BAUCHI STATE UNIVERSITY,

GADAU

FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS

STUDENTS HANDBOOK

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BACHELLOR OF SCIENCE, B.Sc. (Hons) PHYSICS PROGRAMMME

(FULL TIME)

TheDepartment of Physics, Bauchi State University, Gadau, offers courses leading to the award of the degree of Bachelors of Science, B.Sc. (Hons) in Physics and pursues research over a wide range of relevant topics that have fundamental, social, and commercial needs. As the fundamental for all the natural sciences, Physics plays profound role in other branches of science and engineering. As such, the Department will provide supporting courses in the sciences and engineering programmes of the University.

B.Sc. Physics Degree Programme

1. **Philosophy, Aims and Objectives of the Programme**

a. To provide students with a broad and balanced foundation of physics knowledge and practical skills.
b. To instils in students a sense of enthusiasm for physics, and appreciation of its applications in different contexts.
c. To involve the students in intellectually stimulating and satisfying experience of learning and studying.
d. To develop in students the ability to apply their knowledge and skills in Physics to the solution of theoretical and practical problems.
e. To develop in students through an education in Physics a range of transferable skills of value in physics and other areas.
f. To provide students with knowledge and skills base for further studies in physics or multi-disciplinary areas involving physics.

2 Admission and Graduation Requirement

UTME

The entry requirements shall be at least credit level passes in five subjects including English Language, Mathematics, Physics and Chemistry to form the core subjects with credit in one other relevant science subject at the Senior Secondary School Certificate or its equivalent. In addition, an acceptable pass in the Unified Tertiary Matriculation Examination (UTME) into 100-level is required.

Direct Entry

Candidates with two A level passes (graded A-E) at the Advanced Level in one or more relevant subjects (Biology, Botany, Chemistry, Geography, Mathematics and Physics) may undertake the three ï year degree programme into 200-level.

3. Registration

At the beginning of every academic session, all students are required to register courses as provided for each level of their study in accordance with the provisions made by theUniversity. Provision is made for students who wishes to make minor changes to their course registration using the ñ**Add**ò and ñ**Drop**ò forms to be provided by the faculty usually at the beginning of the second semester. Students are to be counselled and guided in theirregistration by their respective level coordinators.

3. Learning Outcomes

All Bachelors honours degree students in Physics are expected to develop the following abilities and skills:

a. *Regime of Subject Knowledge*

Cognitive abilities and skills relating to solution of problems in Physics and Physics related disciplines.

b. *Competencies and Skills*

To develop in the students, practical skills relating to the conduct of laboratory and industrial work in Physics.

c. *Behavioral Attitudes*

The students are expected to acquire general skills relating to non-subject specific competencies in; communication, ICT

knowledge, interpersonal relations, organization skills and ethical standards.

4.**Attainment Levels**

Graduates of Physics are expected to have the ability to apply knowledge and skills to solving theoretical and practical problems in Physics in relation to national and societal problems.

5. Graduation Requirement

Students are required to pass all taught core courses. In addition students are required to complete a minimum of 120 credit units in 4 years (UTME candidates) and 90 credit units in 3 years (DE candidates) for Graduation, 60 of which must come from Physics courses. Students must also complete successfully, the SIWES programme and the final year project.

Where a student fail to pass the required credit unit requirement within 4 years (UTME candidates or within 3 years (DE candidates), such students will be allowed a maximum of 2 years to spill-over in order to obtain the minimum credit requirements for graduation.

6. Course Credit System

The Department runs the Course credit System. This is a `quantitative system of organization of the curriculum in which subject areas are broken down into unit courses which are examinable and for which students earn credit(s) if passedô. The courses are arranged in progressive order of difficulty with some courses at the lower level serving as pre-requisite(s) for higher level courses. The courses are also arranged according to levels of academic progress,e.g Level 1 or year 1 courses are coded 100,and Level II or Year II Courses are coded 200 etc. The second aspect of the system is that courses are assigned weights referred to as Credit Units in a four digit format. The credit unit(s) is/are the second digit in the course code. The last digit refers to the semester at which the course is being offered e.g. PHY 1201 is a level one or year 1 course of two (2) credit units and is offered during the first semester.

7. Grade Point Average(GPA) and Cumulative Grade Point Average (CGPA)

Performance in any semester is reported in Grade Point Average. This is the average of weighted grade points earned in the courses taken during the semester. The Grade Point Average is obtained by multiplying the Grade Point Average in each course by the number of

Credit Units assigned to that course, and then summing these up and dividing by the total number of Credit Units taken for the semester.

The Cumulative Grade Point Average (CGPA) is the up-to-date mean of the Grade Points earned by the students in a programme of study. It is an indication of the studentôs overall performance at any point in the training programme. To compute the Cumulative Grade Point Average, the total of Grade Points multiplied by the respective Credit Units for all the semesters are added and then divided by the total number of Credit Units for all courses registered by the student.

Table 1:Scoring and Grading Systems

(i) Credit Units	(ii) Percentile Scores	(iii) Letter Grades	(iv) Grade Points (GPA)	(v) Grade Point Average (CGPA)	(vi) Cumulative Grade Point Average	(vii) Class of Degree
The second digit of each course code	70 – 100	A	5	Derived by Multiplying i and iv and dividing by total Credit Units	4.50 – 5.00	First Class
	60 – 69	B	4		3.50 – 4.49	2nd Class Upper
	50 – 59	C	3		2.40 – 3.49	2nd Class lower
	45 – 49	D	2		1.50 – 2.39	Third Class
	40 – 44	F	0			Fail

8. COURSE EVALUATION

Techniques of Students Assessment

Students are to be examined by a combination of the following methods:

(a) Un-announced Quizzes
(b) Class Examinations (Test)
(c) Home-Work Assignments
(d) Workshops and Laboratory experiments
(e) Field visits or trips
(f) First Semester and Final Semester Examinations.

Items (a ï c) above are the components of the continuous assessment (CA) and carry a total of 40%, while the semester examination is

weighted out of 60% for taught courses. Practical courses are weighted 50% for the CA component and 50% for the semester examination. At the end of each semester, students will be issued copies of their GPA or CGPA evaluation forms as the case may be.

9. External Examiner System

All examination question papers (including marking schemes) are to be moderated by an External examiner. The External Examiner willalso assess final year courses, results and projects, and to certify the overall performance of the graduating students as well as the quality of facilities and teaching.

10. Repeating Failed Course Unit(s) or Carry over

Subject to the conditions for withdrawal and probation, student may be allowed to repeat the failed course Unit(s) at the next available opportunity, provided that the total number of credit units carried during that semester does not exceed 24, and the Grade Points earned at all attempts shall count towards the CGPA.

11. Probation

Probation is a status granted to a student whose academic performance falls below an acceptable standard. A student whose Cumulative Grade Point Average is below 1.50 at the end of a particular year of study, earns a period of probation for one academic session. Any student who falls into probation in two consecutive sessions will be asked to withdraw.

12. Withdrawals

A candidate whose Cumulative Grade Point Average is below 1.50 at the end of a particular period of probation should be required to withdraw from the University. However, in order to minimize waste of human resources, consideration should be given to withdrawal from programme of study and possible transfer to other programmes within the same University.

ACADEMIC STAFF PROFILE

S/N	NAMES	RANKS	QUALIFICATIONS	SPECIALIZATION	APPOINMENT
1	Dr. M.M. Kashimbila	Assoc. Prof	BSc, MSc, PhD	Theoretical Nuclear Physics	Permanent
2	Dr.M. A. Abdulaziz	Professor	BSc, MSc, PhD	Energy Studies	Visiting

3	Dr. Tijjani H. Darma	Senior Lecturer	BSc, MSc, PhD	Energy/Material Science	Visiting
4	Dr. Yusuf A. Ahmad	Senior Lecturer	BSc, MSc, PhD	Radiation Biophysics	Visiting
5	Dr. Musa O. Aku	Senior Lecturer	BSc, MSc, PhD	Geophysics	Visiting
6	Dr. Tijjani S. Bichi	Senior Lecturer	BSc, MSc, PhD	Radiation Biophysics	Visiting
7	Dr.Sadiq G. Abdu	Senior Lecturer	BSc, MSc, PhD	Solid State Physics	Visiting
8	Dr. Bello Idi	Senior Lecturer	BSc, MSc, PhD	Geophysics	Visiting
9	Dr. A. B. Sulaiman	SeniorLecturer	BSc, MSc, PhD	Condensed Matter	Visiting
10	Aliyu Umar Saad	Graduate Assistant	BSc, M.Sc. (In view)	Plasma Physics	Permanent
11	M. A. Aliyu	Graduate Assistant	BSc, M.Sc. (In view)	Material Science	Permanent
12	AbubakarDauda	Assistant Lecturer	B.Sc, M.Sc.	Plasma Physics	Permanent
13	Dalhatu S. Abubakar	Assistant Lecturer	BSc, M.Sc.	Comptational Physics	Permanent
14	YahayaSaaduItas	Graduate Assistant	BSc,		Permanent
15	Amina M. Danmadami	Graduate Assistant	BSc, M.Sc. (In view)		Permanent
16	AuwaluBaballe	Graduate Assistant	B.Sc.		Permanent
17	Hauwa-KuluShuaibu	Graduate	B. Tech (Ed)		Permanent

		Assistant	Physics		

DETAILS OF COURSE STRUCTURE:

FOUR (4) YEARS B.Sc. PHYSICS PROGRAMME

100 LEVEL COURSES

LEVEL 100

First Semester

Course Code	Title	Credits
PHY 1201	Mechanics	2
PHY 1203	Electricity and Magnetism	2
PHY 1105	Physics Practicals I	1
MTH 1301	Elementary Mathematics I	3
STA 1311	Probability I	3
CSC 1201	Computer Programming	2
GSP 1201	Study Skills	4
CHM 1203	Organic Chemistry	2
CHM 1201	Inorganic Chemistry	2
Total Credits21		

Second Semester

Course Code	Title	Credits
PHY 1202	Behaviour of Matter	2
PHY 1104	Physics Practicals II	1
MTH 1302	Elementary Mathematics II	3
MTH 1304	Elementary Mathematics IV	3
CHM 1202	Physical Chemistry	2
CHM 1204	Practical Chemistry	2
GSP 1202	Introduction to Computer Science	2
Total Credits13		

LEVEL 200

First Semester

Course Code	Title	Credits
PHY 2101	Renewable Energy	1
PHY 2107	Physics Practicals	1
PHY 2303	Electric Circuits and Electronics	3
PHY 2305	Elementary Modern Physics	3
MTH 2301	Mathematical Methods	3
STA 2211	Probability II	2
CSC 2310	Computer Programming	3
GSP 2201	Foundation of Nigerian Culture	2
GSP 2203	Nigerian Government and Economy	2
GSP 2401	Study Skills (Direct Entry Students only)	4
Total Credits		**24**

Second Semester

Course Code	Title	Credits
PHY 2106	Electronics Practicals	1
PHY 2302	Waves and Optics	3
PHY 2304	Thermal Physics	3
MTH 2302	Elementary Differential Equations	3
STA 2212	Probability III	2
GSP 2202	Peace and Conflict Resolution	2
Total Credits		**14**

LEVEL 300

First Semester

Courses	Title	Credits
PHY 3301	Analytical Mechanics I	3
PHY 3303	Vectors and Tensors	3
PHY 3305	Solid State Physics	3
PHY 3207	Electronic Circuits	2
PHY 3109	Physics Practicals	1
MTH 3304	Complex Analysis	3
GSP 3201	Enterprenueal studies I	2
Total Credits		**17**

Second Semester

Course Code	Title	Credits
PHY 3302	Analytical Mechanics II	3
PHY 3304	Electricity and Magnetism	3
PHY 3306	Electromagnetic Waves	3
PHY 3308	Quantum Physics	3
PHY 3310	Statistical and Thermal Physics	3
PHY 3300	SIWES	3
PHY 3114	Electronics Practicals	1
PHY 3112	Energy and Environment	1
Total Credits		**20**

Elective Courses
First Semester

Course Code	Title	Credits
PHY 3211	Design Studies	2
PHY 3213	Introduction to Acoustics	2

Second Semester

Course Code	Title	Credits
PHY 3216	Introduction to Geophysics	2
PHY 3318	Semiconductor Devices	3

LEVEL 400
Core Courses
First Semester

Course Code	Title	Credits
PHY 4301	Quantum Mechanics I	3
PHY 4303	Mathematical Methods in Physics I	3
PHY 4305	Computational Physics	3
Total Credits		**9**

Second Semester

Course Code	Title	Credits
PHY 4302	Quantum Mechanics II	3
PHY 4304	Mathematical Methods in Physics II	3
PHY 4600	Supervised Independent Project	6
Total Credits		**12**

ELECTIVECOURSES
First Semester

Course Code	Title	Credits
PHY 4307	Plasmas	3
PHY 4309	Geophysics	3
PHY 4311	Nuclear and Particle Physics I	3
PHY 4313	Logic Circuits	3
PHY 4315	Modern Optics	3
PHY 4317	Advanced Analytical Mechanics	3
PHY 4319	Solid State Physics	3
PHY 4121	Electron Microscopy	1
PHY 4123	Logic Circuit Laboratory	1
PHY 4325	Atomic and Molecular Spectroscopy	3

Second Semester

Course Code	Title	Credits
PHY 4306	Ocean, Atmosphere, Ionosphere	3
PHY 4308	Nuclear and Particle Physics II	3
PHY 4310	Electronic Circuits	3
PHY 4312	Acoustics	3

PHY 4314	Surfaces and Interfaces	3
PHY 4316	Electromagnetism and Relativity	3
PHY 4318	Gases	3
PHY 4320	Liquids	3
PHY 4322	Astrophysics	3
PHY 4324	Solids	3
PHY 4326	Solid Earth	3
PHY 4328	Advanced Analytical Mechanics II	3

DESCRIPTION OF COURSE

PHY 1201 Mechanics 2 Credits

Space and Time, Frames of Reference, Units and Dimension, Kinematics; Fundamental Laws of Mechanics, Statics and dynamics; Galilean invariance; universal gravitation; work and energy; rotational dynamics and angular moment; Conservation Laws.

PHY 1203 Electricity and Magnetism 2 Credits

Electrostatics; conductors and currents; dielectrics; Magnetic fields and induction; Maxwellôs equations; electromagnetic oscillations and waves; Applications.

PHY 1202 Behaviour of Matter 2 Credits

Pre-requisite ï Credit in O/L Physics and Mathematics

Molecular treatment of properties of matter; elasticity; Hookeôs law; Youngôs shear and bulk moduli.Hydrodynamics; Streamlines, Bernoulli and continuity equations, turbulence, Reynoldôs number, Viscosity; laminar flow, Poiseulleôs equation. Surface tension; adhesion, cohesion, capillarity, drops and bubbles, Temperature; the zeroth law of thermodynamics; heat; gas laws; laws of thermodynamics; kinetic theory of gases. Applications.

PHY 1105/1104 PhysicsPracticals I/II 1 Credit/1 Credit

This introductory course emphasizes quantitative measurements; the treatment of measurement errors, graphical analysis. A variety of experimental techniques will be employed. The experiments include studies of matter, the oscilloscope, mechanical systems, electrical and mechanical resonant systems, light, heat, viscosity, etc, covered in the above Physics courses.

PHY 2305 Elementary Modern Physics 3 Credits

Special Relativity: Defects in Newtonian Mechanics; the speed of light; the Lorentz transformation; transformation of velocities. Experimental basis of quantum theory: Blackbody radiation; electrons and quanta; Bohrôs theory of atomic structure; De Broglie hypothesis; the uncertainty principle; Schrodingerôs equation and simple application.

PHY 2303 Electric Circuits and Electronics 3 Credits

D.C. Circuits; Kirchhoffôs Laws, sources and sinks of currents, network analysis and circuit theorems. A.C. Circuits; Inductance, capacitance, the transformer, sinusoidal waveforms, rms and peak values, power, impedance and admittance, series RLC circuit, Q-factor, resonance, network analysis and circuit theorem, filters. Electronics; Semiconductor, the unijunction, field effect transistors, bipolar transistor, Characteristics and equivalent circuits, amplifiers, feedback, oscillators.

PHY 2302 Waves and Optics 3 Credits

Wave phenomena; Acoustical waves; the harmonic oscillator; waves on a string, energy in wave motion; Longitudinal waves; standing waves, group and phase velocities; Doppler effect; Physical optics; Spherical waves; interference and diffraction, thin films; crystal diffraction, holography, dispersion and scattering. Geometrical optics; Waves and rays; reflection at a spherical surface, thin lenses, mirrors and prisms.

PHY 2304 Thermal Physics 3 Credits

The foundations of classical thermodynamics including the zeroth law and definition of temperature; the first law: work, heat and internal energy; Carnot cycles and the second law; entropy and irreversibility; thermodynamic potentials and the Maxwell relations. Application: Qualitative discussion of phase position: third law of thermodynamics; ideal and real gases. Elementary kinetic theory of gases including Boltzmann counting, Maxwell-Boltzmann Law of distribution of velocities, simple applications of the distributive law.

PHY 2101 Renewable Energy 1 Credit

Energy and power; Principles, demands and outlook; transformation of energy and its costs; thermal pollution; electrical energy from fossil fuels; hydroelectric generation: Principles and problems. Costs, capacity storage, reserves, efficiency, new environmental effects.Electrical energy from nuclear reactors; energy in the future breeder reactors; fusion power, geothermal power, solar power, tidal power, etc., promise and problems.Lectures (15) Excursion.

PHY 2107 Physics and Electronics Practicals 1 Credits

The laboratory course consists of a group of experiments drawn from diverse areas of Physics (Optics, Electromagnets, Mechanics, Modern Physics, etc.) It is accompanied by seminar studies of standard experimental techniques and the analyses of famous challenging experiments.

PHY 3216 Introduction to Geophysics 2 Credits

Meaning and significance of geophysics.Origin and geophysical significance of various geophysical methods.Gravity, magnetic.Electrical and radiometric

types of geophysical surveys and their importance.Introductory discussion to gravity, k magnets and seismic methods, their instrumentation and simple applications.

PHY 3301 Analytical Mechanics I 3 Credits

Newtonôs Mechanics; motion of a particle in one, two and three dimensions; systems of particles and collision theory; Newtonôs gravitation; conservative forces and potentials; oscillations; central force problems; accelerated frames of reference; rigid body dynamics; geberalized motion; mechanics of continuous media.

PHY 3304 Electricity and Magnetism 3 Credits

Electrostatics and magnetostatics. Laplaceôs equation and boundary value problems; Multipole expansions; dielectric and magnetic materials. Faraday;s law, A.C. Circuits. Maxwellôs equations.Lorentz covariance and special relativity.

PHY 3308 Quantum Physics 3 Credits

Wave ï particle duality and the uncertainty principle; basic principles of the quantum theory, energy level and potential barriers. Atomic and molecular structure and spectra.Nuclear structure and reactions, fission and fusion; magnetic resonance; elementary particles.

PHY 3114 Physics and Electronics Practicals 1 Credit

A year long series of mini-courses on important experimental techniques. Topics covered include electronics, optics, electricity, atomic, molecular, nuclear and low-temperature physics, statistics and data handling and scientific writing

PHY 3305 Solid State Physics I 3 Credits

Crystal structure and crystal binding.Elastic properties; lattice vibration.Superconductivity.

PHY 3318 Semiconductor Devices and Electronic Circuits 3 Credits

Effective mass; electrons and holes; intrinsic and extrinsic semiconductor doping methods; drift current and mobility; recombination; bulk effects: resistance, thermoelectricity, Hall effect, piezo-resistance, photoconductivity, the semiconductor plasma, the Gunndiode; P-N junctions; solar cells; particle detectors; emitting diodes; lasers; IMPATT diodes, junction transistors; thyristor, the JUGFET, interfaces; the MOSFET; charge-coupled devices; memories; Schottky-barrier gate FET; hetero-junctions; integrated circuits. Electronic circuits.

PHY 3300 Student Industrial Working Experience Scheme

This course is compulsory to all B.Sc. Physics students. It is designed to train students in the industrial application of chemistry. The course is undertaken by students at the end of their 300 Level for three months. The student is assessed as follows:

(a) Written report by the student	50%
(b) Supervisorôs assessment	15%
(c) Management assessment for the candidate	35%

PHY 4309 Geophysics **3 Credits**

Electrical Methods; Self [poptential; Electromagnetics, Induced Polarcyation.Resistivity Radiometrics. Well logging. Instrumentation and simple applications. Basic theories related to the various methods.

PHY 4301 Quantum Mechanics I **3 Credits**

The formulation of quantum mechanics in terms of state vectors and linear operators.Three dimensional spherically symmetric potentials.The theory of angular momentum and spin.Identical particles and the exclusion principle.Methods of approximation.Multi-electron atoms.

PHY 4302 Quantum Mechanics II **3 Credits**

Time ï independent and time ï dependent perturbation theory, elastic potential scattering.Greenôs function and partial wave methods. Selected phenomena from each of atomic physics, molecular physics, solid state physics, and nuclear physics are described and then interpreted using quantum mechanical models.

PHY 4303/4304 Mathematical Methods in Physics I/II **6 Credits**

Linear algebra and Functional analysis.Transformations in linear vector spaces and matrix theory.Hilbert space and complete sets of orthogonal functions.Special functions of Mathematical Physics.The gamma function, hypogeometric functions; Legendre functions; Bessel functions; hermite and Laguerre functions, the Delta function. Integral Transforms and Fourier Series: Fourier series and Fourier transforms; Laplace transform. Application of transform methods in the solution of elementary differential equations of interest in physics and engineering.Partial Differential equations.Solution of elementary differential equations.Solution of boundary value problems of partial differential equations by various methods which include Sturm-Liouville theory; Uniqueness of solutions.Calculus of residues and applications to evaluation of integrals and summation of series.Applications to

various physical situations which may include electrpmagnetic theory, quantum theory, diffusion phenomena.

PHY 4317 Advanced Analytical Mechanics II 3 Credits

Degree of freedom; generalized coordinates; Lagrangeôs formulation of mechanics; Applications.The calculus of variations and the action principle.Hamiltonôs formulation of mechanics.Applications.Invariance and conservation laws. Oscillatory systems, including damped, forced and coupled oscillations. Normal modes.

PHY 4305 Computational Physics 3 Credits

Use of numerical methods in physics; various methods of numerical integration, differentiation.Numerical solutions of some differential equations in physics.Statistical analysis of experimental data.

PHY 4311 Nuclear and Particle Physics I 3 Credits

Nuclear structure; Nuclear properties, nuclear size, nuclear masses; nuclear forces, nucleon-nucleon scattering; the deuteron.Nuclear models. Radioactive decay: alpha, beta, gamma decays. Nuclear reactions.

PHY 4316 Electromagnetism 3 Credits

Maxwellôs equations and electromagnetic potentials.The wave equation.Propagation of plane waves.Reflection and refraction. Transmission lines, waveguides and resonant cavities. Radiation; geometrical optics.Interference of waves.Diffraction.

PHY 4308 Nuclear and Particle Physics II 3 Credits

Nuclear Instrumentations and radiation detection techniques; detectors.Nuclear spectroscopy. Neutron physics: Production and detection of neutrons. Fission and fusion.Nuclear reactor and nuclear energy. Elementary particles: Conservation laws, particle classification. Strong, electromagnetic, and weak interactions.Resonances.

PHY 4319 Solid State Physics 3 Credits

Dielectric properties. Magnetism: paramagnetism and diamagnetics; ferromagnetism and antiferromagnetism; magnetic resonance. Imperfections in solids

PHY 4325 Atomic and Molecular Spectroscopy 3 Credits

The hydrogen atom; relativistic effects and spin.Identical particles and symmetry.Many electron atoms.Coupling schemes and vector model. Zeeman effect. Hyperfine structure.The diatomic molecule; the Frank-Condon principle.X-ray diffraction.Microwave methods.Resonance phenomena.ESR, NMR and optical pumping and Mossauer scattering.

PHY 4307 Plasmas **3 Credits**

From gas to plasma; electron oscillation; MHD equations; the pinch and its stabilization. Magnetic mirror; methods of heating a plasma; propagation of waves in plasmas; diffusion and conduction; plasmas in space, in fusion devices, in metals and in semiconductors.

PHY 4318 Gases **3 Credits**

Molecular dimensions; mean free path; types of gas molecules; active and inactive; enthalpy of association; the free energy of active gases; monatomic and polyatomic molecules; rotation and vibration; specific heats; the intermolecular potential of inactive gas molecules; cross section; critical temperature and latent heat of condensation; the Boltzmann distribution and its assumptions; the Maxwell velocity and speed distribution. The equipartition theorem, its approximate application to gases and its rigorous application; experimental difference between the two.Mixing in a flow of heat, temperature difference induced by concentration gradient.Doppler width observations; diffusion, viscosity, thermal conductivity; effusion. Knudsen gases, van der Waals and formulations of kinetic theory, fluctuations in density and the scattering of light.

PHY 4320 Liquids **3 Credits**

Liquids as dense gases and as disordered solids; tensile strength of a liquid; cohesion and surface tension; shear strength, Newtonian and Bingham liquids; liquid polymers; superheating estimated from van der Waals equation; pour pressure of a liquid; diffusion, viscosity and Einstein short range order; the miscibility of liquids; solution of gases and solids in a liquid; ionic solutions and the flow of electricity; crystallization and melting; the glassy state; polymers; liquid crystals; soaps and lipids; suspensions and colloidal solutions; structure of water.

PHY 4324 Solids **3 Credits**

Structure of amorphous condition for monocrysallinity; natural and man-made amorphous solids; silicon and selenium and their uses; metastability in amorphous solids; the growth of crystals; crystalline order and line defects; point defects and melting; ductile and brittle solids; mechanisms of deformation; crystallography;; unit cell, lattice planes and rows; x-ray and

electron diffraction; reciprocal lattice; the Nye bubble rafts, ionic, molecular, covalent and metallic bonding, examples; mixed bonding in graphite; one and two dimensional anisotropy relation between crystal structure and useful properties; melting point, hardness, optical and electrical properties; lattice vibrations and heat capacity, classical and quantum one and three dimensions; thermal expansion and conductivity of insulators; second sound mobile electrons in semiconductors; acceptors; Hall effect and cyclotron resonance; metals; the free electron model; heat capacity and conductivity; periodic potential and effective mass; Brillouin zones and Fermi surfaces; plasma oscillations; para-ida, ferra and antiferomagnetism; magnetic order; superconductivity; the Josephson junction and quantum interferometers; dielectric properties; ferroelectrics; optical properties and free carriers.

PHY 4314 Surfaces and Interfaces 3 Credits

Twin boundary; stacking fault; tilt and twist boundaries; coherent and incoherent boundaries; precipitates, bubbles and voids; cracks; epitaxy; surface morphology and growth; the quartz crystal and the snowflake; surface enthalpy and entropy as distributed parameters; electric fields at surfaces; the field ion microscope; work function; contact potential; point and line defects in surfaces; adhesion and surface mobility; contamination in laboratory and interplanetary values; experimental techniques; scanning electron low energy diffraction, RHEED, energy dispersive x-ray analysis, photoelectron spectroscopy; surface modification; ion beam etching; doping of metals and semiconductors as an industrial process; cleavage under vacuum; controlled growth of heterogeneous thin films.

PHY 4326 Solid Earth 3 Credits

Shape, mass and moment of inertia; origin and explosion composition; the continental crust; earthquake and explosion seismology; structure and origin of the crust; gravitational anomalies; continental drift, oceanic crustal structure; sea floor spreading and ridges, magnetic anomalies, plate tectonics; seismology of the mantle and core; temperature and composition of the mantle; structure, composition and temperature of the core, origin and secular variation of the geomagnetic fields; internal sources of heat; heat flow through lithosphere and crust; geology of crust and mantle.

PHY 4306 Oceans, Atmosphere and Ionosphere 3 Credits

Density currents and diffusion processes in the sea, the coriolis force; eddy conductivity and viscosity; the oceanic thermocline and nutrient circulation; wind driven currents in deep water and in the atmosphere; variation of velocity and direction with altitude; the Ekman spiral; scale heights and energy transport; water movements in bounded seas and estuaries; effect of ice formation on currents; waves in deep and shallow water; tides; optical

transmission and photosynthesis; acoustic transmission in the ocean; the atmosphere as a gas mixture in a gravitational field; hydrostatic equilibrium; dadiative equilibrium and lapse ratter; escape of atmospheric gases; photochemistry of the upper atmosphere; oxygen and carbon in the dynamics of the atmosphere and biosphere; C-14 dating; microclimate; electric sources; global and local atmospheric circulation; the ionospheric layer and the Chapman model; the plasma frequency; collision and absorption; structure of the ionosphere and plasmasphere; regular and irregular variations.

PHY 4322 Astrophysics 3 Credits

Olbers paradox; gravitational red shift; the Pound-Rebka experiment; the Schwarschild radius, and examples; the virialtheorm; its application to galaxy formation, the limits to its application; centre temperature of sun; the states of stellar matter; energy sources and the virial theorem; equations of hydrostatic support; gas and radiation pressure; energy transport and opacity; transparency to neutrinos; nuclear energy; the p-p chain and the CNO cycle; the p-p one chain as a weak interaction of small cross section; solar neutrinos and current hypotheses; oxygen and silicon; burning: photo-disintegration and dynamic equilibrium; electron absorption as a catastrophic process; age of solar system and uranium isotope half-lives; electron and neutron degeneracy pressure; white dwarfs; neutron stars and black holes; the Herzsprubg-Russel diagram; stellar populations and star types; variable stars and distance measurement; other methods of distance synoptic; view of radio and x-ray Astronomy; galactic systems; the solar planetary system; the solar cemetery system.

PHY 4313 Logic Circuits 3 Credits

Dichotomous systems switches; sets of points and propositions; related algebra and logic; logic gates; electronic gates; truth tables and com3binations of gates; adders; sequential logic and flip-flops; registers; binary counting; BCD counters; decoders and displays, the Schmidt trigger; time delays; multiplexing; CMOs and MTL and emitter completed logic; programmable array logic; microcomputer circuits.

PHY 4123 Logic Circuit Laboratory 1 Credit

A series of lecture material of course PHY 4308

PHY 4315 Modern Optics 3 Credits

Thick lenses formula and applications; multi element lens types; telephoto and zoom lenses; analytic ray tracing; aberrations; the Mathiessen (gradient of refractive index) lens in fishes; multielement lenses in crustaceans; biological mirrors and mirror eyes opposition and superposition eye; fibre optic and communication; Fourier transform spectroscopy, imaging and optical processing; media Brillouin scattering; phase conjugate reflection; aperture

synthesis; intensity interferometry; lasers, Cerenkov and synchrotron radiation.

PHY 4121 Electron Microscopy 1 Credit

The magnetic lens; the transmission microscope; scanning reflection and scanning transmission; the brightness theorem and its applications to electron sources; phase and absorption contrast; kinematic diffraction theory; preparation of conducting, non-conducting and biological specimens; specimen contamination; methods of image recording; x-ray chemical analysis; electron damage to specimen materials; applications of electron microscopy.

PHY 4328 Advanced Analytical Mechanics II 3 Credits

Generalized coordinates; the principle of least action; the Lagrangians for a free particle and a system of particles; Greenôs function; conservation n laws; mechanical similarity; the reduced mass; motion in a central force field; Keplerôs problem; rockets; the earth ï moon system; elastic and inelastic binary collisions; scattering; time reversal in two body mechanics; small oscillations; vibraton of molecules; parametric resonance; non-linear oscillations; equatons of moton of a rigid body; the inertia tensor; Eulerôs equation; the asymmetric top; non-inertial frames; the coriolis force and geophysical applications; Larmor effect; Hamiltonôs equations; Poisson brackets; canonical transformations; Liouvilleôs theorem; Hamilton-Jacobi equation; separation of variables.

PHY 4312 Acoustics 3 Credits

Objective and subjective assessment of sound levels; loudness, spectrum, measurement of levels. Radiation of sound: sound fields, loudspeakers, ultrasonic generators. Applications of ultrasonics, particularly the measurement of the elastic and inelastic properties of matter. Microphones: Construction, characteristics, calibration. Absorption of sound: measurement of acoustic impedance. Acoustics of rooms: acoustic design, measurement of reverberation time.

SOME FREQUENTLY USED TERMINOLOGIES

Registered Credit Units (RCU):- This is the aggregation of the credit units of various courses registered by the student during the entire semester.

Earned Credit Units (ECU):- This is the aggregation of all the courses passed by a student during the semester examination.

Total Registered Credit Units (TRCU):- This is the aggregation of all the courses registered by a student from the first year of the study to the particular semester under consideration.

Total Earned Credit Units (TECU):- This the aggregation of the credit units of all the courses passed by a student from the first year to the particular semester under consideration.

Grade Point (GP):- This is the point system replacing the F to A classification. The table below shows the classification:-

Mark Range (%)	Letter Grade	Grade Point
0-44	F	0
45-49	D	2
50-59	C	3
60-69	B	4
70-100	A	5

Weighted Grade Point (WGP):- This is the product of the Grade Point and the number of Credit Units carried by the courses. Thus:

WGP= GP multiply by Nunmber. of Credit Units

Grade Point Average (GPA)

GPA= Total Points Scored/Total Credit Units Registered

= Total WGP/Total Credits units Registered

Cumulative Grade Point Average (CGPA)

CGPA= Total Point so far Scored/Total Credit Unit

Similarly, the calculation goes the same way:

RCU (First Semester) = 25

ECU (First Semester) = 25

RCU (Second Semester) = 20

ECU (Second Semester) = 20

TRCU = 25+20 = 45

TECU = 25+20 = 45

A student is said to be in good academic standing if the person CGPA is 1.00 or above.

EXAMINATION AND RESULTS

- Å Examination shall consist of CA (40%) and semester examination (60%)
- Å However, student must have 75% attendance lectures.

PROBATION AND WITHDRAWAL

Probation: A student shall be in probation if his/her CGPA is below 1.00 for two consecutive semesters.

Withdrawal:- A student shall be withdrawn if he/she remains in probation for two consecutive semesters.

Meanwhile, Withdrawal can also be on the grounds of absence. That is when student refuses to register two consecutive semesters.

CALCULATION OF GPA AND CGPA

Let assume that, a 100 level student of Public Administration had the following scores in the first semester examination as shown in the table below;

Course	Credit Unit	Score (%)	Letter Grade	GP	WGP
PHY1301	3	60	B	4	12
PHY 1305	3	70	A	5	15
MTH 1301	3	65	B	4	12
CHM 1301	3	50	C	3	9
PHY1203	3	59	C	3	9
PHY 1301	2	60	B	4	8
GSP 1203	2	73	A	5	10
CHM 1205	2	80	A	5	10
GSP 1207	2	91	A	5	10
CSC 1201	2	54	C	3	6
	25				101

GPA= = 4.04

Assuming that, the same student registered 20 credit units in the second semester and earned 20 credit units with WGP total of 90, then

GPA (Second Semester) = = 4.5

CGPA = 4.24 (to 2 decimal places)

GRADUATION REQUIREMENTS

For the purpose of graduation, in addition to passing all prescribed core courses for the degree programme, 20% of the total credit units earned by a student must come from elective courses. Restricted elective shall constitute about 15% and unrestricted about 5%.

(Core course ï 80%)

(Cognate/Restricted ï 15%)

(Unrestricted ï 5%)

To graduate a student admitted to 100 level or transferred into 200 level must earn a minimum of 120 credit for four years programme and 150 credits for a five years programme before graduation.

A student admitted into 200 level (DE) or transferred into 300 level must earn a minimum of 90 credit for four years programme before graduation.

Student transferred from one faculty to another shall be credited with all the courses taken at 100 level and any relevant courses taken at higher levels. These shall form part of the credits earned towards graduation.

CREDIT REQUIREMENTS FOR GRADUATION

UME

Å 4 Year Degree Programme

Å 4x30 or 120 Credit Units

DE

Å 3 Year Degree Programme

Å 3x30 or 90 Credit Units

DURATION OF ACADEMIC PROGRAMME

Å Normal Duration

Å Spill Over

Å Over Stayed

Normal duration + normal duration

Classification of Degrees

Classification of degrees is based on the Cumulative Grade Point Average (CGPA) at the point of graduation. The system shown in the table below is adopted.

CGPA	CLASS OF DEGREE
4.50 ï 5.00	First Class
3.50 ï 4.49	Second Class Upper
2.40 ï 3.49	Second Class Lower
1.50 ï 2.39	Third Class
1.00 ï 1.49	
Below 1.00 ï 1.49	Fail

EXAMINATION ADMINISTRATION

- A student shall be at the examination hall at least ten minutes before advertised time of the examination. Each student is also required to supply his/her own pen, pencils, rulers etc.
- A student may be admitted up to forty five minutes after the start of the examination but he shall not be allowed extra time.
- If a student arrives later than forty five minutes after the start of the examination, an invigilator may at his/her discretion admit him if he is satisfied that the student had good reason for his/her lateness. The invigilator shall report the circumstances to the faculty examination officer who shall advise the board of examiners, which shall decide whether to accept the studentôs paper.
- A student may be permitted by an invigilator to leave the examination room during the course of an examination provided that:-
- No student shall normally be allowed to leave during the first hour or last fifteen minutes of examinations.
- A student must handover his/her script to the invigilator before leaving if he does not intend to return.
- A student who leaves the examination room shall not be re-admitted unless throughout the period of his/her absence he has been continually under the supervision of an invigilator or assistant invigilator.
- A student shall bring his/her examination card and identity card to each examination and display them in prominent position on his/her desk.
- Each student shall complete an attendance form with his/her number, name and signature, which shall be collected by the invigilator of each examination.
- During an examination, no student shall speak to any other student, or accept as essential, to the invigilator, or make any noise or disturbance.
- No book, printed paper, or written document or unauthorized aid may be taken in to the examination room by any student, except as may be stated in the rubrics of any examination paper.

A student is required to deposit any hand bags, briefcase etc. at the invigilatorôs desk or desk provided for the purpose the start of an examination.

- a student must not doing an examination directly or indirectly give assistance to any other student or permit any other student to copy from or otherwise use his/her papers. Similarly, a student must not directly accept assistance from any other student or use any other studentôs paper.

- If any student is suspected or found to be infringing any of the provisions or paragraph and or in any way cheating or disturbing the conduct of the examination, a report shall be made as soon as possible to the faculty board examinations officer and the dean. The dean will cause the circumstance to be

investigated and reported to the board of examiners, and take each steps as may be necessary for the smooth conduct of examinations. The student concerned shall be allowed to continue with the examination provided he caused no disturbance but the board of examiners may subsequently recommend to the faculty board and the senate whether his/her paper should be accepted and as to any action that should be taken in the case.

- A student shall write his/her examination number, not his/her name, directly at the top of the cover of every answer booklet or separate sheet of paper.

- The use of scrap paper is not permitted. All rough work must be done in answer booklet and crossed neatly, or in supplementary answer books which must be submitted to the invigilator. Except for the printed quest paper, a student may not remove from the examination hall/room or mutilate any paper or other material supplied.

- At the end of the time allowed, each student shall stop writing when instructed to do so and shall gather his/her script together in order for collection by the invigilator.

CATEGORIES OF PUNISHMENT FOR EXAMINATION MALPRACTICE

The following offences shall carry the punishment of expulsion:

1. Impersonation at examination. This may involve the exchange of examination numbers or names on answer sheets or the intentional use of someoneôs examination number.

2. Introduction of relevant foreign materials and cheat notes into the examination hall.

3. Exchange of relevant materials in examination hall which may involve

(a) The exchange of question paper containing relevant looting materials or

(b) Collaborating/Copying from each other or

(c) Exchange of answer script.

4. Theft/removal of examination script or materials.

5. Mischief by fire to examination script or materials.

6. Copying from cheat notes.

7. Consulting cheat notes outside the examination hall.

8. facilitating/abetting cheating.

RUSTICATION FOR ONE ACADEMIC YEAR

The following offences shall carry the punishment of rustication for one session.

- Non-submission or incomplete submission of answer script.
- Introduction of foreign materials to the examination hall.
- Non-appearance at the senate examination irregularities and malpractice committee (ERIC).

After first warning, the student should be restricted for one year.

WRITTEN WARNING

The following offence shall attract a written warning:

Speaking/conversation during examinations.

Writing on question papers/Scripts.

DRESS CODE

All Students should note that the authorities of all tertiary institutions in the country have been directly by government to check the prevalence of indecent dressing, which is identified as one of the problems afflicting the nation tertiary institutions. Just as the war on cultism, the government in the same vein directed for an all- out war against the menace of indecent dressing. In view of that, all students are strongly advised to achieve to the following dress code.

Bauchi state university has determined that students and staff should be dressed decently, this avoiding:

- Short and skimpy dresses e.g body hugs, show me your- chest, spaghetti wears and dresses exposing sensitive parts.
- Tight shorts and skirts that are above the knees/except for sporting purposes and medical grounds.
- Tattered jeans and jeans with holes.
- Transparent and see through dresses.
- Tight fittings e.g Jeans, hip star, patra, lactra etc. that reveal the contour of the body.
- Under clothing such as singlet worn publicity.
- Unkempt appearance such as bushy hair and beards.

- Dressing that make it impossible to wear laboratory coats diving practical of participate in practical and other academic activities.
- Long but tight skirts which are slit in front or at the sides, which reveals sensitive parts as the wearer moves on.
- Wearing t-shirts with obscene captions
- Shirts without buttons or not properly buttoned, leaving the wearer base chested
- Wearing of earrings by male students
- Painting and weaving of hair by male students
- Wearing of colour eye glasses in the lecture theatres (except on medical grounds).
- Wearing of bathroom slippers to classrooms (except on the medical ground).

Wearing trousers that stop between knees and ankle (three- quarter). Infringement of the dress code will however, attract the following sanctions:

A – STUDENTS

1st Offender: To appear before unit dress code implementation committee for counseling

2nd Offender: To be sent out of lecture theater, library, office laboratory, studio, workshop, clinic e.t.c

3rd Offender: to appear before advisory committee on studentsô discipline

B – STAFF

1st Offender: counseling

2nd Offender: warning

3rd Offender: To appear before the staff disciplinary committee.

MISCONDUCT

Any action that is contrary to university regulations is an act of misconduct. These regulations cover every aspect of life on campus. These include:

OFFENSE	PENALTY
False claims and forgery	Expulsion
Appearing before university committees to give false evidence that	Rustication for the semester if approved against him/her

misled the university authority	
Rape	Expulsion
Embezzlement	Refund, warning to expulsion
Drug abuse and the use of prohibited substance	Expulsion and handling over to appropriate security agency
Possession of and drink of alcohol on campus, misappropriate and unauthorized use of university premises/buildings and other properties	Warning to expulsion replacement
Belonging to or participating in the activities of unregistrated association, including secret cults	Expulsion and handling students to appropriate security agency
Possession of fire arms and/or any dangerous weapons	Expulsion and handling students to appropriate security agency
Organizing and/or taking part in unlawful demonstration	Expulsion
Harboring and accommodating person	Expulsion from hall
Male entry into female hostel at anytime	Warning to expulsion
Female -nto male rooms after 10.00pm	Warning to expulsion
Persistent rowdy and/or anti-social behavior	Warning to expulsion
Unauthorized transfer of bed spaces	Expulsion from hall
Illegal rallies and assembly	Expulsion
Disturbances such as inter and intra clubs and scouts conflict	Warning to expulsion
Religious fanaticism and intolerance processing and/or distribution of illegal handbills, and provocative materials	Warning, rustication to expulsion
Fighting fellow students	Rustication to expulsion
Fighting staff in pursuit of his or her legitimate duties, willful damage to university property	Replacement of damaged property at current value in cash or kind, or warning to expulsion, or denial of facility at the point of damage
Stealing	Expulsion
Physical assault and/or causing bodily hurt on any other person whether a student or not and banning from being accommodated on campus in future	Warning to expulsion
Failure to return/release university property	Withholding of results
Violation of the universityôs dress code	Refusing of entry into classes, offices, library etc.
Any action likely to bring the university or its officers and/or student to disrepute	Expulsion