Govt. Bilasa Girl's P.G. (Auto.) College

Bilaspur

SYLLABUS

M.Sc. Physics

Semester – I & II

2019-20

Govt. Bilasa Girls' P.G.(Auto.) College,

Link Road, Bilaspur (C.G.)

Phone No. 07752-224249, Website : www.bilasagirlscollege.ac.in

"Regulation for Exmaination (Semester System) At Post Graduate Level, Under Autonomous Scheme"

Guru Ghasidas University, Bilaspur (C.G.) vide letter No. 60/Reg/Steno/96 dated 20.03.1996 has granted autonomous status to the Govt. Girls' P.G. College, Bilaspur (C.G.) Further the University Grants Commission, New Delhi vide letter No. F-22.01.2005 (Desk-AC) December 2005 and Guru Ghasidas University, Bilaspur (C.G.) vide letter No. 81/CDC/Auto/2006 dated 22.05.2006 have extended the autonomous status of the college till the session 2010-11. The University has authorized Govt. Girls' P.G. College, Bilaspur (C.G.) to frame syllabus and conduct examination in the following faculties the subjects at the Post Graduate Level.

	FACULTY	**SUBJECT**
I.	Arts 1.	M.A. Economics
		2. M.A. English
		3. M.A. Geography
		4. M.A. Hindi
		5. M.A. History
		6. M.A. Political Science
		7. M.A. Psychology
		8. M.A. Sociology
		9. M.A. Urdu
II.	Science Faculty	1. M.Sc. Botany
		2. M.Sc. Chemistry
		3. M.Sc. Food & Nutrition
		4. M.Sc. Human Development
		5. M.Sc. Mathematics
		6. M.Sc. Physics
		7. M.Sc. Zoology
		8. P.G. Diploma in Computer Science
		9. P.G. Diploma in Guidance & Counselling
		10. Post P.G. Diploma in Clinical Psychology
III.	Commerce	1. M.Com
IV.	B. Lib. I. Sc.	

1. As per the decision taken by the Co-ordination Committee in its Eleventh meeting, and in compliance of the order issued by the Directorate to Higher Education, vide letter No. 341/187/CHE/Co-ord/06 dated 27.04.2006 Govt. Girls' P.G. Collge Bilaspur (C.G.) is going to start semester system of examination from the session 2007 at post Graduate Level.
2. There shall be semester system of examination for the student who take admission in P.G. Classes in the session 2008-09 and for the Ex-students or students who take admission in the year of P.G. Classes, there shall be annual pattern of Examination.
3. The course, of study at the post Graduate Level (Master of Science, Master of Arts and Master of Commerce) is extended over four semesters in two academic Sessions. Examination of the first & Second semesters will be held in the first academic session and the third and fourth semesters in the second academic session.
4. Practical Examination of the science Faculty/Subjects will be held with the theory examination in each semester, where as Viva-Voce Examination of Arts and Commerce Faculty will be held with the thoery examination of second and fourth semester.

ADMISSION :

5. The admission in the Post Graduate Classes shall be strictly on merit basis in accordance to the admission rules of Govt. of Chhattisgarh State.
6. A graduate from any recognized University of Chhattisgarh State is eligible for admission in the Post Graduate Classes. A graduate from any recognized University outside of the Chhattisgarh state will also be eligible for admission in the Post Graduate Classes provided, she fulfills all other conditions of eligibility.

SYLLABUS :

7. Syllabus of each course shall be framed and approved by the Board of studies of that subject and Academic Council of the college.
8. There shall be four or five theory papers in each subjects in each semester practical examination of the subjects shall be conducted as per the syllabus framed and approved by the Board of Studies of that subject.
9. A student who has 60% or more aggregate marks in three semester can opt Dissteration as an Optional Paper in the forth semester if there is such a provision in that course of that subject.
10. In the theory papers of semester examination, there shall be 40 marks for external examination and 10 marks for internal examination. Each theory paper of the semester examination shall be of 40 marks in which there shall be Eight questions in total out of which a candidate will have to attempt four questions Maximum marks of the practical decided by the board of studies of the subject.

11. In each semester one seminar & two Internal test will be held for each paper. Both internal test and seminar of the paper will consist of five marks each. Each student has to appear in at least one seminar & one Internal test examination failing to which the student will be declared disqualify for appearing the semester examination.

EXAMINATION PATTERN :

12. There shall be main examination at the end of the each semester First and Third semester examination shall be held as for a possible in the month of November and second & fourth semester examination shall be held as for as possible in the month of April.

13. To be successful in the exam a student has to score atleast 36% marks in each Internal & External theory papers with an aggregate of 36% marks. Also to be successful in each practical paper a student has to score 36% Marks. Best marks of the two internal text examination will be incorporated in the marks of semester examination. The head of the department shall submit the detailed mark list to the controller of Examination after the completion of all tests and seminars.

14. A student shall be declared fail in the semester examination if she fails in more than one paper in the external examination and she will have to appear in all the papers of that semesters as an Ex-Student.

15. A student who fails in only one paper of semester examination can appear in the second attempt examination which will be held after two months of the main semester examination.

16. A student who fails in only one paper of a semester examination shall be eligible to take admission in the course of study of next semester but she shall not be eligible to appear in the next semester in the second attempt examination.

17. The admission of the student who fails in the second attempt examination of a semester, the admission to the next semester will automatically by cancelled and she will have to appear in all the papers of the semester examination in the next academic session as an Ex-student but marks of the internal examination will carry forward.

18. It is a must for the students to appear in the Internal test on the scheduled dates which will be declared by examination cell failing to which she shall be declared fail. If due to some unavoidable circumstances and sufficient reason the students fails to appear in the test on scheduled dates they have to appear before the High level Committee comprising of the Principal, Controller of Exam and Head of the Department of the particular subject with sufficient proof. The high level committee will decide the matter based on the proofs submitted by the students will be held.

19. If a student leaves the college after taking admission in a course of study of semester without appearing in Internal & External examination and if she would like to take admission in any forthcoming academic session in the same semester she shall be given admission in the same session as a regular student but her status will be of Ex. Student.

20. For Diploma courses there shall be annual examination pattern in which only external examination and practical examination will be held. There shall be no internal examination and seminars for these courses. Syllabus of these courses shall be framed by the board of studies, of the particular subject.

21. For B. Lib. I. Sc. Course there shall be Annual Examination pattern and Internal tests & Seminars will be organized.

DIVISION AWARD :

22. The division shall be awarded at the end of the Fourth Semester on the basis of taking together the aggregate of marks obtained by the students in all the four semester examination. The division shall be awarded on the following basis :-

23. A candidate who fails by one mark in a paer on in aggregate, shall be given grace mark but this one mark shall no where be added, Such candidate shall be declared pass with grace.

24. A candidate who lacks one mark to attain division shall be given one grace marks.

25. The names of first five candidates who have obtained first division at the end of the forth semester will be declared in the order of merit.

REVALUATION :

26. A candidate can apply for revaluation of answer books in not more than two theory papers. She has to pay prescribed fee for each paper within 15 days after the publication of the result of the semester examination. The provision of revaluation is only for the main exam and there is no provision of revaluation for the second attempt examination.

27. The change in the marks will depend upon the rules of revaluation issued by the Guru Ghasidas University, Bilaspur from time to time.

28. The points, which are not covered in the regulation mentioned above shall be governed by the existing rules, regulation and ordinance of Guru Ghasidas University, Bilaspur (C.G.)

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DEPARTMENT OF PHYSICS

MARKS SCHEME

M.Sc. Semester I

S.No.	Name of Paper	External		Internal		Total	
		Max.	Min.	Max.	Min.	Max.	Min.
1	Mathematical Physics	80	29	20	07	100	36
2	Classical Mechanics	80	29	20	07	100	36
3	Quantum Mechanics	80	29	20	07	100	36
4	Electronic Devices	80	29	20	07	100	36
5	Practical	...	...	...	...	200	72

Grace Marks – 01

M.Sc. PHYSICS

SEMESTER I

PAPER-I	**MATHEMATICAL PHYSICS**	**100 MARKS**
PAPER-II	**CLASSICAL MECHANICS**	**100 MARKS**
PAPERS-III	**QUANTUM MECHANICS**	**100 MARKS**
PAPDER-IV	**ELECTRONIC DEVICES**	**100 MARKS**
PRACTICAL		**200 MARKS**

M.Sc. PHYSICS SEMESTER I

PAPER-I

MATHEMATICAL PHSYSICS

Max. Marks-80 **Min. Marks-29**

Vector Spaces and Matrices; linear Independence; Bases; Dimensionality; inner product. Linear Transformations; Matrices; Inverse; Orthogonal and unitary matrices; independent elements of a matrix.

Eigen values and eigenvectors; Diagonalization; Complete ortho normal sets of functions.

Differential Equations and Special Function; Second order linear ODEs with variable Coefficients; Solution by series expansion; Legendre, Bessel, Hermit and Language-equations: Physical applications; Generation functions; recursion relations.

Integral transforms, Laplace transform; First and second shifting teorems: Inverse LT by partial functions: LT of derivative and integral of a function; Solution of initial value problems by using Laplace transform; LT and inverse LT of various functions.

Fourier series; FS or arbitrary period; Half wave expansions; Partial sums: Fourier integral and transforms: FT of delta function. Solutions of time dependent problems by Fourier transform. FT of Gaussian function; Applications of FT of Dirac delta function.

Text and Reference Books

Mathematical Methods for Physics, by G.Arfken

Matrices and Tensors for Physicists. by A.W.Joshi

Advanced Engineering Mathematics, by E.Kreyszig

Special Functions, by E.D.Raville

M.Sc. PHYSICS SEMESTER I

PAPER-II

CLASSICAL MECHANICS

Max. Marks-80 **Min. Marks-29**

Preliminaries; Newtonian mechanics of one many particle systems; conservation work-energy theorems; open systems (with variable mass).

Constraints; their classification; D Alembert's principle. generalized coordinates.

Lagrange's equations; gyroscope forces; dissipative systems; Jacobi integral; invariance; generalized coordinates and moment; integral of motion; Symmetries of space time with conservation laws; invariance under Galilean transformations.

Rotating frames; inertial forces.

Central force; definition and characteristics; two-body problem; closure and stabish circular orbits; general analysis of orbits; Kepler's law and equations; Rutherford scattering.

Principle of least action; derivations of equations of motion; variation and end of Hamilton's principle and characteristic functions; Hamilton-Jacobi equation.

Canonical transformation; generating functions; properties; infinitesimal general poison bracket; Jacobi's identity; Poisson theorems; angular momentum; PBs; oscillations; normal modes and coordinates.

Text and Reference Books

Classical Mechanics. by N.C. Rana and P.S. Joag (Tata MeGraw-Hill, 1991)
Classical Mechanics. by Goldstein (Addision Wesley, 1980)
Mechanics. by A Sommerfeld (Academic Press, 1952)

M.Sc. PHYSICS SEMESTER I

PAPER-III

QUANTUM MECHANICS

Max. Marks-80 **Min. Marks-29**

Why Q.M.? Revision; inadequacy of classical mechanics; Schrodinger equation; continuity equation; Ehrenfest theorem; Admissible wave functions; stationary states.

On-dimensional problems, wells and barriers; Harmonic oscillator by Schrodinger and operator method.

Central force problem; Solution of Schrodinger equation for spherierically symmetric potentials; Hydrogen atom.

Uncertainty of x and p, State with minimum uncertainty product; General realism of wave mechanics; Commutation relation; representation of states and dynamical variables; Completeness of Eigen functions; Dirac delta function; Bra and kept notion; Matrix presentation of an operator; Unitary transformation. Angular momentum in Q.M.

Time-independent perturbation theory, non-degenerate cases. applications such as Normal He-atom. 2. Perturbed harmonic oscillator, 3. Zeeman effect; degenerate cases/

applications such Stark effect in hydrogen atom.

Text and Reference Books

Sehiff. Quantum Mechanics (McGraw-Hill)
B Craseman and J D Powell, Quantum Mechanics (Addison Wesley)
A.P. Messiah. Quantum Mechanics
A.K.Ghatak & S. Lokanathan: Quantum Mechanics
B.S.Rajput: Advanced Quantum Mechanics
Satya Prakash: Quantum Mechaincs.

M.Sc. PHYSICS SEMESTER I

PAPER-IV

ELECTRONIC DEVICES

Max. Marks-80 **Min. Marks-29**

BJT: structure, working, derivation of the equation for 1-V characteristics. Bias stabilization & stabilization factor. Low frequency h-parameter for transistor amplifier. Different types of feed-back in amplifier.

JFET. MOSFET and MESFET : Structure, working dedication of the equation for 1-V characteristics under different conditions.

Microwave devices: tunnel diode transfer electron devices (Gunn diode). Avalanche Francis time deices.

Photonic devices, photoconductive devices (LDR). diode photo detectors, solar cell (open circuit voltage and short circuit current, fill factor). LED (High frequency limit, effect of surface and indirect recombination current, operation of LED). diode lasers (Conditions for population inversion, in active region, light confinement factor. Optical gain and threshold current for lasing.)

Liquid crystal.

Memory devices; Static and dynamic random access memories SRAM and DRAM, CMOS and NMOS, non-volatile NMOS, magnetic, optical and ferroelectric memories, charges coupled devices (CCD).

Text and Reference Books

Semiconductor devices- Physics and Technology, by S.M. Sze Wiley (1985)
Introduction to semiconductor devices, by M.S. Tyagi, John Wiley & Sons.

M.Sc. PHYSICS

SEMESTER II

PAPER-I	**ELECTRODYNAMICS AND PLASMA PHYSICS**	**100 MARKS**
PAPER-II	**STATISTICAL MECHANICS**	**100 MARKS**
PAPERS-III	**QUANTUM MECHANICS**	**100 MARKS**
PAPDER-IV	**ATOMIC AND MOLECULAR PHYSICS**	**100 MARKS**
PRACTICAL		**200 MARKS**

M.Sc. PHYSICS SEMESTER II

PAPER-I

ELECTRODYNAMICS AND PLASMA PHYSICS

Max. Marks-80 **Min. Marks-29**

Review of Maxwell's Equations, Wave equation for Vector and Scalar Potential and Solution. Retarded Potential and Lienard-Wiechert Potential, Electric and Magnetic fields due to a uniformly moving charge and a accelerated charge. Linear and Circular Acceleration and Angular distribution of Power Radiated, Bremsstrahlung. Synchrotron Radiation and Cerenkov.

Radiation. Reaction Force of Radiation.

Motion of charged particles in Electromagnetic field; Uniform E and B fields, Nonumiform fields. Diffusion across Magnetic Fields, Time varying E and B Fields, Adiabatic Invariants; Firs, Second, Third adiabatic invariants.

Elementary Concepts; Derivation of moment, Equations from Boltzmann equation, Plasma oscillations. Debye Shielding, Plasma parameters, Magneto plasma, Plasma confinement.

Hydro-dynamical Description of Plasma's Fundamental equations. Hydro-magnetic waves. Magneto-sonic and Alfven waves.

Wave phenomena in magneto plasma; Polarization, Phase velocity, Group velocity, Cutoffs. Resonance for Electromagnetic Wave Propagating parallel and perpendicular to the magnetic field, Propagation at Finite Angle and CMA Diagram, Appleton-Harte Formula and propagation through Ionosphere and Magnetosphere; Helicon, Whistler, Faraday rotation.

Text and Reference Books

Panofsky & Phillips; Classical Electricity and Magnetism
Jackson; Classical Electrodynamic
Bittencourt; Plasma Physics
Chen; Plasma Physics

M.Sc. PHYSICS SEMESTER II

PAPER-II

STATISTICAL MECHANICS

Max. Marks-80 **Min. Marks-29**

Foundations of statistical mechanics; specification of states of a system, Contact between statistics and thermodynamics, classical ideal gas, entropy of mixing and Give's paradox.

Micro canonical ensemble, phase space, trajectories and density of states, Lowville's theorem, Canonical and grand canonical ensembles; partition function, calculation of statistical quantities, Energy and density fluctuations.

Density matrix, statistics of ensembles, statistics of indistinguishable particles, Maxwell-Boltzmann, Fermi-Dirac and Base-Einstein statistics, Properties of ideal Bose and Fermi gases.

Bose-Einstein condensation.

Landau theory of phase transition, Critical indices.

Fluctuations and transport phenomena, Brownian motion, Lange in theory, Fluctuation dissipation theorem.

Text and Reference Books

Statistical Mechanics, by K Huang
Statistical Physics, by Landau and Lifshitz
Statistical Mechanics, by R.K. Pathria

M.Sc. PHYSICS SEMESTER II

PAPER-III

QUANTUM MECHANICS

Max. Marks-80 **Min. Marks-29**

Variation method, applications – ground state of helium atom; WKB approximation; connecting formulae.

Time-dependent perturbation theory; Harmonic perturbation; Fermi's golden rule; Adiabatic and sudden approximations.

Semi-classical theory of radiation; transition probability for absorption and induced emission; Electric dipole and forbidden transitions; selection rules.

Collision in 3-D all scattering; Laboratory and CM reference frames; Scattering amplitude; differential scattering cross section and total scattering cross section; Scattering by spherically symmetric potentials; Partial waves and phase shifts; Scattering by a perfectly rigid sphere and by square well potential; complex potential and absorption.

Identical particles; symmetric and ant symmetric wave function; Collision of identical particles; spin angular momentum; spin functions for a many electron system.

Text and Reference Books

L.L. Sehiff Quantum Mechanics (Mc Grow-Hill)
B Craseman and J.D. Powell, Quantum Mechanics (Addision Wesley)
A.P. Messiah, Quantum Mechanics
J.J. Sokurai, Modern Quantum Mechanics
A.K.Ghatak & S. Lokanathan; Quantum Mechanics
Satya Prakash; Quantum Mechanics
B.S. Rajput; Advanced Quantum Mechanics

M.Sc. PHYSICS SEMESTER II

PAPER-IV

ATOMIC AND MOLECULAR PHYSICS

Max. Marks-80 **Min. Marks-29**

Quantum state of one electron atoms ; - atomic orbital's, hydrogen spectrum, Pauli's principle spectra of alkali elements, spin orbit interaction and fine structure in alkali spectra, equivalent and non-equivalent electrons, normal and anomalous Zeeman effect, Paschal back, effect. Stark effect, two electron systems, interaction energy in LS and JJ coupling, Hyperfine structure (Qualitative), line broadening mechanism (General ideas).

Types of molecules ;- diatomic linear symmetric top, asymmetric top and spherical top molecules, Rational spectra of diatomic molecules as a rigid rotator, energy levels and spectra of no rigid rotor, intensity of rotational line, Stark modulated microwave spectrometer (qualitative).

Vocational energy of diatomic molecule : - diatomic molecule as a simple harmonic oscillator, energy levels and spectrum. Morse potential energy curve, molecules as vibrating rotator, vibration spectrum of diatomic molecule, PQR branches IR branches IR spectrometer (qualitative).

Text and Reference Books

Introduction to Atomic Spectra, by H.E. White (T)
Introduction to Molecular spectroscopy, by G.M. Barrow
Modern spectroscopy, by J.M. Holias
Molecular spectroscopy, by J.M. Brown

LABORATORY COURSE - II

The following experiment are recommended :

1. Experiment on FET characterization and application as and amplifier.
2. Experiment on MOSFET characterization and application and amplifier.
3. Experiment on Uni-junction transistor and its application.
4. Study of logic circuits TTL. NAND and NOR gates.
5. Study oflip-flopHop.
6. Experiments based on operational amplifier (741)
7. Differential amplifier.
8. Measurement of resistivity of a semiconductor by four probe method at different temperatures and determination of band gap.
9. Determination of Lande's factor of DPPH using ESR spectrometer.
10. Hybrid parameters of a transistor.
11. Multiplexers and Demultiplezers.
12. Study of Faraday effect using He-Ne Larer.
13. Study of solar cell

Each student has to perform two experiments in practical examination. Duration of practical Examinations is 05 Hours Distribution of marks are as follows -

Experiments (60 + 60)	-	120
Viva	-	40
Sessional	-	40

"Regulation for Examination (Semester System)

At Post Graduate Level, Under Autonomous Scheme"

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FACULTY		SUBJECT			
I.	Arts	1.	M.A. Economics	2.	M.A. English
		3.	M.A. Geography	4.	M.A. Hindi
		5.	M.A. History	6.	M.A. Political Science
		7.	M.A. Psychology	8.	M.A. Sociology
		9.	M.A.Urdu.		
II.	Science Faculty	1.	M.Sc. Botany	2.	M.Sc. Chemistry
		3.	M.Sc. Food & Nutrition		
		4.	M.Sc. Human Development		
		5.	M.Sc. Mathematics		
		6.	M.Sc. Physics		
		7.	M.Sc. Zoology		
		8.	P.G. Diploma in Computer Science.		
		9.	P.G. diploma in Guidance & Counselling		
		10.	Post P.G. Diploma in Clinical Pshchology		
III.	Commerce	1.	M.Com		
IV.	B.Lib. I.Sc.				

1. As per the decision taken by the Co-ordination Committee in its Eleventh meeting and in compliance of the order issued by the Directorate of Higher Education, vide letter No. 341/187/CHE/Co-ord/06 dated 27.04.2006 Govt. Girls P.G. College Bilaspur (C.G.) is going to start semester system of examination from the session 2007 at post Graduate Level.
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3. The course, of study at the post Graduate Level (Master of Science, Master of Arts and Master of Commerce) is extended over four seraesters in two academic Session. Examination of the first & Second semesters will be held in the first academic session and the third and fourth semester in the second academic session.
4. Practical Examination of the science Faculty / Subjects will be held with the theory examination in each semester, where as Viva-Voce Examination of Arts and Commerce Faculty will be held with the theory examination of second and fourth semester.

ADMISSION :

5. The admission in the Post Graduate Classes shall be strictly on merit basis in accordance to the admission rules of Govt. of Chhattisgarh State.
6. A graduate from any recognized University of Chhattisgarh State is eligible for admission in the Post Graduate Classes. A graduate from any recognized university outside of the Chhattisgarh state will also be eligible for admission in the Post Graduate Classes provided, she fulfills all other conditions of eligibility.

SYLLABUS:

7. Syllabus of each course shall be framed and approved by the Board of studies of that subject and Academic Council of the college.
8. There shall be four or five theory papers in each subjects in each semester practical examination of the subjects shall be conducted as per the syllabus framed and approved by the Board of Studies of that subject.

9. A student who has 60% or more aggregate marks in three semester can opt Dissertation as an Optional Paper in the forth semester if there is such a provision in that course of that subject.

10. In the theory papers of semester examination, there shall be 40 marks for external examination and 10 marks for internal examination. Each theory paper of the semester examination shall be of 40 marks in which there shall be Eight questions in total out of which a candidate will have to attempt four questions Maximum marks of the practical decided by the board of studies of the subject.

11. In each semester one seminar & two Internal test will be held for each paper. Both internal test and seminar of the paper will consist of five marks each. Each student has to appear in at least one seminar & one Internal test examination failing to which the student will be declared disqualify for appearing the semester examination.

EXAMINATION PATTERN:-

12. There shall be main examination at the end of the each semester First and Third semester examination shall be held as for a possible in the month of November and second & fourth semester examination shall be held as possible in the month of April.

13. To be successful in the exam a student has to score at least 36% marks in each Internal & External theory papers with an aggregate of 36% marks. Also to be successful in each practical paper a student has to score 36% marks. Best marks of the with internal text examination will be incorporated in the marks of semester examination. The head of the department shall submit the detailed mark list to the controller of Examination after the completion of all test and seminars.

14. A student shall be declared fail in the semester examination if she fails in more than one paper in the external examination and she will have to appear in all the papers of that semesters as an Ex-student.

15. A student who fails in only one paper of semester examination can appear in the second attempt examination which will be held after two months of the main semester examinations.

16. A student who fails in only one paper of a semester examination shall be eligible to take admission in the course of study of next semester but she shall not be eligible to appear in the next semester examination unless has passed the remaining paper of the first semester in the second attempt examination.

17. The admission of the student who fails in the second attempt examination of a semester, the admission to the next semester will automatically be cancelled and she will have to appear in all the papers of the semester examination in the next academic session as an Ex-student but marks of the internal examination will carry forward.

18. It is a must for the students to appear in the Internal test on the scheduled dates which will be declared by examination cell failing to which she shall be declared fails. If due to some unavoidable circumstances and sufficient reason the students fails to appear in the test on scheduled dates they have to appear before the High of the Department of the particular subject with sufficient proof. The high level committee will decide the matter based on the proofs submitted by the students will be held.

19. If a student leaves the college after taking admission in a course of study of semester without appearing in Internal & External examination and if she would like to take admission in any forthcoming academic session in same semester she shall be given admission in the same session as a regular student but her status will be of Ex-student.

20. For Diploma courses there shall be annual examination pattern in which only external examination and practical examination will be held. There shall be no internal examination and seminars for these courses. Syllabus of these courses shall be framed by the board of studies, of the particular subject.

21. For B.Lib. I.Sc. course there shall be Annual Examination pattern and Internal tests & seminars will be organized.

DIVISION AWARD

22. The division shall be awarded at the end of the Fourth Semester on the basis of taking together the aggregate of marks obtained by the students in all the four semester examination. The division shall be awarded on the following basis -

    1. I Division - 60% & above
    2. II Division - 48 & above but less than 60%
    3. III Division - 36% & above but less than 48%

23. A candidate who fails by one marks in a pear or in aggregate, shall be given grace mark but this one marks shall no where be added. Such candidate shall be declared pass with grace.

24. A candidate who lacks one mark to attain division shall be given one grace marks.

25. The names of first five candidates who have obatined first division at the end of the forth Semester will be declared in the order of merit.

REVALUATION :-

26. A candidate can apply for revaluation of answer books in not more than two theory papers. She has to pay prescribed fee for each paper within 15 days after the publication of the result of the semester examination. The provision of revaluation is only for the main exam and there is not provision of revaluation for the second attempt examination.

27. The change in the marks will depend upon the rules of revaluation issued by the Guru Ghasidas University, Bilaspur from time to time.

28. The points, which are not covered in the regulation mentioned above shall be governed by the existing rules, regulation and ordinance of Guru Ghasidas University, Bilaspur (C.G.)

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DEPARTMENT OF PHYSICS

MARKS SCHEME

M.Sc. Semester III

S.No.	Name of Paper	External		Internal		Total	
		Max.	Min.	Max.	Min.	Max.	Min.
1	Condensed Matter Physics	80	29	20	07	100	36
2	Nuclear and Particle Physics	80	29	20	07	100	36
3	Operational Amplifiers and Digital Electronics (Special Paper I	80	29	20	07	100	36
4	Electronics and its Applications	80	29	20	07	100	36
5	Practical	...	...	...	...	200	72

Grace Marks - 01

M.Sc. PHYSICS (III SEMESTER): PAPER-I
CONDENSED MATTER PHYSICS

Crystal Physics and Defects in Crystals

Crystalline solids, unit cells and direct lattice, two and three dimensional Bravais lattices, closed packed structures.

Interaction of X-ray with matters, absorption of X-rays. Elastic scattering from a perfect lattice. The reciprocal lattice and its applications to diffraction techniques. The Laue, powder and rotating crystal methods, crystal structure factor and intensity of diffraction maxima. Extinctions due to lattice centering.

Point defect, line defects and planer (stacking) faults. The role of dislocations in plastic deformation and crystal growth. The observation of imperfections in crystal, X-ray and electron microscopic techniques.

Electronic Properties of solids

Electrons in a periodic lattice: Bloch theorem, band theory, classification of solids, effective mass. Tight-bonding, cellular and pseudo-potential methods. Fermi surface, de Hass von Alfen effect. cyclotron resonance, magneto-resistance, quantum Hall effect. Superconductivity: critical temperature, persistent current, Meissen effect.

Weiss theory of ferromagnetism. Heisenberg model and molecular field theory. Spin waves and magnons. Curie-Weiss law of susceptibility, Ferry and antihero-magnetic order.

Domains and Bloch-wall energy.

Text and Reference Books

Verma and Srivastava: Crystallography for Solid State Physics
Azaroff: Introduction to Solids
Omar : Elementary Solid State Physics
Kittal : Solid State Physics

M.Sc. PHYSICS (III SEMESTER): PAPER-II
NUCLEAR AND PARTICLE PHYSICS

Nuclear Interactions and nuclear Reactions

Nucleon-nucleon interaction. Exchange force and tensor forces. Meson theory of nuclear forces. Nucleon-nucleon scattering, Effective range theory. Spin dependence of nuclear forces, Change independence and charge symmetry of nuclear forces. Is spin formalism. Yukawa interaction.

Direct and compound nuclear reaction mechanism. Cross section in terms of partial wave amplitudes. Compound nucleus. Scattering matrix. Reciprocity theorem. Bruit-Wigner one-level formula. Resonance scattering.

Nuclear Models

Liquid drop model. Bohr-Wheeler theory of fission. Experimental evidence for shell effects. Shell model. Spin-orbit coupling. Magic numbers. Angular moments and parities of nuclear ground state. Qualitative discussion and estimates of transition rates. Magnetic moments and Schmidt lines. Collective model of Bohr and Mottelson.

Nuclear Decay

Beta decay. Fermi theory of beta decay. Shape of the beta spectrum. Total decay rate. Angular momentum and parity selection rules. Comparative half-lives. Allowed and forbidden transitions. Selection rules. Parity violation. Two-component theory of neutrino decay. Detection and properties of neutrino. Gamma decay. Multiple transitions in nuclei. Angular momentum and parity selection rules. Internal conversion. Nuclear isomerism.

Elementary Particle Physics

Types of interaction between elementary particles – Hadrons and leptons – Symmetry and conservation laws. Elementary ideas of CP and CPT invariance. Classification of hadrons.

Text and Reference Books

Kenneth S. Kiane : Introductory Nuclear Physics, Wiley, New York, 1988
H.A. Enge: Introductory Nuclear Physics, Addison-Wesley. 1975
M.K. Pal : Theory of Nuclear Structure, affiliated East-West, Madras, 1982
J.M. Longo: Elementary Particles, Mc Grow-Hill, New York, 1971
I. Kaplan: Nuclear Physics, 2nd Narosa Modron 19850

M.Sc. PHYSICS (III SEMESTER): PAPER-III
SPECIAL PAPER - I
OPERATIONAL AMPLIFIERS & DIGITAL ELECTRONICS

Module 1:

Operational Amplifiers

Differential amplifier – circuit configuration – dual input, balanced output differential amplifier – DC analysis – AC analysis, inverting and non inverting inputs CMRR – constant current bias level transistor.

Block diagram of a typical Op-Amp-analysis. Open loop configuration inverting and non-inverting amplifiers. Op-amp with negative feedback-voltage series feed back-effect of feed back on closed leap gain input persistence output resistance bandwidth and output offset voltage-voltage follower.

Practical pomp input offset voltage-input bias current – input offset current, total output offset voltage, CMRR frequency response.

DC and AC amplifier summing scaling and amplifiers instrumentation amplifier, integrator and differentiator.

Oscillators principles-oscillator type-frequency stability response- The phase shift oscillator, Wein bridge oscillator – LC tunable oscillators- Multivibrators – Constable and Actable-comparators – square wave and triangle wave generators.

Voltage regulators – fixed regulators – adjustable voltage regulators switching regulators.

Module 2:

Communication Electronics

Amplitude modulation – Generation of AM waves- Demodulation of AM waves- DSBSC modulation. Generation of DSBSC waves, coherent detection of DSBSC waves, SSB modulation, generation and detection of SSB waves. Vestigial sideband modulation. Frequency division multiplexing (FDM).

Digital Electronics

1. Combinational Logic

The transistor as a switch, OR, AND and NOT gates. NOR and NAND gates. Boolean algebra Demerger's theorems exclusive OR gate, Decoder Dmultiplexer data selector/multiplexer Encoder.

2. Sequential Logic

Flip Flop : A I-bit memory The RS Flip-Flop, JK Flip-Flop, JK master slave Flip-Flops, T Flip-Flop, D Flip-Flop. Shift registers synchronous and asynchronous counters cascade counters.

Microprocessors

Introduction to microcomputers memory input/output interfacing devices. 8085 CPU architecture, BUS timings, Demultiplexing the address but generating control signals, Instructions set-address modes illustrative programmers' writing assembly language, programmers looping, counting and indexing counters and timing delays stack and subroutine.

Text and Reference Books

Electronic Devices and Circuit Theory: Robert Boylested and Louis Nashdsky, PHI, New Delhi-110001, 1991

Op-Amps & Linear Integrated Circuits: Ramakanth, A. Gayakwad PHI, Second Ed., 1991

Digital Principles and Applications: A.P. Malvino and Donald P.Laach, Tata Mcgrow-Hill Company, New Delhi, 1993

Microprocessor Architecture, Programming and Applications with 8085/80856: Ramesh S. Gaonkar, Wiley Eastern Ltd. 1987

M.Sc. PHYSICS (III SEMESTER): PAPER-IV
SPECIAL PAPER II
ELECTRONICS & ITS APPLICATIONS

Module 1:

Analog and Digital Systems

Analog computation, active filters, comparators, logarithmic and anti-logarithmic amplifiers, sample and hold amplifiers, waveform generators. Square and triangular wave generators, pulse generator.

Read-only memory (ROM) and applications. Random access memory (RAM) and applications. Digital to analog converters, ladder and weighted resistor types Analog to digital converts counter type, successive approximation and dual slope converters, applications of DACs and ADCs.

Optoelectronics

Photo detectors: Photo detectors with external photo effect, photo detectors with internal photo effect, photo conductors and photo resistors and photo resistors, junction photo detectors.

Circuits with light emitting diodes, diode tester. Polarity and voltage tester, measuring instruments with LED indication.

LED, numeric and alphanumeric display units. Semiconductor switches and potential isolation. The phototransistor as a switch in the opt couplers, steady state performance, dynamic performance, use of opt couplers.

Module 2:

Microwave Devices

Klystrons, Magnetrons and Travelling wave tubes, Velocity modulation, Basic principles of two cavity Klystrons and Reflex Klystrons, principles of operation of magnetrons. Helix Travelling Wave Tubes, Wave Modes.

Transferred electron devices, Gunn effect, Principles of operation. Modes of operation, Read diode, IMPATT diode, TRAPATT diode.

Microwave Communications

Advantages and disadvantages of microwave transmission, loss in free space, propagation of microwaves, atmospheric effects on propagation, Fresnel zone problem, ground reflection, fading sources, detectors, components, antennas used in MW communication systems.

Radar Systems

Radar block diagram an operation, radar frequencies, pulse considerations. Radar range equation, derivation of radar range equation, minimum detectable signal, receiver noise, signal to noise ration, integration of radar pulses, Radar cross section, Pulse repetition frequency, Antenna parameters, system losses and propagation losses. Radar transmitters, receivers. Antennas, displays.

Satellite Communications

Satellite communications: orbital satellites, geostationary satellites, orbital patterns, look angles, orbital spacing, satellite systems. Link modules.

Text and Reference Books

Microelectronics: Jacob Millman, MeGraw-Hill International Book Co., New Delhi, 1990

Optoelectronics: Theory and Practice, Edited by Alien Chappal, McGrow-Hill Book Co., New York

Microwaves: K.L. Gupta, Wiley Eastern Ltd. New Delhi, 1983

Advanced Electronics Communications System: Wayne Tomasi, Phi.Edn

LABORATORY COURSE-I

The following experiments are recommended:

1. To construct the Ex-NOR gate using NAND gate and verify its truth table.
2. To study of a left shift, right shift register and its operation.
3. To study the fundamental logic gates: OR gate, AND gate, NOT gate using NAND gate and NOR gate.
4. Verification of the De-Morgans theorem.
5. To study the fundamental logic gates: Ex-OR gate and construct the half adder and verify the truth table.
6. To construct half sub tractor and verify its truth table.
7. To construct the full adder and verify its truth table.
8. Experiment on microprocessor – Addition.
9. Experiment on microprocessor – Multiplication
10. Study of a up-down counter.

DEPARTMENT OF PHYSICS

MARKS SCHEME

M.Sc. Semester IV

S.No.	Name of Paper	External		Internal		Total	
		Max.	Min.	Max.	Min.	Max.	Min.
1	Computational Methods and Programming	80	29	20	07	100	36
2	Physics of Lasers and Laser Application	80	29	20	07	100	36
3	Digital Communication (Special Paper-III)	80	29	20	07	100	36
4	Microprocessor (Special Paper IV)	80	29	20	07	100	36
5	Practical & VIVA	...	...	...	...	200	72

Grace Marks – 01, First Division -60% and above, Second Division – 45% to Below 60%, Third Division – Below 45% and Pass.

M.Sc.PHYSICS (IV SEMESTER): PAPER-I

COMPUTATIONAL METHODS AND PROGRAMMING

Computational Method

Methods of determination of zeroes of linear algebraic and transcendental equations: bisection method, method of false position, iteration method Newton-Rap son method. Methods of determination of zeroes of nonlinear equations: method of iteration, Newton-Rap son method.

Solution of simultaneous linear equations, Gaussian elimination, pivoting, iterative method, matrix inversion.

Eigen values and eigenvectors of matrices, Power and Jacobi method.

Finite differences, interpolation with equally spaced and unevenly spaced points. Curve fitting, Polynomial least squares and cubic Spine fitting.

Numerical differentiation and integration, Newton-Cotes formulae, error estimates, Gauss method.

Random variety, Monte Carlo evaluation of integrals, Methods of importance sampling, Random walk and Metropolis method.

Numerical solution of ordinary differential equations, Euler and Range Kutta methods, Predictor and corrector method. Elementary ideas of solutions of partial differential equations.

Programming

Elementary information about digital computer principles, compilers, interpreters and operating systems. Fortran programming, flow charts, integer and floating point arithmetic, expressions, built in functions, executable and non-executable statements, assignment, control and input-output elements, subroutines and functions, operation with files.

Text and Reference Books

Sastry: Introductory Methods of Numerical Analysis

Rjaraman: Numerical Analysis

Rajaraman: Fortran Programming

Vetterming, Teukolsky, Press and Flannery: Numericals Recipes.

M.Sc.PHYSICS (IV SEMESTER): PAPER-II
ELECTIVE PAPER
PHYSICS OF LASERS AND LASER APPLICATIONS

Laser Characteristics

Gaussian beam and its properties. Stable two-minor optical resonators, Longitudinal and transverse modes of laser cavity. Mode selection. gain in regenerative laser cavity. Threshold for 3 and 4 level laser systems. Mode locking pulse shortening – picoseconds & femtosecond operations, Spectral narrowing and Stabilisation.

Laser Systems

Ruby laser, Nd-YAG laser, Semiconductor lasers, Diode-pumped solid state lasers, Nitrogen laser, Carbon-dioxide laser, Excimer laser, Dye laser, High power laser systems.

Laser Spectroscopic Technique and other Applications

Laser Fluorescence and Raman scattering and their use of pollution studies, Non-linear interaction of light with matter, Laser induced multiphoton processes and their applications, Ultrahigh resolution spectroscopy with lasers and its applications, Propagation of light in a medium with variable refractive index. Optical fibers. Light wave communication. Qualitative treatment of medical and engineering application. Qualitative treatment of medical and engineering applications of lasers.

Text and Reference Books

Svelto: Lasers
Yariv: Optical Electronics
Demtroder: Laser Spectroscopy
Letekhov: non-linear Laser Spectroscop.

M.Sc.PHYSICS (IV SEMESTER): PAPER-III

ELECTIVE PAPER III

DIGITAL COMMUNICATION

Module 1

Digital Communications

Pulse modulation systems: Sampling theorem - low pass and band pass signals, PAM, Channel BW for a PAM signal. Natural sampling. Flat-top sampling. Signal recovery through holding, Quantisation of signals, Quantisation, Differential PCM, Delta modulation, Adaptive delta modulation, CVSD.

Digital Modulation

BPSK, DPSK, QPSK, PSK, QASK, BFSK, FSK, MSK.

Mathematical Representation of Noise

Sources of noise. Frequency domain representation of noise, Effect of filtering on the probability density of Gaussian noise, Spectral component of noise, Effect of filter on the power spectral density of noise. Superposition of noises. Mixing involving noise. Linear filtering, Noise bandwidth, Quadrature components of noise. Power spectral density of nc(t), ns(t) and their time derivatives.

Data Transmission

Baseband signal receiver, probability of error. Optimum filter. White noise. Matched filter and probability of error. Coherent reception. Correlation, PSK, FSK, Non-coherent detection of FSK, Differential PSK, QPSK, Calculation of error probability for BPSK, BFSK and QPSK.

Module 2

Noise in Pulse-code and Delta-module.

PCM transmission, Calculation of quantization noise, output-signal power. Effect of thermal noise, output signal-to-noise ratio in PCM, DM, Quantisation noise in DM, output signal power, DM output-signal-to quantization-noise ratio. Effect of thermal noise in Delta modulation, output signal-to-noise ratio in DM.

Computer Communication Systems

Type of networks, Design features of a communication network, examples, TYMNET, ARPANET, ISDN, LAN.

Mobile Radio and Satellites

Time Division multiple access (TDMA), Frequency division multiple access (FDMA), Slotted ALOHA, Carrier sense multiple access (CSMA). Poisson distribution, protocols.

Text and Reference Books

Taub and Schilling: Principles of Communications Systems, Second Ed., TMH, 1994

Simon Haykin: Communication Systems, Third Ed., John Wiley & Sons, Inc. 1994

M.Sc. PHYSICS SEMESTER IV
PAPER-IV
MICROPROCESSOR

Max. Marks-80 **Min. Marks-29**

Module 1 microprocessors & Micro Computers

Microprocessors and Architecture

Internal microprocessor architecture, Real mode and protected modes of memory addressing, Memory paging.

Addressing Mode

Data addressing modes. Program memory addressing modes, Stack-memory addressing modes.

Instruction Set

Data movement instructions, Arithmetic and logic instructions, Program control instructions, Assembler details,

Programming the Microprocessor

Modular programming using the keyboard and video display, Data conversations, Disk files, Examples programs.

Hardware Specifications

Pin-outs and the pin functions, clock-generator (8284A), Bus buffering and latching, Bus timing, ready and wait state, Minimum mode versus maximum mode.

Module 2 Memory Interface

Memory device, Address decoding, 8088 and 80188 (8-bit) memory interface, 8086, 80186, 80286, and 80386 (16-bit) memory interface, 80386DX and 80486 (32-bit) memory interface, Dynamic RAM.

Basic I/O Interface :

Introduction to I/O interface. I/O port address decoding, 8255, 8279, 8254, 16550, ADC and DAC (excluding multiplexed display & keyboard display using 8255)

Interrupts :

Basic interrupt processing, Hardware interrupts, Expanding the interrrupt structure. 8259A PIC.

Direct Memory access :

Basic DMA operation. 8237 DMA controller. Shared bus operation. Disk memory system, Video displays.

Text and Reference Books :

____ B. Brey : The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486.
____ and Pentium Processor Architecture, Programming and Interfacing, Fourth Ed. PHI,
___

___ V. Hall : Microprocessors and Interfacing, Programming and Hardware, Second Ed., Graw-Hill International Ed., 1992.

____ Ali Mazidi and Janice Gillispic Mazidi : The 80x86 1BM PC and Compatible computers (Volume I & II) Second Ed., Prentice – Hall International, 1998.

M.Sc. PHYSICS (IV SEMESTER) : PROJECT

This course will be based on preliminary research oriented topics both in theory at experiments. The teachers who will act as supervisors for the projects will float projects and at one of them will be allocated to the student. At the completion of the projects by the semester end, the student will submit Project Report in the form of Dissertation which will be examine by the examiners. The examination shall consist of (a) Presentation and (b) Comprehensive viva voce. Marks allotted for project and presentation is of 200.