vacuum.
Paper-III	**CO-1.** Know about temperature in kinetic theory, Maxwellian distribution function of molecular speeds, Boltzmann's extension of Maxwell's distribution law, Specific heat of gases, molecular collisions, transport phenomena in gases, coefficient of viscosity of gases, thermal conductivity of gases. **CO-2**. Know about real gases, virial expansion and virial coefficients , Vander Waal's equation of state, critical constants, conductivity and diffusivity, one-dimensional heat flow equation, heat flow in three dimensions with spherical and cylindrical geometry, Ingen-Hausz experiment , Wiedemann-Franz law. **CO-3.** Think about the Gauss's theorem in integral and differential forms, applications of Gauss's theorem, Laplace's equation, solution of Laplace's equation for simple geometries, Poisson's equation, multipole expansion of the electrostatic scalar potential, the linear quadrupole, Earnshaw's theorem. **CO-4.** Know about redistribution of charges on the surface of a conductor, method of images, capacitance and their types, Dielectric, Polarization, electric displacement vector **D,** field and potential due to a dielectric sphere etc. **CO-5.** Learn on wave picture of light, Fermat's principle and its

	application loaded , Paraxial theory, Matrix method in paraxial optics. **CO-6.** Think about the aberrations, Abbe's sine condition , chromatic aberration , Ramsden and Huyghens eye pieces , simple and compound microscopes , Elements of fiber optics , step-index and graded-index fibers , single and multimode fibers , intermodal dispersion.
Paper-IV[Practical]	**CO-1.** Experimentally determine Young's modulus of a material in the form of a wire by Searle's method. **CO-2**. Experimentally determine rigidity modulus of a material in the form of a wire by dynamical method. **CO-3.** Experimentally determine coefficient of linear expansion of the material of a rod using Pullinger's apparatus. **CO-4.** Experimentally determine the pressure coefficient of air. **CO-5.** Experimentally determine focal length of a concave lens by the combination method. **CO-6.** Experimentally determine refractive index of a liquid by using a travelling microscope. **CO-7.** Experimentally determine the acceleration due to gravity with the help of Kater's pendulum. **CO-8.** Experimentally determine Young's modulus of a material in the form of a bar by the method of flexure. **CO-9.** Experimentally determine the coefficient of viscosity of water by Poiseuille's method. **CO-10.** Experimentally determine the coefficient of viscosity of highly viscous liquid by Stoke's method. **CO-11.** Experimentally determine surface tension of liquid at different temperatures by Jaeger's method. **CO-12.** Experimentally determine the surface tension of water by capillary – rise method. **CO-13.** Experimentally determine thermal conductivity of a bad conductor by Lees and Chorlton method.

Course Outcomes B. Sc Physics Part-II	
Course	**Outcomes** After completion of these courses students should be able to:
Paper-V	**CO-1.** Know about complex numbers, polar form, Argand diagram, complex variable, analytic functions, Cauchy-Riemann equations, complex line integrals, Cauchy's integral theorem, Cauchy's integral formula, singular points, Poles, Essential singularity, residue at a pole of order *m*, Cauchy's residue theorem. **CO-2**. Know about Linear vector spaces, virial expansion and virial coefficients , linearly independent set of vectors, orthogonality of vectors, linear transformation. linear operators. **CO-3.** Learn about Matrix algebra , Hermitian, orthogonal and unitary solution of a system of linear equations by matrix method, eigenvalues and eigenvectors of a matrix , properties of eigenvectors and eigenvalues of Hermitian and unitary matrices , similarity transformation. **CO-4.** Know about constraints and their classification generalized coordinates, configuration space, principle of virtual work, D'Alembert's principle, calculus of variations, Hamilton's variational principle, Langrangian formalism, cyclic or ignorable coordinates. **CO-5.** Think on Legendre's dual transformation to the Lagrangian of a system, Hamilton's function and Hamilton's equations of motion, application of Hamiltonian formalism to simple systems.
Paper-VI	**CO-1.** Know about equation of continuity, Resistance networks, Kirchoff's laws, Wheatstone bridge, Ampere's law, magnetic induction **B,** Biot-Savart law, integral form of Ampere's law, magnetic dipole, magnetic dipole-dipole interaction, Lorentz force, motion of charged particles in a uniform magnetic field, measurement of the charge *e* and the (*e*/*m*) ratio of electrons. **CO-2.** Learn on Faraday's law of electromagnetic induction, motional emf, self and mutual inductance, electromagnetic damping, Fluxmeter, magnetic field in material media, magnetic moment. Magnetization M, Permeability and magnetic susceptibility, Dia-, para-, and ferromagnetism, Hysterisis. B-H curve.

	CO-3. Know about growth and decay of currents in circuits with L and R, charging and discharging of capacitors in CR and LCR circuits, alternating current , use of complex numbers, currents in LR, CR, and LCR circuits with sinusoidal emf , Power factor, AC and DC motors and generators, Transformer, Wattmeters, **CO-4.** Think on generalization of Ampere's law, Displacement current. Maxwell's equations, Maxwell's equations in material media , Coulomb and Lorentz gauges , Poynting's theorem, Poynting vector, electromagnetic waves in isotropic dielectric media, Plane waves in conducting media, Skin effect, Reflection at a conducting surface, Polarization of electromagnetic waves, Fresnel's relations, Polarization by reflection. Brewster angle. **CO-5.** Know about Scattering of radiation by a free charge, Thomson scattering cross-section, Scattering by a bound charge , Rayleigh scattering cross-section. blue of the sky, elementary treatment of normal and anomalous dispersion, Cauchy's formula.
Paper-VII	**CO-1.** Think about Electromagnetic spectrum, wave equation, Plane, cylindrical, and spherical waves, Wavefront. Huygens' principle, reflection and refraction phenomena, Interference. Spatial and temporal coherence, Holography , Two-beam interference. Interference by division of wavefront and division of amplitude. Young's double slit experiment. Fresnel's biprism, Lloyd's mirror, Michelson's interferometer, visibility of fringes, interference in thin films. Newton's rings. Fabry-Perot interferometer, Resolving power of a Fabry-Perot interferometer. **CO-2.** Learn on Fresnel diffraction, Zone plate. Rectilinear propagation. Fraunhofer diffraction. Diffraction due to a single double slits, grating. Rayleigh's criterion for the resolution , Resolving powers of telescope, microscope, and prism. Resolving and dispersive power of a plane diffraction grating. **CO-3.** Know about anisotropic crystals, Fresnel equation, Optic axis. Uniaxial and biaxial crystals, birefringence, Ordinary and extraordinary rays. Huygens' construction, Half-wave and quarter-wave plates, Nicol prism, Babinet's compensator. Optical activity, Faraday effect, Kerr effect, Pockels effect.

	CO-4. Think on stimulated and spontaneous emission, Ordinary and laser light, characteristics of laser light, Population inversion. Pumping. Optical resonator, Ruby laser. He- Ne laser. **CO-5.** Know about thermodynamic systems, thermal equilibrium, Zeroth law of thermodynamics, thermodynamic processes, work and its path dependence, work in quasi-static processes, work and heat, Adiabatic work, First law of thermodynamics, applications of the first law, adiabatic and isothermal elastic moduli. **CO-6.** Learn about Heat engines, efficiency of Carnot cycle. Second law of thermodynamics, Refrigerator, reversible and irreversible processes, Carnot's theorem, entropy, TS diagram, Entropy change in reversible and irreversible processes. Principle of the increase of entropy, Entropy and disorder. Entropy and information. **CO-7.** Think on Maxwell's thermodynamic relations, Clausius-Clapeyron equation, Enthalpy. Porous-plug experiment. Joule-Thomson effect. Helmholtz and Gibbs functions, Chemical potential. Gibbs' phase rule , Triple point. **CO-8.** Concept on Seebeck, Peltier and Thomson effects. Thermoelectric power, Cooling by adiabatic demagnetization. Nernst heat theorem, Unattainability of absolute zero of temperature. Third law of thermodynamics.
Paper-VIII[Practical]	**CO-1.** Experimentally determine the horizontal component of the earth's magnetic field using deflection and vibration magnetometers. **CO-2.** Experimentally determine the potential difference and the current through a resistance with the help of a potentiometer. **CO-3.** Experimentally determine the resistance of a suspended coil dead beat galvanometer by the half deflection method. **CO-4.** Experimentally verify Thevenin's theorem and the maximum power transfer theorem. **CO-5.** Experimentally determine temperature co-efficient of resistance of a material in the form of a coil. **CO-6.** Experimentally determine the melting point of a suitable solid by using a thermocouple.

	CO-7. Experimentally determine the ECE of copper. **CO-8.** Experimentally determine the boiling point of a suitable liquid using a platinum resistance thermometer. **CO-9.** Experimentally determine the constant of a ballistic galvanometer using a suitable standard solenoid by drawing R-λ curve. **CO-10.** Experimentally determine the self-inductances of two coils and their equivalent inductance in cases of series and parallel connections by using Anderson's method. **CO-11.** Experimentally determine the resonance curve and the determination of the Q-factor of a series LCR circuit. **CO-12.** Experimentally construct one ohm coil and comparison with standard one-ohm coil.
Course Outcomes B. Sc Physics **Part-III**	
Course	**Outcomes** After completion of these courses students should be able to:
Paper-IX	**CO-1.** Know about Galilean and Newtonian relativity, The ether concept, Michelson-Morley experiment, Relativity of simultaneity. Lorentz transformation equations, Length contraction. Time dilation. Decay time of muons. Law of addition of velocities along the same direction. Doppler effect, Head light effect, invariance of the principle of conservation of linear momentum, variation of mass with velocity. Covariant formulation of Newton's laws of motion, idea of mass-energy equivalence. The longitudinal and transverse mass, The transformation properties of momentum, energy, mass and force. **CO-2.** Learn on Four vector, Transformation of 4 vectors, four velocity, four momentum, Poincare & Minkowski 4-D representation. Geometrical interpretation of Lorentz transformation equation, space like and space like intervals, light cone, past, present and future, proper length, proper time interval, length contraction and time dilation from Minkowski 4-D representation, the intererdependence of electric and magnetic fields. Transformation equations for **E** and **B**. Invariance of Maxwell's equations under a Lorentz transformation. **CO-3.** Know about Probality Theory, Probability of occurrence of event.,

	theorem and total probability and compound probability. Binomial, Poission and Guassian distribution, mean value, variance and standard deviation. **CO-4.** Think on Phase space, μ-space and Γ-space, Ensembles, Principle of equal a priori probability, Microstates and macrostates. Statistical equilibrium. Microcanonical ensemble. Statistical definition of entropy. Entropy of a perfect gas, Sackur-Tetrode formula, Gibbs paradox, Law of equipartition of energy, Rotational specific heat of hydrogen. Ortho and para hydrogen, vibrational specific heat of diatomic molecules. **CO-5.** Learn about MB, BE, and FD statistics, Derivation of distribution functions for the three statistics, Conditions under which BE and FD distributions reduce to MB distribution. Thermodynamic behaviour of an ideal Bose gas. BE condensation. Einstein and Debye's theories of the specific heat of solids. **CO-6.** Know about classical theory of black body radiation. Kirchhoff's law, Stefan's law, Wien's displacement law, Rayleigh- Jeans formula, cavity radiation as a photon gas, Density of states of photons. Derivation of Planck's law by applying BE statistics. Energy density as functions of wavelength and frequency, Stefan's constant. Entropy of a photon gas. Radiation pressure. **CO-7.** Learn on FD distribution function, Fermi gas, Free electron gas in metals, Specific heat of electron gas in metals, Thermionic emission. Richardson-Dushman equation, Brownian motion, Langevin and Einstein's theories. Brownian motion of small spherical particles suspended in a viscous liquid. **CO-8.** Understand on crystalline and amorphous solids, Lattice and basis, Primitive cell, Unit cell. The characteristics of the three cubic lattices sc, bcc, and fcc, Miller indices, Reciprocal lattice, The volume of a primitive cell of reciprocal lattice, The reciprocal lattices of sc and square lattices. Determination of crystal structure by x-ray diffraction. Laue and Bragg equations, Ewald construction, The powder method. **CO-9.** Think about different types of interatomic binding in solids, Ionic crystals, Dielectric materials. Polarization. Lorentz local field. Clausius-Mosotti relation. Induced and orientational polarization.

	Dipolar polarizability. Langevan's theory of orientational polarizability, Sommerfeld's free electron theory, Fermi energy, temperature, velocity and momentum. Electrical and thermal conductivity in free electron model. Wiedemann-Franz law and its range of validity, Hall effect, Hall coefficient for one and two types of carriers, Origin of energy bands in solids, Band picture of metals, insulators and semiconductors. **CO-10.** Know about Langevin's formula for molar diamagnetic susceptibility, Elementary quantum theory of paramagnetism. Curie's law. Curie constant, Effective number of Bohr magnetons. Gouy method for the measurement of susceptibility. Ferromagnetism. Spontaneous magnetization, Curie-Weiss law, Weiss molecular field. Weiss's phenomenological theory of ferromagnetism, Ferromagnetic domains, Boundary displacement. Rotation of domains, Hysterisis.
Paper-X	**CO-1.** Learn about Millikan's oil drop method, Thomson method, Photoelectric effect, Einstein's quantum theory of the photoelectric effect, Stopping potential , The concept of photon. Interaction of photons with free and bound electrons, Compton effect. **CO-2.** Know about Singly ionized helium, positronium, and muonic atom, Wilson-Sommerfeld quantization rule and its application to linear harmonic oscillator, particle in a one-dimensional box, The correspondence principle. Failures of old quantum theory, Franck-Hertz experiment, Excitation and Ionisation potentials, metastable states; Bremstrahlung. X –ray spectra, Moseley's law. **CO-3.** Know about One electron system, Bohr magneton, Orbital g-factor. Stern –Gerlach experiment, Electron spin, Spin angular momentum, The quantum numbers S and M_s. Spin magnetic moment and spin g-factor, Toatal angular momentum $\mathbf{J} = \mathbf{L} + \mathbf{S}$, Vector atom model. Fine structure. Elementary theory of spin-orbit coupling and the spin-orbit interaction energy. Spectra of atoms of alkali metals. Doublet structure. Quantum defect and its dependence on *l*. Principal, sharp, diffuse and fundamental series. Doublet structure. Atomic transitions and selection rules , atom in a magnetic field. Lande's g-factor. Weak-field Zeeman effect, Normal and anomalous Zeeman effects, Paschen back effect. **CO-4.** Lean on many –electron atoms, Pauli exclusion principle, LS & JJ coupling schemes, Hund's rules. Ground states of atoms, The covalent

	bond. Hydrogen molecule. Molecular spectra. Rotational, vibrational, and electronic spectra. Rotational and vibrational energy levels of diatomic molecules, Raman effect and its uses. **CO-5.** Know about de Broglie's postulate, wave-particle duality, Davisson-Germer experiment, Uncertainty principle and its implications, Heisenberg's thought experiment with gamma ray microscope. Young's double slit experiment with electrons/photons. **CO-6.** Take concept of measurement in quantum theory, Postulates of quantum theory regarding the results of measurement of an observable, Expansion postulate , Orthogonality and completeness, Schroedinger's equation in one dimension, generalization of the one dimensional Schroedinger's equation to three dimensions, Schroedinger equation as an operator equation. Statistical interpretation of wavefunction, Probability density. Normalization. Expectation values. Schroedinger's time-independent equation. Equation of continuity, Probability current density. **CO-7.** Know about free particle or particle in a constant 1D potential, The step potential. Boundary conditions on the wavefunction and its derivative at a point where the potential function has a finite discontinuity, Reflection and transmission coefficients. Finite potential barrier, Barrier penetration. Tunnelling, The infinite square well potential or particle in a box, The simple harmonic oscillator, Particle in a rectangular box. **CO-8.** Learn about particle in a spherically symmetric potential, Radial and angular parts of the wavefunction, Space quantization. Hydrogen atom problem. **CO-9.** Think about Rutherford's scattering formula. Estimation of nuclear radius. Determination of atomic masses by Bainbridge type mass spectrograph. Unified mass unit (u), Mass defect, Packing fraction. Nuclear binding energy. Average binding energy per nucleon. Binding energy curve. Neutron and alpha separation energy. Nuclear radius. Nuclear density. Magnetic moment of nuclei. Nuclear magneton. Electric quadrupole moment of nuclei. Electric quadrupole moment and nuclear shape. **CO-10.** Learn about Liquid drop model, Binding energy on the basis of

	liquid drop model, Shell model, Magic numbers. Spin-orbit interaction, Bethe-Weizsacker semi-empirical formula. Volume, surface, Coulomb, asymmetry, pairing and shell terms, Mass parabola. Most stable nuclei. Stability of nuclei. Discovery of the neutron. Detection of neutrons. Neutron Magnetic moment. Nuclear forces. **CO-11.** Know about Natural, and artificial radioactivity, half life, and mean life. Activity and its units. Radioactive dating, Simplified account of Gamow's theory of alpha decay. Geiger-Nuttall law, Beta decay. β^-, β^+ decays, Pauli's Neutrino hypothesis, Outline of Fermi theory of beta decay, Gamma decay. Pair creation and annihilation. Energetics. Interaction of gamma rays with matter. Photoelectric, Compton and pair production processes. **CO-12.** Understand about ionization chamber, Proportional counter, Geiger-Muller counter, Self-quenching. Dead time and recovery time, Linear accelerator. Cyclotron, Betatron. VEC. **CO-13.** Learn about Nuclear Fission, Energy release, Emission of neutrons. Theory of spontaneous fission. Self-sustaining chain reaction. Nuclear Reactor, Nuclear reactions. Cross-section of a nuclear reaction. Laboratory and centre of mass systems. Conservation principles governing nuclear reactions. Threshold energy of an endo-ergic reaction. Compound nucleus. Experimental verification of the compound nucleus hypothesis. Mention of Ghoshal experiment. Q-value of a nuclear reaction. Nonrelativistic Q-equation.
Paper-XI	**CO-1.** Know about Richardson's equation, Fermi level and work function of solids. Vacuum diodes and triodes-- their volt ampere characteristics, Triode parameters (μ , r_p, g_m), Functional structure and operation of a Cathode Ray Oscilloscope. **CO-2.** Take concepts on study on Eenergy band concept. Band diagram, Concept of hole, Intrinsic and extrinsic semiconductors, Elemental and compound semiconductors, Majority and minority carrier densities. Effective mass. Mobility of holes and electrons. Direct and indirect band gap semiconductors. **CO-3.** Know about Unbiased and biased p-n junctions, Varactor diodes, Zener diodes, Photodiode, LED , Metal semiconductor junction diode, Half wave and full wave rectifiers, Bridge rectifier. Capacitor filters. L-Section and π section filters, Voltage regulators – Zener diode-based

	regulators. Three terminal IC regulators. **CO-4.** Know on Bipolar junction transistor, CE, CB, CC configuration, Introduction of α and β parameters. Cut-off, active, saturation and breakdown regions, DC models of BJT at different , SCR . **CO-5.** Learn about Biasing of BJT. Operating point, Typical biasing circuits, Other biasing circuits – collector bias, emitter bias. AC equivalent circuit of BJT. Simplified h-parameter ac mode, CE, CB and CC amplifiers,High frequency equivalent circuit of transistor, Miller effect, Single stage R-C coupled amplifier.. **CO-6.** Take concepts about Feed back principle. Negative and positive voltage feedback. Effect of negative feedback , Cascaded BJT amplifiers – two stage RC coupled and transformer coupled amplifiers, Class A, class B and class C operation of amplifiers Class A power amplifier. **CO-7.** Learn on Barkhausen criterion and oscillator principle, R-C Phase Shift Oscillator. Wien bridge oscillator, Hartley and Colpitts oscillators. Astable multivibrator circuit using BJT. **CO-8.** Take knowledge on amplitude modulation, Envelope detector using diode. Frequency modulation (single tone), Cursson's rule. Principle of detection of FM signal. Phase modulation-relation between FM and PM. **CO-9.** Learn on Properties of Op-amp, ideal op- amp, CMRR,Virtual ground. inverting amplifier, Unity gain buffer, adder, phase shifter, integrator, differentiator and differential amplifier. Basic principle of analog to digital converter. Digital-to-analog converter circuit. **CO-10.** Understand on Number systems , binary arithmetic,Boolean algebra,De Morgan's theorem, Karnaugh map, logic gates with their truth tables : AND, OR, NOT and Ex-OR gates. NOR and NAND gates as universal gates. Implementation of OR and NAND gates with diodes and resistors. Combinational logic circuits – Half adder, full adder, binary comparator, multiplexer and de-multiplexer. Sequential logic circuits – SR, JK , D and T flip-flops.
Paper-XII[Practical]	**CO-1.** Experimentally determine the radius of curvature of a convex lens by Newton's ring.

	CO-2. Experimentally draw the I-δ curve for a prism. **CO-3.** Experimentally determine diffraction pattern due to a thin wire by using a laser source. **CO-4.** Experimentally determine the angle of the prism and to draw μ–λ curve for the material of a prism using a spectrometer. **CO-5.** Experimentally determine the mean wavelength of D-lines of sodium with the help of Fresnel's bi-prism. **CO-6.** Experimentally determine the width of the given single slit producing a Fraunhofer diffraction pattern. **CO-7.** Experimentally determine the number of ruling per mm of a plane diffraction grating and the wavelength of an unknown line with the help of a spectrometer. **CO-8.** Experimentally determine the number of ruling per mm of a plane diffraction grating and the width of a slit adjusted for resolving D-lines of sodium. **CO-9.** Experimentally Calibrate a polarimeter and determination of the concentration of an active solution. **CO-10.** Experimentally determine excitation potential using Franck-Hertz experiment.
Paper-XIII[Practical]	**CO-1.** Experimentally determine the band gap of a semiconductor by using a thermistor. **CO-2.** Experimentally determine amplitudes, frequencies and phase differences of two sinusoidal voltages with a CRO. **CO-3.** Experimentally determine the characteristics of a Zener diode and location of the break down voltage of the Zener diode. **CO-4.** Experimentally determine the mutual inductance of two coils at different angles (ϕ). **CO-5.** Experimentally determine high resistance by the method of charge-leakage from capacitor. **CO-6.** Experimentally draw B-H loop for a ferromagnetic material in the form of an anchor. **CO-7.** Experimentally draw static anode and mutual characteristics curves and dynamic characteristics curves of a triode valve and determine the triode parameters.

	CO-8. Experimentally study the transistor characteristics in CE mode transistor and to find α. β. **CO-9.** Experimentally study the frequency response of a CE transistor amplifier. **CO-10.** Experimentally study the response of op-amp based circuits with offset null adjustment. **CO-11.** Experimentally determine *e/m* ratio for electron by using a cathode ray tube and a pair of bar magnets.

B. Sc. PHYSICS GENERAL

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 an overall 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. To inculcate the scientific temperament in the students and outside the scientific community. PO-6. 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 **Part-I**	
Course	**Outcomes** After completion of these courses students should be able to:
Paper-I	**CO-1.** Know about the unit and dimension, Vector Calculus and some related theorems. **CO-2**. Clear understanding about conservation laws in Classical mechanics, Central force problems and applications & dynamics of rigid bodies. **CO-3.** Think about the various general properties of matters like Gravitation, Elasticity, Viscosity, Surface tension with detail mathematical calculations and applications. **CO-4.** Know about Kinetic theory of gases, real gas, ideal gas, pressure exerted by gas molecules and Thermal conduction in details. **CO-5.** Clear understanding about thermal conductivity and diffusivity, Fourier equation for one dimensional heat flow and its solution, theory of Ingen Hausz's experiment, cylindrical flow of heat, experimental determination of Lee's method. **CO-6.** Understand thermal equilibrium and zeroth law of thermodynamics, 1^{st} law of thermodynamics , work done and p-v diagram, Carnot cycle, Carnot engine and its efficiency; 2^{nd} law of thermodynamics - concept of entropy (S), physical interpretation of entropy, change in entropy in reversible and irreversible processes, Carnot theorem, thermodynamic scale of temperature; Joule Thomson effect, enthalpy and temperature of inversion. **CO-7.** Gain the knowledge of emissive and absorptive power, black body and blackbody radiation, Kirchhoff's law, Stefan's law, Newton's law of cooling; Planck's idea of quantization, Planck's distribution law and graphical interpretation, Wien's displacement law, pyrometer principle.

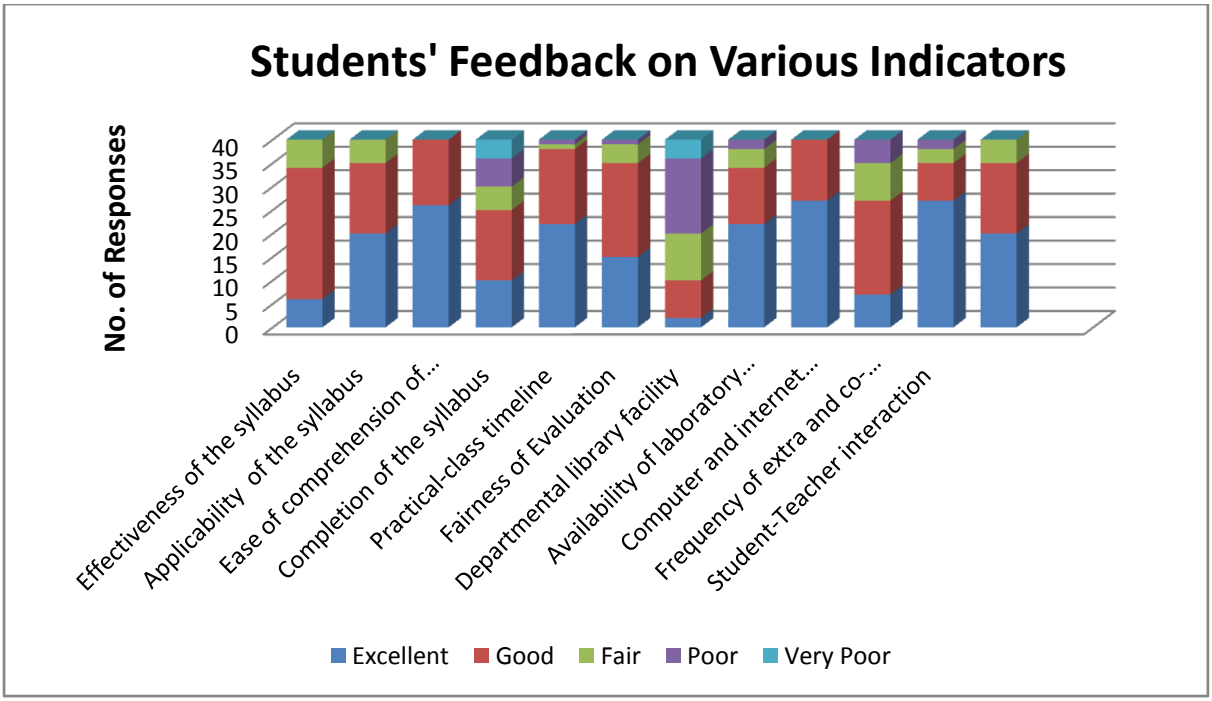
	CO-8. Gain the knowledge of Superposition of two S.H. vibrations, Lissajous figures, damped and forced vibration, resonance and its sharpness, Wave motion and differential equation of plane progressive waves, energy and intensity, velocity of longitudinal wave in solid and gas, velocity of transverse wave in string, standing waves and energy- distribution, Doppler effect.

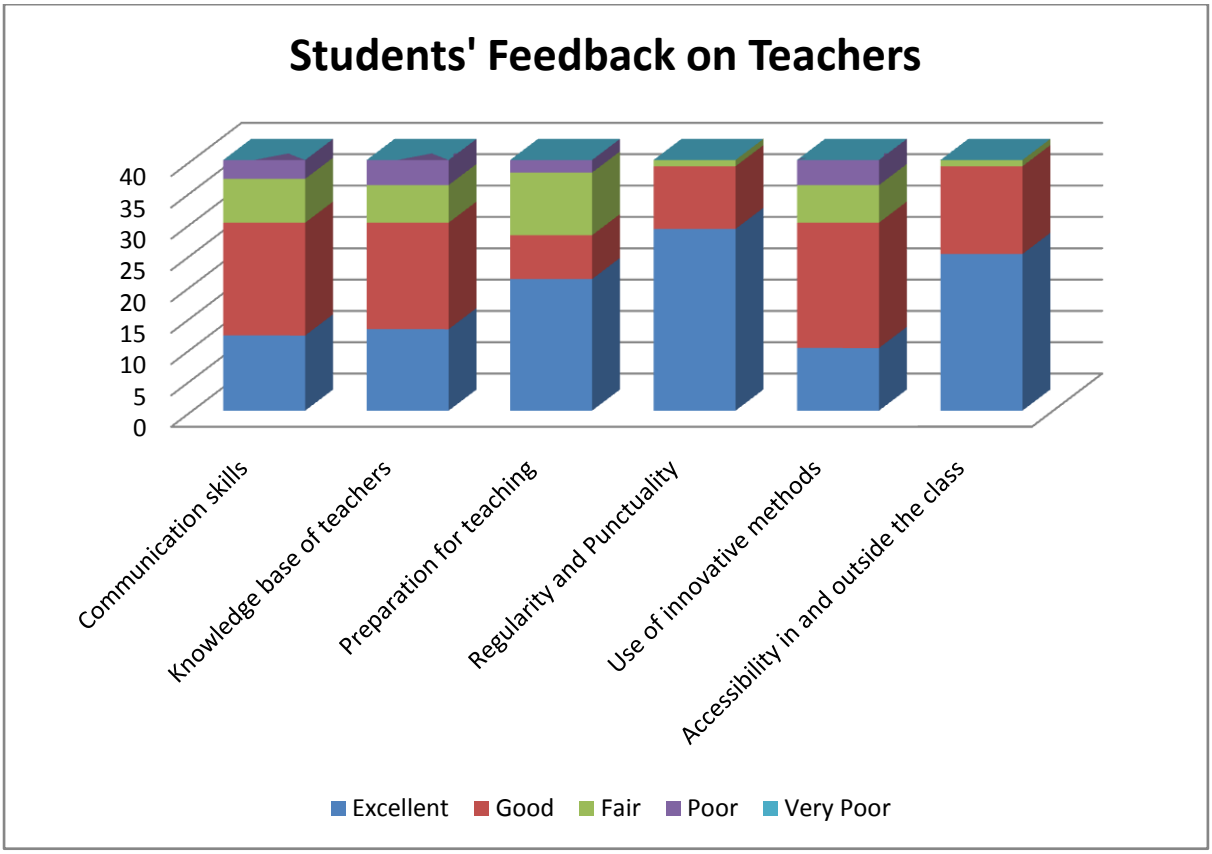
Annexure-II
Feedback Analysis
Department of Physics
Session: 2016 -17

Year of Study		No. of student participated	Total no. of student participated
1st Year	Honours	08	40
	General	15	
2nd Year	Honours	…….	
	General	12	
3rd Year	Honours	…….	
	General	05	

No. of Responses

Questions	Excellent	Good	Fair	Poor	Very Poor	Total
Effectiveness of the syllabus	6	28	6	0	0	40
Applicability of the syllabus	20	15	5	0	0	40
Ease of comprehension of the subject thought	26	14	0	0	0	40
Completion of the syllabus	10	15	5	6	4	40
Practical-class timeline	22	16	1	1	0	40
Fairness of Evaluation	15	20	4	1	0	40
Departmental library facility	2	8	10	16	4	40
Availability of laboratory equipments	22	12	4	2	0	40
Computer and internet facilities	27	13	0	0	0	40
Frequency of extra and co-curricular activities	7	20	8	5	0	40
Student-Teacher interaction	27	8	3	2	0	40
Student-Lab attendant interaction	20	15	5	0	0	40
On Teachers						
Communication skills	12	18	7	3	0	40
Knowledge base of teachers	13	17	6	4	0	40
Preparation for teaching	21	7	10	2	0	40
Regularity and Punctuality	29	10	1	0	0	40
Use of innovative methods	10	20	6	4	0	40
Accessibility in and outside the class	25	14	1	0	0	40


Students' Feedback on Various Indicators
No. of Responses
40
35
30
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
40
35
30
25
20
15
10
5
0
Communication skills
Knowledge base of teachers
Preparation for teaching
Regularity and Punctuality
Use of innovative methods
Accessibility 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.

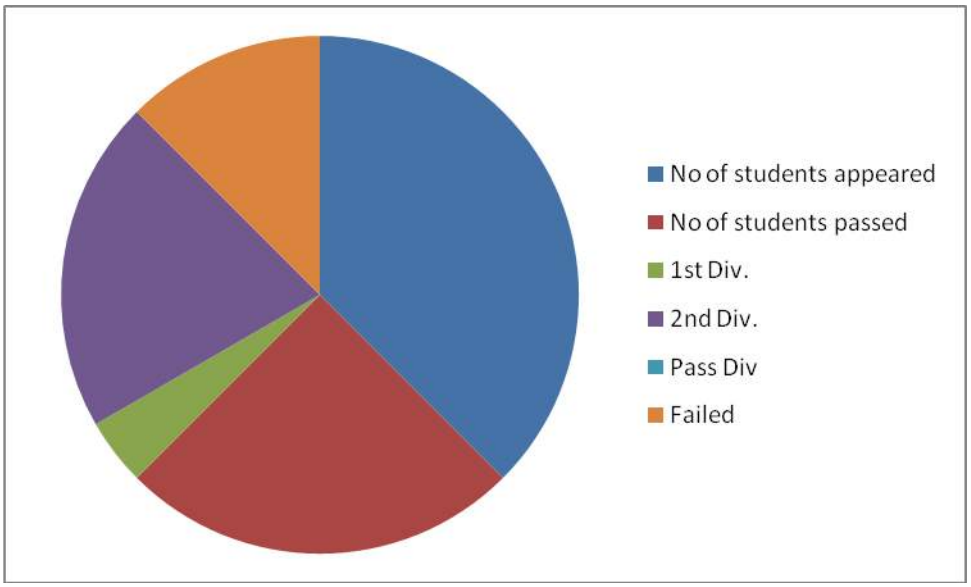
- To resolve the complaints by the students regarding the insufficient books more grants are issued by the college authority.
- Numerous academic initiatives have been taken in this academic year to enrich the academic capabilities of students as well as teachers. Seminars, workshops, exhibitions, quiz 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: 2016 -17

No. of Students Appear	No. of Student Passed	Division/Class		No. of Student Fail
09	06	1st	01	03
		2nd	05	
		Pass	00	



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 2016-17

Department of Physics

Sl. No.	Name of the faculty	Designation	Research Publication		Book Publication
			National	International	
1	Goutam Mandal	Asst. Professor	0	01	0
2	Thakurdas Mahato	Guest Teacher	0	0	0
3	July Dey	Guest Teacher	0	0	0
4	Apurba Paramanik	Guest Teacher	0	0	0

Details of Publication:

(A) Research Article :

Sl. No.	Title of the paper	Journal name	ISSN No.	Date of publication
1	Optical Flip-Flops and Their Applications in Optical Communications Networks [Page No:38-47]	IJSRR	2279-543X [I.F:6.1]	VOL- 6, ISSUE- 8 (Aug-2017)

(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	Air Pollution and some remedies using Nano-technology	Environmental Education: A need of the day 23.08.16-24.08.16	BZSMM	National
2	Some elemental aspects of Tri-state logic	1st Regional Science Congress & Technology Congress 07.11.16-08.11.2016	Bankura Christian College	State level

Annexure - V

National Seminar

Academic year 2016-17

Name of the Seminar: Environmental Education – A Need of the Day

Organising Departments: Chemistry, Physics, Geography, Economics & Mathematics.

Sponsorship: UGC

BANKURA ZILLA SARADAMANI MAHILA MAHAVIDYAPITH

UGC sponsored National Seminar
On

Environmental Education - A need of the Day

Registration: 9.30 AM - 10.30 AM

Inauguration: 10.30 AM – 11.30AM

Inaugural Programme

Date: September 23, 2016

10.30 AM Floral greetings to the dignitaries.

10.35 AM Inaugural song by the students of the department of Music guided by the faculties of the Department of Music, BZSMM.

10.45 AM Welcome address and Introduction to the Seminar theme by Prof. Nityananda Patra, Coordinator, NAAC,BankuraZillaSaradamaniMahilaMahavidyapith.

10.55 AM Inauguration of the Seminar and inaugural speech by Dr.Santanu Bhattacharya, Chief Scientist, National Metallurgical Laboratory, Jamshedpur,Jharkhand.

11.10 AM Presidential address by Dr. Siddhartha Gupta, Principal, BankuraZillaSaradamaniMahilaMahavidyapith.

11.20 AM Tea Break

UGC sponsored National Seminar
On
Environmental Education - A need of the Day
Programme

Date: September 23, 2016

- Scientific Session I: **Fresh Water Scarcity : Quantity, Quality, Food Security, Health Effects and Mangement Issues Mainly In Developing Countries.**

Chairman: Dr.Santanu Bhattacharya

11.50AM – 01.00 PM **Key Note Address** Dr. Dipankar Chakraborty ,
Founder Director,
School of Environmental Studies,
Jadavpur University.

01.0 M – 02.00 PM **Lunch Break**

2.00PM-2.15PM**Speech by Dr. Dipak Ranjan Mandal, VC, SidhoKanhoBirshaUniversity, Purulia.**

- Scientific Session II: **Poster Session**

Hon'ble Judges: Dr. Dipankar Chakraborty.
Dr.Santanu Bhattacharya.
Dr.SubrataDey.

02.15 PM – 03.00 PM **Poster Presentation** Room No.18
(Poster Nos. 1 to 20)

- Scientific Session III: **Reclaimed coalmine water:**
An alternative source ofDrinking water

Chairman: Dr.Dipankar Chakraborty

03.00 PM – 03.45 PM Invited Speaker Dr.Santanu Bhattacharya, Chief Scientist, National Metallurgical Laboratory,Jamshedpur,Jharkhand.

- Scientific Session IV: **Consequencies& Effects of Global Warming**

Chairman: Dr. Samaresh Ghosh

03.45 PM – 04.30 PM Invited Speaker Dr.SubrataDey
Associate Professor of Chemistry
SidhoKanhoBirshaUniversity.
Purulia, West Bengal

Date: September 24, 2016

10.00 AM – 10.10AM **Announcement and Distribution of Best Poster Award.**

- Scientific Session V: **Need for Environmental Education at School Level in relation to Environmental and Social Justice.**

Chairman : Dr.Sumanta Bhattacharya

10.10 AM – 10.50AM Invited Speaker Prof.SanatGuchhait
Department of Geography
The University of Burdwan

- Scientific Session VI**: Applying Nanotechnology For Environmental Sustainability.**

Chairman: Prof.SourangshuMukhopadhyay

10.50 AM – 11.30 AM Invited Speaker Dr.Sumanta Bhattacharya
Head, Dept. of Chemistry,
The University of Burdwan
11.30AM**Tea Break**
12.00 PM – 01.00 PM**Oral Presentation**
01.00 PM – 02.00 PM **Lunch Break**

- Scientific Session VII:**Role of CO_2 – An Environmental Issue.**

Chairman: Prof.SanatGuchhait

02.00 PM – 02.40 PM Invited Speaker Prof.SourangshuMukhopadhyay
Department of Physics
The University of Burdwan

- Scientific Session VIII:***Azo-dye Organics: Environmental Impacts* &Remediation.**

Chairman: Dr.SayantanMondal

O2.40 PM – 03.20 PM Invited SpeakerDr. Samaresh Ghosh
Assistant Professor of Chemistry
BankuraSammilani College

03.20PM – 03.30 PM Valediction / Vote of Thanks
Vote of Thanks by: Prof.Nityananda Patra
Coordinator, NAAC.
BankuraZillaSaradamaniMahilaMahavidyapith.

03.30 PM – 04.00 PM Distribution of Participation Certificate