MUGBERIA GANGADHAR MAHAVIDYALAYA

P.O.-BHUPATINAGAR, Dist.-PURBA MEDINIPUR, PIN.-721425, WEST BENGAL, INDIA
NAAC Re-Accredited B+ Level Govt. aided College
CPE (Under UGC XII Plan) & NCTE Approved Institutions
DBT Star College Scheme Award Recipient

E-Mail: mugberia_college@rediffmail.com // www.mugberiagangadharmahavidyalaya.ac.in/

Programme outcomes and Course outcomes

Department of Physics

Faculties and students of our department are aware of the stated Programme and course outcomes offered by the Institution.

PROGRAMME OUTCOMES: B. Sc. PHYSICS

After successful completion of three year degree (3 Tier Examination Pattern) program in physics a student should be able to:	
Programme Outcomes	PO1: Attain a deep understanding of the subject matter and enhance the capacity to operate effectively across various interdisciplinary fields. PO2: Explore personal, organizational, and societal values and comprehend the influence of diverse cultural perspectives, as well as the effects of technological progress, innovations, and their applications. PO3: Proficiency in collaborative teamwork, leadership, and effective management techniques to steer the organization towards achieving its Vision and Mission. PO4: Demonstrate proficiency in research methodology, data analysis, and effective communication of research findings in a clear and concise manner. PO5: Acquire a comprehensive understanding of ethical principles and uphold professional ethics through a dedicated commitment. PO6: Enhancement of communication skills, proficiency in teamwork, and the ability to lead effectively PO7: Utilize modern methods, high-quality equipment, and diverse software applications

Programme Specific Outcomes	PSO1: Comprehend and implement the principles of different courses offered under the CBCS curriculum. POS2: Ensure that individuals are properly trained and equipped to safely operate and effectively handle sophisticated instruments. POS3: Comprehend and adhere to established laboratory safety protocols and best practices for maintaining a safe and efficient laboratory environment. POS4: Acquire and improve computer skills. POS5: Drive to pursue advanced education (PG,B.ed, PhD)

Course Outcome

Course Code	Course Name	Course Outcome
P1	Mathematical Methods I	After completion of this course, the students are expected to gain knowledge/skill about the following topics 1. Study of Calculus brings about a clear understanding and estimation of infinitesimal dynamical variations in Space and Time domain. 2. Knowledge of Vector Calculus refers to direction specific variations in 1D, 2D and 3D Space with time dependent coordinate system. 3. Development of skills to solve ODE and Special Differential equations. 4. Basic knowledge on Fourier Series. .
	General Properties of Matter	1. Study of elastic properties of solid material 2. Brief discussion surface tension and Viscosity.

	Vibration & Waves	1. knowledge simple Harmonic oscillation their classification, 2. Rigorous calculation on Damped and forced oscillation. 3. Basic knowledge on Acoustics.
	Geometrical & Physical Optics	1. Study of geometrical optics includes format principle , some types of abberations. 2. Construction of Ramsdan and Huygens eyepieces. 3. Detailed discussion on interference, diffraction and polarization on Physical Optics part.
	Electronics I	1. Knowledge about the construction and principle of diodes and their applications. some special type of diodes are also included in the syllabus. 2. Discussion on basic principle and construction of BJTs. 3. Study of fundamental GATEs .
P2	Mechanics I	After completion of this course, the students are expected to gain knowledge/skill about the following topics 1. Learn about Gravitation and its impact on the dynamic Universe. 2. Learn about elastic properties of matter and its application I construction field, bending of beam and how to measure different types of elastic constant. 3. Learn first that motion and rest are completely relative phenomenon. Speed of light is the highest speed in this universe. 4. Learn how fluid moves and what conservation theorem work.

		5. To expose the students to the hands-on experience of classical mechanical domain that they have learnt theoretically.
	Heat & Thermodynamics	1. Understand and apply the laws of thermodynamics 2. Knowledge about the interrelationship among thermodynamic functions and improve ability to use these relationships to solve physical problems 3. Understand the postulates of kinetic theory of gas. 4. Knowledge how to express macroscopic parameters from Maxwell velocity distribution law. 5. Understand the basic ideas of transport phenomenon and extraction of some physical parameters. 6. Knowledge how real gas behaves and find out critical constants.
	Electricity and Magnetism	1. Electrostatics, Gauss Law and Concepts of Capacitance along with application to Capacitors. 2. Dielectric Properties of Materials and concept of Polarization in various media along with their applications. 3. Existence and generation of Magnetic Field and Force, Concepts of Magnetic Dipole formation, Amperes Circuital Law and its applications. 4. Magnetic properties of matter, Magnetization, Magnetic susceptibility and permeability. Ferromagnetism and development of Hysteresis phenomenon
P3	Mathematical Methods II	After successful revision of this course, students will acquire knowledge of the following: 1. To understand Fourier series and Fourier transform and apply to analyze various periodic and non periodic functions. 2. Know about the application of Fourier series and Fourier Transform i.e Summing of Infinite series. 3. To understand the technique of series solution of

		2^{nd} order linear differential equations. 4. Solve partial differential equations by method of separation of variable. 5. Understand special mathematical functions and orthogonal polynomials. 6. Knowledge about the basic ideas of variational calculus. 7. Knowledge about partial differential equations with some physical problems. 8. Brief understanding of complex variables to solve physical problems. 9. Detailed understanding of physical problems with integral transformation. 10. Knowledge about matrix algebra and their application to find out ordinary differential equation.
	Current Electricity And Magnetism II	1. Electrical circuits - Their types and applications. Development of Network theorem and their uses. This course helps to develop insights for motors, dynamos, etc. and their design along with fabrication of large and small scale electro-magnetic units. 2. Know about various electrical components, power supply, multimeter and various other measuring instruments like (i) Potentiometer (ii) Carey Foster's Bridge (iii) Anderson's bridge (iv) Galvanometer etc
	EM theory	1. Electromagnetic Induction, Lenz's Law, Reciprocity theorem. 2. Basic Knowledge on dispersion and Scattering. 3. How EM waves behave in different kind of medium.
	Quantum Mechanics I	1. Basic terms in Quantum Mechanics and association with classical physics. 2. Time independent Schrodinger equation-Hamiltonian and its application. 3. General discussion of bound states in an arbitrary potential and uncertainty principal.
	Relativity	1. Know the basic Postulates of STR. 2. Knowledge about the significance of Null Result. 3. Knowledge about the Galilean and Lorentz transformation.

P4	Mechanics II	After successful revision of this course, students will acquire knowledge of the following: 1. Review of Newtonian Mechanics and introduction of Lagrangian and Hamiltonian. 2. Application of Lagrangian and Hamiltonian in different system. 3. Familiarizations and its application of Small System. 4. Ideas on Special Theory of Relativity and will be able to solve the problem using four-momentum. Drive and application of Poiseuille's equation, Navier-Stokes equation, qualitative description of turbulence and Reynolds number
	Atomic , Molecular physics with LASER	1. Idea about the Atoms in Electric & Magnetic Fields (Stern-Gerlach Experiment , Zeeman Effect, Anomalous Zeeman Effect) 2. Familiarize with Spin-orbit coupling in atoms - L-S and J-J couplings. Hund'sRule. Term symbols. Spectra of Hydrogen and Alkali Atoms. 3. Study of basic principle of LASER action. 4. Study of Different kind of lasers and their principle of action.
	Electronics II	1. Understand Boolean logic and its connection to digital electronics. 2. Knowledge about the number system and their arithmetic operations. 3. Knowledge about some Boolean function and simplification of Boolean expression. 4. Understand the operation of sequential and combinational circuits. 5. Knowledge about some basics of computer.
	Nuclear Physics I	1. Explain the nuclear structure, different nuclear Models . Predict the spin parity of nucleus. 2. Ideation about the radioactive decay process. 3. Analyze the types of nuclear reactions, familiarization with detectors and accelerators.

P5	Non Electrical Lab.(Group A) Electrical Lab.(Group B)	After completion of this course, the students are expected to gain knowledge/skill about the following topics : 1. Study of flexure of a bar. 2. Study of flow of liquid through capillary tube (radius to be measured 3. by microscope directly) 4. Study of Focal length of a concave lens by combination method 5. Determination of wavelength by Newton's ring experiment 6. Dispersive power of a prism 7. Calibration of spectrometer and determination of unknown wavelength 8. Determination of thermal conductivity of a bad conductor by Lee's 9. and Chorlton's method 10. Deflection Magnetometer experiment to determine earth horizontal 11. Magnetic field 12. Calibration of polarimeter and study of optical rotation of solution 1. Platinum resistance thermometer. 2. Verification of Thevenin and Norton Theorems. 3. Calibration of a thermocouple and find thermoelectric power. 4. Study of response curve of LCR series resonance. 5. Study of the reverse and regulation characteristics of a Zener diode. 6. Construction of OR, AND, NOT and NAND gates with basic components and verification of truth tables. 7. To draw the characteristics of a transistor in CE mode.
P6	Quantum Mechanics II	After completion of this course, the students are expected to gain knowledge/skill about the following topics 1. Quantum mechanical solution of Hydrogen atom 2. Idea about the Atoms in Electric & Magnetic Fields (Stern-Gerlach Experiment , Zeeman Effect, Anomalous Zeeman Effect)

		3. Familiarize with Spin-orbit coupling in atoms - L-S and J-J couplings. Hund'sRule. Term symbols. Spectra of Hydrogen and Alkali Atoms
	Nuclear Physics II	1. Explain the nuclear structure, different nuclear Models . Predict the spin parity of nucleus. 2. Ideation about the radioactive decay process. 3. Analyze the types of nuclear reactions, familiarization with detectors and accelerators. 4. Know different types of elementary particles, associated quantum number and their interaction.
	Statistical Mechanics	1. Find the connection between the statistics and the thermodynamics 2. Knowledge of different types of ensamble and use of these to drive thermodynamic variables. 3. Familiarizations with Maxwell-Boltzmann, Bose-Einstein and Fermi- Dirac statistics and their application. 4. Develop the concept of negative temperature, classical and quantum theory of radiation.
	Solid State Physics	1. Knowledge about the concept of crystal structure and basic ideas to analyze crystal structure of unknown sample. 2. Knowledge about normal modes of vibration. 3. Understand the basic properties of solid. 4. Knowledge about the differences of metal, semiconductor and insulator on the basis of band formation. 5. Development of elementary ideas about Superconductor and their properties.
P7	Group A: Analog Electronics Experiments	After completion of this course, the students are expected to gain knowledge/skill about the following topics:
	Group B: Digital Electronics Experiments	1. Improve skill to handle electronic equipments. 2. Improve ability to perform experiments mainly focus on combinational and sequential circuit analysis using ICs.
P8	Non-electronic experiments (VIIIA)	After completion of this course, the students are expected to gain knowledge/skill about the following topics.

		1. Knowledge of basic measurements and their errors. 2. Knowledge of working principle of Voltmeter, CRO Q-meters , Digital multimeter etc. 3. Enhancement of ability to perform experiments based on the macroscopic properties of Solid.
	Program writing with algorithm(VIIIB)	1. Basic knowledge in Fortran language in sorting, read N numbers, mean media mode find out etc. 2. Skill enhancement. 3. Apply different computational techniques in any branch of theoretical and experimental physics. 4. Improve ability to write computer program to solve physical problems .
	Project (VIIIC)	1. Enhancement of skills on idea execution and report writing etc. 2. Basic ideas on literature survey and some ethical values.

Mapping of COs with POs and PSO

3: High, 2: Medium, 1: Low

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
P1	3	3	2	2	1	2	3	3	1	1	3	2
P2	3	1	1	1	2	3	3	2	3	1	1	2
P3	2	2	3	1	2	2	3	2	3	3	2	2
P4	2	2	2	2	2	2	3	2	2	3	3	2
P5	3	2	3	3	2	3	2	2	2	1	2	2
P6	2	2	1	1	3	2	3	2	3	3	2	2
P7	3	2	2	2	2	2	3	3	2	3	3	2
P8	2	2	3	2	2	2	2	2	2	2	2	3

Based on the score put on every column and row, we have evaluated the marks of each CO, PO and PSO.

Course	PO 1	PO 2	PO3	PO4	PO 5	PO 6	PO 7	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	Average of CO
P1	3	3	2	2	1	2	3	3	1	1	3	2	2.17
P2	3	1	1	1	2	3	3	2	3	1	1	2	1.92
P3	2	2	3	1	2	2	3	2	3	3	2	2	2.17
P4	2	2	2	2	2	2	3	2	2	3	3	2	2.25
P5	3	2	3	3	2	3	2	2	2	1	2	2	2.25
P6	2	2	1	1	3	2	3	2	3	3	2	2	2.17
P7	3	2	2	2	2	2	3	3	2	3	3	2	2.25
P8	2	2	3	2	2	2	2	2	2	2	2	3	1.92
Average of PO and PSO	2.5	2	2.125	1.875	2	2.25	2.75	2.25	2.25	2.125	2.25	2.125	

MUGBERIA GANGADHAR MAHAVIDYALAYA

P.O.-BHUPATINAGAR, Dist.-PURBA MEDINIPUR, PIN.-721425, WEST BENGAL, INDIA
NAAC Re-Accredited B+ Level Govt. aided College
CPE (Under UGC XII Plan) & NCTE Approved Institutions
DBT Star College Scheme Award Recipient

E-Mail: mugberia_college@rediffmail.com // www.mugberiagangadharmahavidyalaya.ac.in/

Department of Physics

Attainment of Course & Programme Outcomes

Assessment in Outcome Based Education (OBE) involves one or more processes implemented by the department to gather data and evaluate students' attainment of COs and POs. These assessment methods are classified into two types: direct methods and indirect methods.

1. Direct Methods: Direct methods focus on assessing students' knowledge and skills through their performance in various activities. These methods provide tangible evidence of student learning. Some commonly used direct assessment methods include:

- Internal Assessment Tests
- Assignments
- Surprise test
- Seminars/Presentation
- Laboratory Assignments/Practical.
- Mini Projects

Direct assessment methods provide concrete evidence of students' knowledge, skills, and application abilities, offering a comprehensive understanding of their learning outcomes.

2. Indirect Methods: Indirect methods are used to gather feedback and opinions about students' learning experiences and the effectiveness of the educational process. Although they do not directly measure knowledge and skills, these methods provide valuable insights into students' perceptions and satisfaction. Two commonly used indirect assessment methods are:

- Course Exit Survey
- Examiner Feedback

Indirect assessment methods help capture students' opinions, thoughts, and reflections on their learning journey, providing valuable insights for curriculum development and teaching improvement.

Details description can be found following Table:

Direct Assessment tool used for CO attainment			
Sr. No.	**Name of Assessment Method**	**Frequency**	**Description**
1	Internal Assessment Test	2 per year	Assessments conducted within the year to gauge students' progress and mastery of course material. Generally, assessments are conducted at the end of the 6^{th} and 11^{th} weeks of each semester. It is a metric utilized for continuous assessment of the attainment of course outcomes with respect to course objectives. The Internal Assessment Marks for the relevant course is calculated as the average marks of two tests
2	Assignments	2 per year	Usually, assignments are given to students before the internal assessment to showcase their understanding, critical thinking, and problem-solving abilities in relation to the course content.
3	Surprise test	2-4 per year	A surprise MCQ (Multiple-Choice Question) test is conducted to assess the ongoing performance of students in a specific topic related to the course.
4	Seminars/Presentation	Frequently	The department organizes seminars and invites resource persons to enrich students' knowledge in various research areas. Additionally, student seminars are organized where students take on the role of speakers and deliver lectures on relevant topics from their courses. These seminars serve as a means to assess students' communication and presentation skills, as well as their depth of subject knowledge.
5	Laboratory Assignments/Practical	2 per weeks	Practical exercises performed in laboratory settings to assess students' practical skills, experimental techniques, and data analysis abilities.
6	Mini Projects	1 per year	Small-scale projects assigned to students to apply their learning and showcase their ability to execute tasks.
7	Yearly Examinations	Final exam	Comprehensive exams conducted at the end of the year to assess students'

			overall knowledge and skills acquired throughout the course.

Indirect Assessment tool used for PO/PSO attainment

Sr. No.	Name of Assessment Method	Frequency	Description
1	Course Exit Survey/Students feedback	1 per year	A survey administered to students towards the end of the course to gather feedback on the overall learning experience, teaching methods, curriculum, and suggestions for improvement.
2	Examiner Feedback	1 per year	Feedback collected from external (internal) examiners or experts to evaluate students' performance and provide an external perspective on the attainment of POs.

The attainment of Course Outcomes (COs) and Programme Outcomes (POs) is evaluated based on the aforementioned tools, and therefore, the evolution of marks in a particular course is relevant here. Details can be found below:

Marks Distribution

Examination Pattern for Theory & Practical Papers:
For each theory paper: University Written Exam 90 marks – 4 hours
Internal Assessment – 10 marks
Practical Papers: Paper V – VA 50 marks – 6 hrs
VB 50 marks – 6 hrs
Paper VII – 100 marks – 6 hrs
Paper VIII A & B – 70 marks – 6 hrs

Attendance:

75% attendance is compulsory for all.

Practical Examination:

Centre: Examiner and Examination center are nominated and selected by the controller of the University.

Distribution of marks:

Part II Paper VA Full marks- 50

(Expt. – 40, LNB – 5, Viva - 5)

Paper VB Full marks- 50

(Expt. – 40, LNB – 5, Viva - 5)

Part III Paper VIIA Full marks – 50 (Expt. - 80, LNB

Paper VIIB Full marks – 50 10, Viva - 10)

Paper VIIIA Full marks- 50

(Expt. - 40, LNB - 5, Viva - 5)

Paper VIIIB Full marks- 20

(Computer) (Program writing with algorithm and showing result – 16, LNB – 4)

Paper VIIIC (Project) Full marks- 30

(Nature of work – 10, Presentation – 10 and

Viva – 10)

Attainment of COs based on Direct Method

ATTAINMENT LEVELS FOR COs

Target Level	Total (A+I+T+P) % of marks obtained in reverent Course
1	<40
2	40-49
3	>=50

$$\textbf{Score} = \frac{\sum \% \textit{ marks all student in a particular course}}{\sum \textit{no of students}}$$

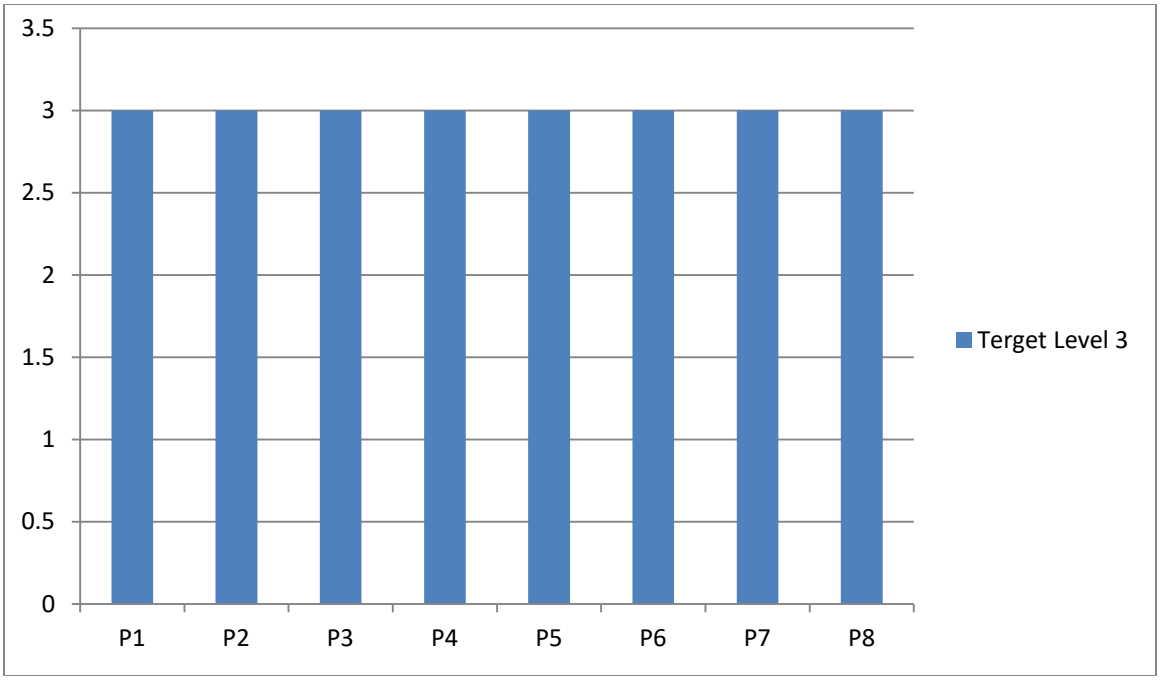


Fig1:Attainment level of UG Physics (Hons) course

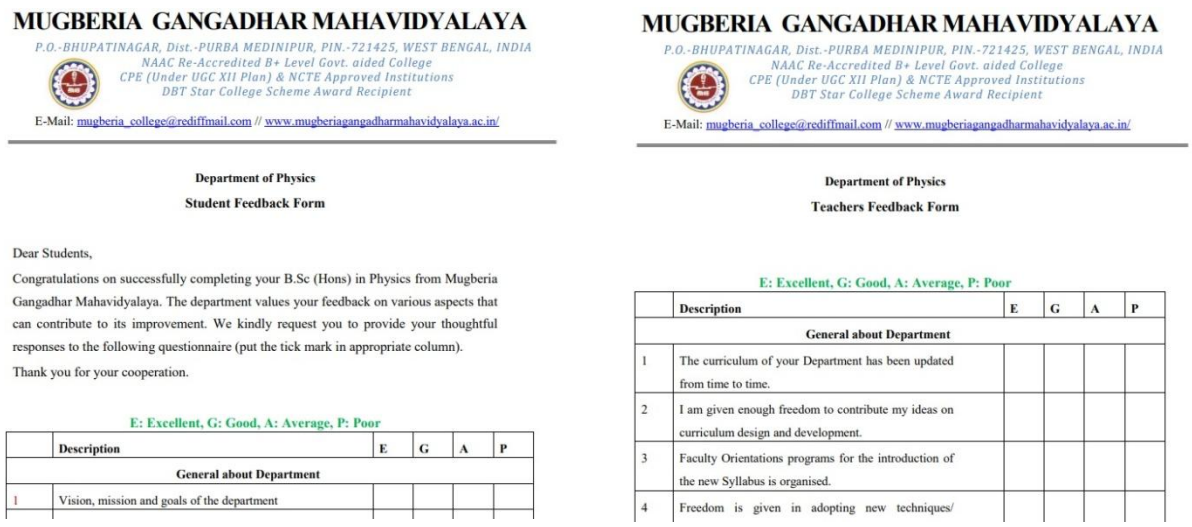
The attainment is based on the marks obtained in that particular course. In the table below, a sample of the results is reported.

Sl No.	Name of Student	Roll No.	Result
1	ARPITA PRADHAN	31216129 / 0112	I
2	ARUNAVA BERA	31216129 / 0113	II
3	SATAKSHI MAHAPA	31216129 / 0121	II

Final Result of 2016-2019 batch

Attainment of POs & PSOs

Attainment of POs and PSOs are based on student feedback, examiner feedback and enrolment in higher education/jobs.



MUGBERIA GANGADHAR MAHAVIDYALAYA

P.O.-BHUPATINAGAR, Dist.-PURBA MEDINIPUR, PIN.-721425, WEST BENGAL, INDIA
NAAC Re-Accredited B+ Level Govt. aided College
CPE (Under UGC XII Plan) & NCTE Approved Institutions
DBT Star College Scheme Award Recipient

E-Mail: mugberia_college@rediffmail.com // www.mugberiagangadharmahavidyalaya.ac.in/

Department of Physics

Student Feedback Form

Dear Students,

Congratulations on successfully completing your B.Sc (Hons) in Physics from Mugberia Gangadhar Mahavidyalaya. The department values your feedback on various aspects that can contribute to its improvement. We kindly request you to provide your thoughtful responses to the following questionnaire (put the tick mark in appropriate column).

Thank you for your cooperation.

E: Excellent, G: Good, A: Average, P: Poor

	Description	E	G	A	P
	General about Department				
1	Vision, mission and goals of the department				

MUGBERIA GANGADHAR MAHAVIDYALAYA

P.O.-BHUPATINAGAR, Dist.-PURBA MEDINIPUR, PIN.-721425, WEST BENGAL, INDIA
NAAC Re-Accredited B+ Level Govt. aided College
CPE (Under UGC XII Plan) & NCTE Approved Institutions
DBT Star College Scheme Award Recipient

E-Mail: mugberia_college@rediffmail.com // www.mugberiagangadharmahavidyalaya.ac.in/

Department of Physics

Teachers Feedback Form

E: Excellent, G: Good, A: Average, P: Poor

	Description	E	G	A	P
	General about Department				
1	The curriculum of your Department has been updated from time to time.				
2	I am given enough freedom to contribute my ideas on curriculum design and development.				
3	Faculty Orientations programs for the introduction of the new Syllabus is organised.				
4	Freedom is given in adopting new techniques/				

Fig2: Sample of Feedback form for Student (left) and Examiner (right)

Scan copy of Feedback Form		
Sl. No.	Description	Link
1	Student feedback form	https://drive.google.com/drive/folders/1dO_wkZzGFAEd4J79GsuOt-9AyKgfTzbm?usp=sharing
2	Examiner feedback form	https://drive.google.com/drive/folders/17SAg9AEDPbQ58mqCdAlpj3n9oX66GOMX?usp=sharing

For attainment level, we have average over all questionnaire related to POs and PSOs received from students and examiner. Here is the rating level:

Excellent: 4
Good: 3
Average: 2
Poor: 1

ATTAINMENT LEVELS FOR POs and PSOs												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
Level	3	2.8	3.2	3	2.8	3.1	2.8	3.2	2.8	3.2	3	3

1	Batch 2016-2019												
2	no.	po1	po2	po3	po4	po5	po6	po7	pso1	pso2	pso3	pso4	pso5
3	1	3	2	4	1	3	2	2	3	2	2	3	3
4	2	3	3	3	2	1	3	3	3	2	3	3	3
5	3	2	3	2	3	4	3	2	3	3	2	2	3
6	4	3	3	4	4	3	4	3	3	3	4	3	3
7	5	3	3	4	3	3	4	2	3	3	4	3	3
8	6	3	2	4	4	3	3	3	4	3	4	3	4
9	7	4	3	4	4	3	3	4	3	4	3	4	3
10	8	3	4	3	4	3	3	4	3	3	4	3	3
11	9	3	3	1	2	3	3	3	4	3	3	3	2
12	average	3	2.888889	3.222222	3	2.888889	3.111111	2.888889	3.222222	2.888889	3.222222	3	3
13													

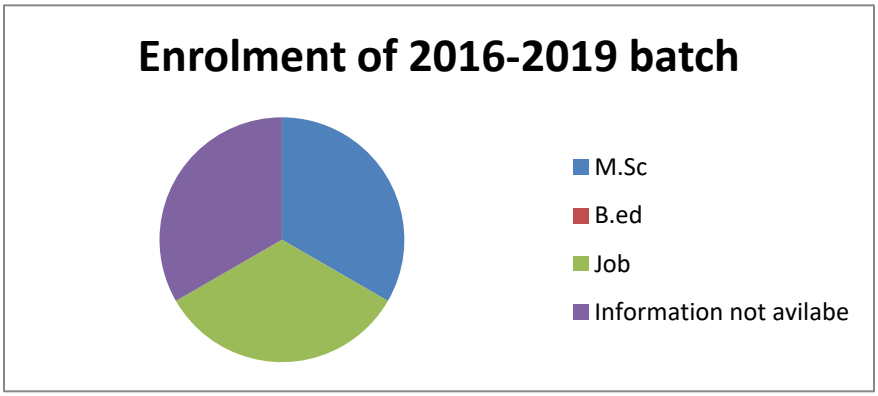


Fig3: Student enrolment in different courses