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ಸಂ. ಗುವಿಗು/ವಿಮವಿ/ಬಿಓಎಸ್/2014–15/ 505 ದಿನಾಂಕ: 25-4-14

ಅಧಿಸೂಚನೆ

ವಿಷಯ: ಭೌತಶಾಸ್ತ್ರ ಸ್ನಾತಕ I ರಿಂದ VI ನೇ ಸೆಮೆಸ್ಟರನ ಪಠ್ಯಕ್ರಮ ಪರಿಷ್ಕರಿಸಿ ಜಾರಿಗೊಳಿಸಿದ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: 1) ಸ್ನಾತಕ ಅಧ್ಯಯನ ಮಂಡಳಿಯ ಸಭೆಯ ನಿರ್ಣಯ 1 ದಿನಾಂಕ: 29.11.2013.
2) ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 08 ದಿನಾಂಕ: 29.01.2014.
3) ಕುಲಪತಿಗಳ ಅನುಮೋದನೆ ದಿನಾಂಕ: 09.04.2014.

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ದಿನಾಂಕ: 29.01.2014 ರಂದು ಜರುಗಿದ ವಿದ್ಯಾವಿಷಯಕ ಪರಿಷತ್ ಸಭೆಯ ಗೊತ್ತುವಳಿ ಸಂಖ್ಯೆ 08 ನ್ನು ಅನುಷ್ಠಾನಗೊಳಿಸುತ್ತ, ಭೌತಶಾಸ್ತ್ರ ಸ್ನಾತಕ I ರಿಂದ VI ನೇ ಸೆಮೆಸ್ಟರನ ಪಠ್ಯಕ್ರಮ ಪರಿಷ್ಕರಿಸಿ 2014–15 ನೇ ಸಾಲಿನಿಂದ ಅನ್ವಯವಾಗುವಂತೆ ಜಾರಿಗೊಳಿಸಲಾಗಿದೆ.

ಮೇಲಿನ ವಿಷಯವನ್ನು ಸಂಬಂಧಪಟ್ಟ ಶಿಕ್ಷಕರ ಹಾಗೂ ವಿದ್ಯಾರ್ಥಿಗಳ ಗಮನಕ್ಕೆ ತರಲು ಸೂಚಿಸಲಾಗಿದೆ. ಪಠ್ಯಕ್ರಮದ ವಿವರಣೆಯನ್ನು ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್‌ಸೈಟ್ www.gulbargauniversity.ac.in ದಿಂದ ಪಡೆಯಬಹುದು.

ಕುಲಸಚಿವರು 25/4/14
ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗುಲಬರ್ಗಾ

ಗೆ,
ಮುಖ್ಯಸ್ಥರು, ಭೌತಶಾಸ್ತ್ರ ಅಧ್ಯಯನ ವಿಭಾಗ, ಗು.ವಿ.ಗುಲಬರ್ಗಾ.

ಪ್ರತಿ:

1) ಡೀನರು, ವಿಜ್ಞಾನ ನಿಕಾಯ, ಗು.ವಿ.ಗುಲಬರ್ಗಾ ರವರ ಮಾಹಿತಿಗಾಗಿ.
2) ಕುಲಸಚಿವರು (ಮೌಲ್ಯಮಾಪನ), ಗುಲಬರ್ಗಾ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಗುಲಬರ್ಗಾ ರವರ ಮಾಹಿತಿಗಾಗಿ.
3) ಸಂಲಗ್ನತೆ ಹೊಂದಿರುವ ಎಲ್ಲಾ ವಿಜ್ಞಾನ ಕಾಲೇಜಿನ ಪ್ರಾಂಶುಪಾಲರಿಗೆ ಮಾಹಿತಿಗಾಗಿ.
4) ಮುಖ್ಯಸ್ಥರು, ವಿಶ್ವವಿದ್ಯಾಲಯ ಗಣಕ ಕೇಂದ್ರ, ಗು.ವಿ.ಗುಲಬರ್ಗಾ ಇವರಿಗೆ ಪಠ್ಯಕ್ರಮದ ಪ್ರತಿಯನ್ನು ಲಗತ್ತಿಸಿ ಕಳುಹಿಸಲಾಗುತ್ತಿದ್ದು, ವಿಶ್ವವಿದ್ಯಾಲಯದ ವೆಬ್ ಸೈಟ್ ನಲ್ಲಿ ಪ್ರಕಟಿಸಲು ತಿಳಿಸಲಾಗಿದೆ.
5) ಕುಲಪತಿಗಳ ಆಪ್ತ ಕಾರ್ಯದರ್ಶಿ / ಕುಲಸಚಿವರ ಆಪ್ತ ಸಹಾಯಕರ ಮಾಹಿತಿಗಾಗಿ.

GULBARGA UNIVERSITY GULBARGA

B.Sc (PHYSICS) REVISED SYLLABUS
(SEMESTER SCHEME)

BOS Resolution No.1, dated 29/11/2013

EFFECTIVE FROM THE ACADEMIC YEAR 2014-15

GULBARGA UNIVERSITY, GULBARGA
B.Sc (PHYSICS) SYLLABUS

Undergraduate Physics syllabus of Gulbarga University is revised based on the semester scheme and regulations of the University. Structure of the syllabus is detailed below.

A. SEMESTERWISE TEACHING HOURS PER WEEK

No.	Semester	No. papers	Theory	Practicals
1	I	01	04 hrs	06 hrs
2	II	01	04 hrs	06 hrs
3	III	01	04 hrs	06 hrs
4	IV	01	04 hrs	06 hrs
5	V	02	06 hrs (3 hrs/paper)	06 hrs
6	VI	02	06 hrs (3 hrs/paper)	06 hrs

B. TOTAL NUMBER OF TEACHING HOURS PER SEMESTER

No.	Semester	No. papers	Theory	Practicals
1	I	01	64 hrs	96 hrs
2	II	01	64 hrs	96 hrs
3	III	01	64 hrs	96 hrs
4	IV	01	64 hrs	96 hrs
5	V	02	96 hrs (48 hrs/paper)	96 hrs
6	VI	02	96 hrs (48 hrs/paper)	96 hrs

C. INSTRUCTIONS TO TEACHERS

1 Lectures must be delivered on all the topics in the syllabus. Use only SI units.

2 The allotted hours for each chapter are only the instructional hours. If required, extra classes may be engaged.

3 Complete teaching notes should not be dictated in the class. Notes in the form of highlights may be distributed.

4 A good number of problems must be solved on all possible topics in the syllabus so that students can appreciate the concepts, laws, phenomenon, ideas and theories and get acquainted with physical quantities and their units.

5 Home work in the form of assignments/problems must be given to the students.

6 Class seminars by the students be conducted. Participation of students in the theme based conferences, Science exhibitions etc., be encouraged.

D. LABORATORY INSTRUCTIONS TO STUDENTS

1 Measurements and results must be written in SI system only.

2 Required number of experiments in each semester must be performed in order to be eligible for taking semester end examination.

3 After completing all the experiments in the given semester and writing up the Journals, students

have to get certify their Journals by the Head of the Department. The same must be produced in the examination for assessment.

E. Scheme of Practical examinations.

Division of marks in practical IA and Practical semester end examinations is detailed below.

Internal Practical Test			Semester End Practical Examination		
No.	Item	Max.marks	No.	Item	Max.marks
1	Journal	02	1	Journal	08
2	Circuit diagram / ray diagram / observations	02	2	Circuit diagram / ray diagram / observations	08
3	Observations/Tabular column	02	3	Observations/Tabular column	08
4	Experimental skill & procedure	02	4	Experimental skill & procedure	08
5	Graph/calculation/result	02	5	Graph/calculation/result	08
Total		10	Total		40

GULBARGA UNIVERSITY, GULBARGA

B.Sc Physics (Semester Scheme): Effective from 2014-2015

Teaching and Evaluation Scheme

Sem	Title of the Paper	Teaching hrs/week	Semester End Examination		Internal Assessment		Total Max. marks
			Duration	Max. marks	Duration	Max. marks	
I	**Paper 1**: Mechanics and properties of matter	4	3 hrs	80	1 hr	20	100
	Practical 1	6	3 hrs	40	3 hrs	10	50
II	**Paper 2**: Thermodynamics, Waves and Oscillations, Electrical measurements and circuits and, Theory of Relativity	4	3 hrs	80	1 hr	20	100
	Practical 2	6	3 hrs	40	3 hrs	10	50
III	**Paper 3**: Mathematical Physics, Electromagnetism, Energy sources and Biophysics	4	3 hrs	80	1 hr	20	100
	Practical 3	6	3hrs	40	3 hrs	10	50
IV	**Paper 4**: Physical Optics, Lasers and Fibre Optics and, Computational Physics	4	3 hrs	80	1 hr	20	100
	Practical 4	6	3 hrs	40	3 hrs	10	50
V	**Paper 5.1**: Atomic and Molecular Physics	4	3 hrs	80	1 hr	20	100
	Practical 5.1	3	3 hrs	40	3 hrs	10	50
	Paper 5.2: Quantum mechanics, Statistical mechanics and Materials Physics	4	3 hrs	80	1 hr	20	100
	Practical 5.2	3	3 hrs	40	3 hrs	10	50
VI	**Paper 6.1**: Nuclear Physics and Solid State Physics	4	3 hrs	80	1 hr	20	100
	Practical 6.1	3	3 hrs	40	3 hrs	10	50
	Paper 6.2: Electronics, Astrophysics, Plasma Physics & Diagnostic Physics	4	3 hrs	80	1 hr	20	100
	Practical 6.2	3	3 hrs	40	3 hrs	10	50

QUESTION PAPER PATTERN FOR IA TESTS AND SEMESTER END EXAMINATIONS

1. **INTERNAL ASSESSMENT TEST**

a) **Internal Assessment Test 1 for theory courses**

There shall be three questions of ten marks each. Students will have to answer two questions.

Questions must be drawn from the first half of the syllabus of the paper giving due weight-age to each of the chapters based on the instructional hours allotted to it.

Duration of the test is one hour. Maximum marks 20.

b) **Internal Assessment Test 2 for theory courses**

There shall be three questions of ten marks each. Students will have to answer any two questions.

Questions must be drawn from the second half of the syllabus of the paper giving due weight-age to each of the chapters based on the instructional hours allotted to it.

Duration of the test is one hour. Maximum marks 20.

NB: Average of the marks secured in two internal assessment tests will be taken as the final awarded marks in the internal assessment test of the respective theory paper.

c) **Practical Internal Assessment Test**

There shall be one Internal Assessment test in each of the practical courses. In the practical test, the students may be asked to perform the experiment or analyze the given experimental data.

Duration of the practical test is 3 hours. Maximum marks 10

2. a) **SEMESTER END EXAMINATIONS**

Question paper Pattern for theory courses

There shall be three sections, A, B and C in the question paper.

In section A, there shall be 15 questions of 1 mark each. Students will answer all the questions.
In section B, there shall be 7 questions of 5 marks each. Students will answer five questions.
In section C, there shall be 6 questions of 10 marks. Students will answer four questions.

Questions must be drawn from the total syllabus of the paper giving due weight-age to each of the chapters based on the instructional hours allotted to it.

Examination will be conducted for 3 hours for maximum of 80 marks.

b) **Question paper pattern for practical courses**

In the semester end practical examination, there shall be one experiment assigned (picked by the student from the list of the experiments put for the examination) to each of the students. It will be examined for 40 marks. Distribution of marks for various components in the practical examination is mentioned under scheme of examination.

GULBARGA UNIVERSITY, GULBARGA

B.Sc (Semester I) Physics Syllabus

Paper 1: Mechanics and properties of matter

1. Frames of reference — 10 hrs

Inertial frame, Galilean transformation equations, Invariance of physical laws under Galilean transformation, Non inertial frames, Concept of fictitious force and coriolis force, Rotating frame of reference and expression for coriolis force, Concept of centre of mass as frame of reference.

2. Angular motion — 8 hrs

Motion along circular path: centrifugal, centripetal force and their characteristics (qualitative). Motion along the curved path (parabolic). Derivation of radial & transverse component of velocity and acceleration.

3. Conservation laws — 20 hrs

Conservation of linear and angular momentum

Law of conservation of linear momentum for a system of particles, Collision between two particles, elastic and inelastic collisions (one dimension) in a Laboratory and centre of mass frames, Scattering angle in Laboratory and centre of mass frames, Conservation of momentum in case of variable mass examples single stage Rocket, expression for escape velocity (neglecting weight), Multistage Rocket (qualitative). Problems.

Definition of angular momentum, Angular velocity and Torque, Conservation of angular momentum, central force, Statements of Kepler's three laws of planetary motion and derivation of second law. Problems.

Conservation of Energy

Basic principle of Conservation of energy including mass-energy (qualitative). Illustration with derivations for SHM, oscillations of light spiral spring. Escape velocity of satellite, nuclear fission, nuclear fusion and pair production with examples.

4. Surface tension — 8 hrs

Definition of surface tension. Surface energy, relation between surface tension and surface energy, pressure difference across curved surface example, excess pressure inside spherical liquid drop, angle of contact, capillarity determination of surface tension by drop weight method, factors affecting surface tension. Problems.

5. Viscosity — 8 hrs

Streamline flow, turbulent flow, equation of continuity, determination of coefficient of viscosity by Poisulle's method, Stoke's method and variation of viscosity with temperature. Problems.

6. Elasticity — 10 hrs

Moduli of elasticity for isotropic material, relation between elastic constants, bending of

beam. Derive an expression for bending moment, theory of cantilever, Hook's Law, I section girders, torsion, expression for couple per unit twist, Torsional pendulum. Problems.

Reference books

1. Mechanics by D. S. Mathur.
2. Elements of properties of matter by D.S.Mathur.
3. Mechanic by J. C. Upadhya.
4. Properties of Matter by Brijlal & Subramanyam.
5. Modern Physics by S.L.Kakani and Shubhra Kakani.
6. Physics vol-I Resnick & Halliday.
7. Berkely Physics Volume I.
8. A Text Book of Mechanics By Bhargava & Sharma

Laboratory course for B.Sc (Semester I) Physics

Paper : Practical I

Instructions

1. Two lab sessions (3 hours duration each) per week are to be conducted.
2. Minimum of 16 experiments and 8 assignments from the list mentioned below should be performed in the semester I.
3. Students must be instructed to write results with correct physical units in SI system.
4. A certified record book consisting of practical work must be produced in the practical examination.

Experiments

1. Bar pendulum (L versus T graph)
2. Bar pendulum (L versus LT^2 graph)
3. Flat spiral spring
4. Moment of Inertia of Fly Wheel
5. Moment of Inertia of irregular body
6. Rigidity of molecules – Torsional pendulum
7. Verification of parallel axis theorem
8. Verification of perpendicular axis theorem
9. Young's modulus by uniform long bending – Load versus Depression graph
10. Young's modulus by cantilever – Load versus Depression graph
11. Young's modulus by Koeing's method
12. Young's modulus by stretching (Searl's apparatus).
13. Viscosity by Stoke's method
14. Radius of capillary tube by mercury pellet method
15. Modulus of rigidity (twisting)
16. Hook's law verification
17. Surface tension by drop weight method
18. Interfacial tension
19. Critical pressure for stream line flow
20. Elastic constants by Searle's double bar
21. Assignment I
22. Assignment II
23. Assignment III
24. Assignment IV
25. Assignment V

26 Assignment VI
27 Assignment VII
28 Assignment VIII
29 Assignment IX
30 Assignment X

GULBARGA UNIVERSITY, GULBARGA

B.Sc (Semester II) Physics Syllabus

Paper 2: Thermodynamics, Waves and Oscillations, Electrical measurements and circuits and, Theory of Relativity

1. Thermodynamics — 15 hrs

The Zeroth law, internal energy, indicator diagrams for different thermodynamic changes, the first law and it's applications, work done in isothermal and adiabatic changes, Carnot's heat engine and expression for it's efficiency (derivation), reversibility of Carnot cycle, principle of refrigerator; Second law of thermodynamics, Entropy, Definition, principle of Increase of entropy, concept of Absolute zero, third law of thermodynamics, Derivation of Clausius-Clapeyron's and latent heat equation and its application to melting and boiling points. Problems.

Low temperatures: Idea of low temperature, Andrew's and Porous plug experiments, Principle of regenerative cooling liquid air, liquid Nitrogen and liquid Helium.

2. Waves and Oscillations — 15 hrs

Progressive wave, equation for wave in one dimension, differential equation for motion, particle velocity and wave velocity, group velocity and phase velocity, energy of progressive wave. Problems.

Expression for stationary longitudinal vibrations in a rod, expression for harmonics in free-free rod and in fixed-fixed rod, vibration of stretched string, harmonics.

3. Electrical Measurements and circuits — 18 hrs

Measurements on CRO

Construction and working of cathode ray oscilloscope, Expression for electrostatic and magnetic deflection sensitivity, Measurement of voltage, current, frequency and phase of the signals using CRO.

DC and AC circuits

D.C. Circuits: Growth and decay of current in RL circuit. Charging and discharging of voltage in C, RC and RLC circuit, frequency of oscillatory current. Problems.

A.C. Circuits: j-operation, AC circuit containing only R, L, C, RL, RC and RLC series & parallel circuits (using j-operation)and study of impedance, admittance, resonance curves. Q-factor. Measurement of L using Maxwell's and Anderson's AC bridges. Problems.

4. Theory of relativity — 16 hrs

Introduction to General Theory of Relativity. Michelson Morley Experiment. Postulates of Special Theory of Relativity. Lorentz transformation equations. Length contraction, time dilation. Relativity of Simultaneity: Relativistic velocity transformation equations:

variation of mass with velocity, Einstein's mass energy relation, Energy momentum relation concept of four vectors Minkowskis space. Effect of gravitational field on ray of light. Edington experiment. Problems.

Reference books

1. Electricity and magnetism by K.K.Tiwari
2. Electricity and magnetism by Muruganeshan
3. Heat & Thermodynamics and Statistical Physics (XVIII-Edition) by Singhal, Agarwal & Satyaprakash
4. Heat & Thermodynamics and Statistical Physics by Brijlal and Subramanyam
5. Heat & Thermodynamics (I-Edition) by D. S. Mathur
6. A Treatise on Heat by Shaha and Srivatsava.
7. A Text Book of Heat by J. B. Rajam.
8. A Text book of Sound (II-Edition) by Brijlal, Subramanyam,
9. Text book of Sound (I-Edition) by Khanna & Bedi
   Text book of Sound (III-Edition) by M.Ghosh
10. Electricity and Magnetism by Brijlal, Subramanyam

Laboratory Course for B.Sc (Semester II) Physics

Paper : Practical 2

Instructions

1. Two lab sessions (3 hours duration each) per week are to be conducted.
2. Minimum of 16 experiments and 8 assignments from the list mentioned below should be performed in the semester II.
3. Results must be written with correct physical units in SI system.
4. A certified record book consisting of practical work must be produced in the practical examination for assessment.

Experiments

1. Helmholtz's Resonator.
2. Frequency of A.C signal using sonometer
3. Velocity of sound through the material of wire using sonomenter.
4. Characteristics of Loud speaker (Tweeter and Woofer).
5. Determination of thermal conductivity of bad conductor by Lee's method.
6. Determination of Stefan's constant.
7. Verification of Stefan's law.
8. Newton's law of cooling (Determination of Sp. heat of liquid)
9. Characteristics of Microphone.
10. J by electrical method with radiation correction.
11. Velocity of sound using CRO and microphone
12. Thermal conductivity of good conductor by Searl's method
13. LCR resonance circuits (series and parallel)
14. High pass low pass filters (RC & RL)
15. Emissivity of surface
16. Latent heat of steam
17. Ratio of specific heat by Clament and Desorm method
18. Verification of Stefen's Boltzmann law
19. Frequency of electrically maintained tuning forks by Lissagous figures (using Meld's apparatus).
20. Laws of transverse vibration of stretched string using Meld's apparatus (Sonometer)

21 Assignment I
22 Assignment II
23 Assignment III
24 Assignment IV
25 Assignment V
26 Assignment VI
27 Assignment VII
28 Assignment VIII
29 Assignment IX
30 Assignment X

GULBARGA UNIVERSITY, GULBARGA

B.Sc (Semester III) Physics Syllabus

Paper 3: Mathematical Physics, Electromagnetism, Energy sources and Biophysics

1. Mathematical Physics — 15 hrs

Vector Analysis: Dot product, cross product of vectors, triple product of vectors. Scalar and vector fields, gradient, divergence and curl and their physical significance, vector entities, statement of Gauss theorem and Stoke's theorem. Problems.
Fourier series: Definition of Fourier series, evaluation of Fourier coefficients for even and off functions, Dirichlet's theorem (statement) and conditions, Physical examples of Fourier series; saw tooth wave. Change of interval from $(-\pi, \pi)$ to $(-l, l)$, complex form of Fourier series.

2. Electromagnetism — 24 hrs

Steady current, Biot-Savart law, magnetic field and Ampere's swimming rule. Non-steady current and charges, Faradays laws of electromagnetic induction. Concept of Dipole, Ampere's circuital law, current loop as dipole, torque on a dipole, Gauss Law. Maxwell's field equations (no derivation, Physical significance only), Wave equation for field vectors, Pointing vectors (no derivation, physical significance only) . Derivation of Maxwell's equations in free space. Equation for Plane electromagnetic waves, production of EM waves, accelerated charges and oscillating dipoles, Hertz experiment. Skin Effect.

3. Energy sources (Renewable & Non-renewable) — 15 hrs

Energy sources, Energy crisis, resources of energy, conventional and non-conventional sources, ecological and sociological perspectives. Non- conventional energies: Solar, wind, tidal and geothermal energy sources (qualitative). Nuclear energy, concept of nuclear fission, controlled and uncontrolled chain reactions, types of nuclear reactors, concepts of nuclear fusion, thermonuclear reaction, DD reaction. C-N cycle and P-P cycle, magnetic confinement of plasma. Biomass energy, Gobar gas plants.

4. Biophysics — 10 hrs

Scope of Biophysics, Biophysics of muscles, strength of bones,
Fluid flow: Energetics of fluid flow and fluid flow in plants.
Molecular Biophysics: molecular components of cell, molecular forces.
Physcics of Bio-membranes: Cell membrane, transport through membranes, passive transport, facilitated diffusion, active transport, thermodynamic analysis of membrane transport.

Neurophysics: Anatomy of Neurons (brief introduction), membrane potential, physico-chemical nature of membrane potential, nerve excitation, action potential, conduction of action potential.

Reference books

1. Electricity and magnetism by K K Tiwari
2. Electricity and magnetism by D.N. Vasudev
3. Non-conventional energy sources by G.D. Rai
4. Text Book of Engineering Physics by A.c.Niranjan
5. Energy Technology by S. Rao & B.B.Rarulekar
6. Mathematical Physics by Satyaprakash
7. Elementary Biophysics by P.K.Srivastava
8. Biophysics by Pattabhi and N.Gautham
9. Introduction to Biophysics by C.Sybesma
10. Essentials of Biophysics by P.Narayanan

Laboratory Course for B.Sc (Semester III) Physics

Paper : Practical 3

Instructions

1. Two lab sessions (3 hours duration each) per week are to be conducted.
2. Minimum of 16 experiments and 8 assignments from the list mentioned below should be performed in the semester III.
3. Results must be written with correct physical units in SI system.
4. A certified record book consisting of practical work must be produced in the practical examination for assessment.

Experiments

1. BH using Helmotz Galvanometer
2. Charge sensitivity of Ballistic Galvanometer
3. Desautys Bridge, DC using BG
4. Desautys Bridge, AC using head phone
5. Field along the axis of a circular coil
6. Study of electromagnetic induction by oscillation of bar magnet
7. Mutual induction by direct method
8 Estimation of Chlorophyll in the plant cell
9 Study of absorption spectrum in Chlorophyll
10 Binomial distribution (coin tossing) –Statistical distribution
11. Charging and discharging of capacitor
12. Half wave and full wave rectifier
13. Determination of C by Maxwell's bridge
14. Determination of L by Maxwell's bridge
15. Verification of Faraday's law
16. Determination of wind energy using given data
17. Earth inductor
18. Determination of Reynold's number for the flow of different fluids
19. Study of gobar gas plant
20. Conductivity of an electrolyte using Kohlrausch bridge
21 Assignment I
22 Assignment II
23 Assignment III

24 Assignment IV
25 Assignment V
26 Assignment VI
27 Assignment VII
28 Assignment VIII
29 Assignment IX
30 Assignment X

GULBARGA UNIVERSITY, GULBARGA

B.Sc (Semester IV) Physics Syllabus

Paper 4: Physical Optics, Lasers and Fibre Optics and, Computational Physics

1. Interference — 15 hrs

Definition of coherent Source, coherent conditions – Spatial & temporal coherence. Interference due to division of wave front, Young's double slit experiment, Coherent sources, analytical treatment, theory of fringe width, path difference and Phase different, Fresnel's biprism, Theory and experiment (determination of λ) Liyod' single mirror, interference by division of amplitude; Thin film of uniform thickness (Both reflected and transmitted) and wedge shaped film Newton's rings-theory (both reflected and transmitted), determination of radius of curvature. Michelson's interferometer. Types of fringes, determination of λ and dλ problems.

2. Diffraction — 9 hrs

Fresnel and Fraunhoffer diffractions, Fresnels assumptions, Rectilinear propagation of light, zone plate theory, comparison between zone plate and convex lens. Fraunhofer diffraction at a single slit (with derivation). Transmission grating theory and experiment to determine wave length of light. Dispersion and resolution of a grating, problem.

3. Polarisation — 10 hrs

Double refraction in a crystal., Principle of refractive indices. Huygen's construction of O and E waves in uniaxial crystal for plane wavefront. Huygen's theory positive and negative crystals. Quarter wave plate and Half wave plate Babinets compensator. Production and detection of plane, circularly and elliptically polarised light optical activity : Fresnels Theory of optical activity, Lorentz half-shade Polari meter. Problems.

4. Optical Instruments — 8 hrs

Cardinal points; Equivalent focal length of two thin convex lenses separated by a distance (derivation), tracing of cardinal points. Abberrations; Spherical and chromatic aberrations in lenses. Achromatic combination of lenses; in contact and separated by a distance. Power of lenses, Huygens' and Ramsden's eye pieces.

5. Lasers and fiber optics — 12 hrs

Spontaneous emission, stimulated emission and stimulated absorption, condition for Laser action, types of lasers. Gas lasers (He-Ne), Semiconductor lasers (intrinsic and extrinsic), Holography principle of reconstruction of images.

Introduction, types of optical fibers, fibre bundles and cables , optical fibre properties , fibre materials, zero dispersion fibre, infra red fibers, applications of optical fibers,

prospects for fibre optics communication, advantages of optical fibre communication.

6. **Computational Physics** **10 hrs**

Character set, reserved words, identifiers, constants and variables. Data types, operators; arithmetic, relational, logical, assignment, incrementing, decrementing and conditional operators, arithmetic expressions, input and output (I/O) functions.
Control Statements; GO TO, I/F, IF-ELSE statements and switch. Looping statements; WHILE, DO- WHILE and FOR. BREAK & CONTINUE statements. Arrays; one dimensional and two dimensional arrays, character strings.
(Practice C-programming to calculate some physical quantities concerning interference, diffraction and polarization of light)

Reference books

1. A Text book of optics by Brijalal and Subramanyam
2. Optics by Ajay Ghatak.
3. A Text book of optics by D.S.Mathur.
4. Modern Physics by Murugeshan
5. Optics & Spectroscopy by R. Murugeshan
6. College Physics by N.Sundrajan and others
7. Lasers and Non-linear Optics by B B Laud
8. Laser Experiments by Shirohi
9. Programming in ANSIC by E. Balguru Swamy
10. Introduction to Computers and C by P.B.Kotur
11. Computer Concepts and C-Programming by V.S. Wadi

Laboratory Course for B.Sc (Semester IV) Physics

Paper : Practical 4

Instructions

1. Two lab sessions (3 hours duration each) per week are to be conducted.
2. Minimum of 16 experiments and 8 assignments from the list mentioned below should be performed in the semester IV.
3. Results must be written with correct physical units in SI system.
4. A certified record book consisting of practical work must be produced in the practical examination for assessment.

Experiments

1. Interference at a wedge – Measurement of the thickness of paper separator.
2. Determination of wavelength of monochromatic light using biprism.
3. Newton's rings –determination of radius of curvature and verification by telescope method.
4. Determination of diameter of wire by diffraction.
5. Diffraction grating – Normal incidence method.
6. Determination of Cauchy's constant by dispersive method.
7. Brewster's law.
8. Resolving power of grating using spectrometer.
9. Resolving power of telescope.
10. Specific rotation of sugar solution using polarimeter.
11. Searle's Goniometer- Determination of equivalent focal length of combination of lenses for at least three separations and its verification.

12. Liquid lens –Determination of refractive index of liquid.
13. Measurement of numerical aperture of an optical fiber using Laser.
14. Determination of mutual inductance of a pair of coils using BG.
15. Refractive index of single/double prisms using laser
16. Grating constant using Laser
17. Determination of coefficient of damping, relaxation time and quality factor of a damped oscillator.
18. Determination of wavelength of laser using grating (minimum deviation method)
19. Verification of Newton's formula by combination of lenses
19. C-program to calculate velocity of satellite
20. Sextant – height of an inaccessible object such as hill, tree etc.
21 Assignment I
22 Assignment II
23 Assignment III
24 Assignment IV
25 Assignment V
26 Assignment VI
27 Assignment VII
28 Assignment VIII
29 Assignment IX
30 Assignment X

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B.Sc (Semester V) Physics Syllabus

Paper 5.1: Atomic and Molecular Physics

ATOMIC PHYSICS

1. Properties of Atom — **6 hrs.**

Cathode Rays, properties and applications, Charge of an Electron by Millikan's oil drop method, e/m by J J Thomson method and Dunnington method, Atomic mass by Dumpsters method

2. Atomic Spectra — **17 hrs**

Wave mechanical approach of the atom. Concept of electron spin and space quantization, structure of an atom, Stern-Gerlach experiment. The Pauli's exclusion principle, electron configuration of single valence electron atoms (alkali metals) and two valence electron atoms and their spectra (Principle, Sharp, Diffuse and Fundamental series). Vector model of the atom. j-j & L-S Coupling (vector diagrams), spin-orbit interaction, magnetic moment due to orbital and spin motion.
Excitation and ionization potentials; The Frank-Hertz experiment. Penetrating and non-penetrating orbits in the alkali metals.

3. Effect of Magnetic field on spectral lines — **9 hrs**

Larmor's precession in a magnetic field, expression for magnetic interaction energy. Magnetic field effects; Normal and anomalous Zeeman Effect (with energy level diagrams), experimental set up to observe Zeeman effect. Energy level diagram for Sodium D lines in a weak magnetic field. Lande g – factor,. Problems.

MOLECULAR PHYSICS

4. **Molecular Spectra** **8 hrs**

Different types of motion in a molecule (electronic, vibration, rotational, molecular energy distribution in the electromagnetic spectrum, general features of band spectra compared to atomic spectra. The diatomic molecule as a rigid rotator, non-rigid rotator, the rotational energy levels and their spectrum, Frank-Condon principle. Information about the moment of inertia and inter nuclear distances from the pure rotational spectrum.

5. **Raman Effect** **8 hrs**

Rayleigh scattering, Raman scattering. Classical and Quantum theories of Raman effect (derivation) and Raman spectrum. Raman Spectra: Rotational and Vibration. Laser Raman spectrometer, Applications of Raman Spectroscopy (structure of organic molecules).

Reference books

1. Modern Physics by Murugeshan
2. Introduction of Modern Physics by Ritchmeyer & Kennard
3. Perspectives of Modern Physics by Beiser
4. Modern Physics by Brijlal and Subramanyam
5. Atomic Physics by Ghatak
6. Molecular Physics by Banwell
7. Atomic Physics by H E White
8. Specials theory of relativity by French

Laboratory Course for B.Sc (Semester V) Physics

Paper : Practical 5.1

Instructions

1. One laboratory session of 3 hours duration per week is to be conducted under Practical 5.1.
2. Minimum of 8 experiments and 4 assignments from the following mentioned list of experiments must be performed.
3. Results must be written with correct physical units in SI system.

Experiments

1. Temperature of flame by line reversal method.
2. Rydberg constant
3. Charge of electron by dispersion method
4. e/m by Thomson method
5. Plank constant (h) by Photocell
6. Thermionic emission: Childs law
7. Study of Thermistor (I-V characteristics)
8. Stopping potential using photocell
9. Excitation potential of a Neon (gas) bulb.
10. Charge of electron by Millikon oil drop method
11. Excitation and Ionisation potentials using LEDs
12. TCR of metallic wire
13. TCR of semiconductor
14. Ionisation potential of mercury
15. Assignment I
15. Assignment II

16. Assignement III
17. Assignment IV
18. Assignment V
19. Assignment VI
20. Assignment VII

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B.Sc (Semester V) Physics Syllabus

Paper 5.2: Quantum mechanics, Statistical mechanics and Materials Physics

1. Quantum Mechanics — 16 hrs

Failure of Classical Mechanics. Particle nature of waves; Compton scattering theory. Wave nature of particle; Experiments of Davisson and Germer and Thomson, concept of matter waves. Uncertainty principle, illustrations by gamma ray microscope and diffraction at a single slit. Schrodinger wave equation time dependent (qualitative) and Schrodinger wave equation time independent (derivation), interpretation of wave function. Probability current density, Equation of continuity Physical significance. Application of Schrodinger equation: particle in a box, solution for one dimension, extension to three dimensions, degeneracy; harmonic oscillator ,zero point energy.

2. Statistical mechanics — 8 hrs

Statistical ideas in physics, Phase space, ensemble, Boltzmann equi-partition theorem, most probable distribution, derivation of statistical equilibrium. Distribution Laws: Maxwell-Boltzmann, Bosons & Fermions. Bose- Einstein and Fermi-Dirac distribution functions and their comparisons.

MATERIALS PHYSICS

4. Magnetic Materials — 6 hrs

Classification of Para Dia, Ferro magnetic materials, Langevins theory for diamagnetism. B H Curve (hysteresis) for ferromagnetic materials. Qualitative discussion on Curie-Weiss Law. Ferrites: classification, hard and soft ferrites, applications of ferrites.

5. Superconductivity — 8 hrs

Definition. Meissner effect. Classification of superconductors into type I & type II and their properties, critical current and critical magnetic fields. Field penetration depth. High temperature superconductors. Applications of superconductors. BCS Theory.

6. Nano materials — 10 hrs

Introduction to Nano-materials (basics). Effect of reduction of dimension, quantum size effect. Different techniques of preparing Nanomaterials: Physical and chemical methods: PVD , CVD and Sol Gel methods. Application of Nanomaterials

Reference books

1. Quantum Mechanics - B.N.Srivastava
2. Quantum Mechanics –Satyaprakash, Meerut publication.

3. Modern Physics by R. Murugeshan.
4. Statistical Mechanics by Kerson Huang
5. Fundamentals of Statistical mechanics by B B Laud
6. Quantum mech, Statistical mechanics and Solid State Physics by P C Rakshit and
7. Chattopadhyaya.
8. Materials Science and processes by S.K.Hazra Chaudary
9 Nano The Essentials by T Pradeep

Laboratory Course for B.Sc (Semester V) Physics

Paper : Practical 5.2

Instructions

1. One laboratory session of 3 hours duration per week is to be conducted under Practical 5.2.
2. Minimum of 8 experiments and 4 assignments from the list mentioned below should be performed.
3. Results must be written with correct physical units in SI system.
4. A certified record book consisting of practical work carried out under Practical 5.1 & 5.2 must be produced in the examination for assessment. Practical internal Assessment tests (10 marks each) and semester end examinations (40 marks each) for practical courses 5.1 and 5.2 must be conducted separately.

Experiments

1. Analysis of systematic and random errors
2. Yield point of a metallic wire
3. Determination of self inductance using Anderson bridge
4. Maxwell's bridge
5. Power supply using Bridge Rectifier
6. Simple multimeter
7. I-V characteristics of solar cells
8. B-H curve using CRO
9. B-H curve by hysterisis method
10. Study of Magnetic materials
11. Curie temperature for ferromagnetic materials
12. Dielectric constant of solids
13. Verification of Gaussian distribution (measure length of 100 nails/diameter of balls)
14. Spectral response of LDR
15. Assignment I
16. Assignment II
17. Assignment III
18. Assignment IV
19. Assignment V
20. Assignment VI

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B.Sc (Semester VI) Physics Syllabus

Paper 6.1: Nuclear Physics and Solid State Physics

NUCLEAR PHYSICS

1. Properties of Nucleus **6 hrs**

Elementary ideas on nucleus, Binding Energy of nucleus, properties of nuclear forces, YUKAWA theory (qualitative). Nuclear models- Liquid drop and Shell models (in detail),

magic numbers.

2. **Radio activity** — 8 hrs

Radioactive disintegration: Law of successive disintegration, transient and secular equilibrium. Alpha decay: Range of alpha particles-Braggs method. Geiger Nuttal law, Gammow's theory of alpha decay, Beta decay: Pauli's neutrino hypothesis, Fermi theory of beta decay (qualitative). Gamma rays: Attenuation of gamma rays, applications of nuclear radiations; Industrial, medical and agricultural, problems.

3. **Elementary particles** — 5 hrs

Classification of particles and antiparticles. Four basic interactions in nature. Unified theory (salient features). Quark model, standard model; Higg's Bosons (introduction and properties).

4. **Nuclear Instruments** — 5 hrs

Particle accelerators; Principle and working of Cyclotron and Betatron. Particle detectors; GM Counter-construction and working (dead time, operating voltage, paralysis time, internal quenching), Scintillation counter. Problems.

SOLID STATE PHYSICS

5. **Crystal structures** — 8 hrs

Concept of lattice, unit cell and its construction, Bravais lattice, Seven Crystal systems and characteristics, Miller indices, crystal planes, interplanar spacing, X-ray diffraction, Bragg's law, Bragg diffractmeter (construction and working), powder method, indexing of peaks. Structure of NaCl, KCl, diamond (cubic & hexagonal).

6. **Band theory of solids** — 7 hrs

Free electron theory for metals - expression for electrical. Ohms law, calculation of electron density of states. Wiedeman-Frange Law for thermal conductivity, Drude model (qualitative), Kronig-Penny model (Energy values and energy function calculation). Concept of Fermi energy and its temperature dependence.

7. **Semiconductor Physics** — 6 hrs

Intrinsic and extrinsic semiconductor, derivations for carrier concentrations (electron and hole), electrical conductivity in intrinsic semiconductor. Hall effect: Definition, expression for Hall co-efficient in semiconductors, Experimental determination of Hall co-efficient. Identification of n & p type semiconductors by Hall Effect.

8. **Specific heat of solids** — 3 hrs

Dulong and Petits law, Einstein and Debye's theories (quantitative) and experimental comparison.

Reference books

1. Modern Physics by R.Murgeshan and J.B.Rajan
2. Nuclear Physics by D.C.Tayal
3. Introductory Nuclear Physics by Kenneth Crane

4. Nuclear Physics by I Kaplar
5. Nuclear Physics by Brijlal and Subramanyam
6. Solid state physics by C.Kittel
7. Solid state physics by A.J.Dekkar
8. Solid state physics by Sexena and Gupta

Laboratory Course for B.Sc (Semester VI) Physics

Paper : Practical 6.1

Instructions

1. One laboratory session of 3 hours duration per week is to be conducted under Practical 6.1.
2. Minimum of 8 experiments and 4 assignments from the list mentioned below should be performed.
3. Results must be written with correct physical units in SI system.

Experiments

1. Determination of operating voltage of Gieger Muller Counter
2. Dead time of Geiger Muller counter (single source)
3. Verification of inverse square law using G.M. Counter
4. Determination of half life of source using G.M. Tube
5. Absorption coefficient of Aluminum for β ray
6. Attenuation coefficient for β rays
7. Study of Solar panels
8 Temperature variation of resistance of semiconductor
9 Determination of Hall coefficient.
10 B-H Curve by Hysterisis curve
11. Magneto resistance of a metal
12. Magneto resistance of metals a semiconductor
13. Determination of inter planar spacing on powder diffraction film
14. Determination of Curie temperature of a ferromagnetic material.
15. Specific heat of solids
16. Energy gap of semiconductor
17. Assignment I
18. Assignment II
19. Assignment III
20. Assignment IV
21. Assignment V
22. Assignment VI

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B.Sc (Semester VI) Physics Syllabus

Paper 6.2: Electronics, Astrophysics, Plasma Physics & Diagnostic Physics

1. Network Theorems — 4 hrs

Thevenin's theorem, Norton's theorem, Maximum Power Theorems. Problems.

2. Semiconductor devices — 12 hrs

P-N Junction diode & its I-V characteristics, I-V relationship for forward bias, emission of energy during forward bias, light emitting diodes (LED) with different colors (factors which decides the color of a LED). Use of LED and LCD, seven segment display. P-N

Junction during reverse bias, junction breakdown Avalanche breakdown and Zener breakdown, Tunneling phenomenon , characteristics of Zener and Tunnel diodes.
Transistors: PNP and NPN transistors, characteristics, α and β and their inter relationship.
Field Effect Transistors (FET): JFET, MOSFET & their characteristics.
Silicon Controlled Rectifier (SCR)-Construction and switching action.
Solar Cells: I-V characteristics.

3. Amplifiers **4 hrs**

Comparison of characteristics of CE CB & CC configurations. Biasing; DC & AC Load lines of CE configuration. CE Amplifier: Frequency response and band width. Basics of Linear Integrated Circuits (IC's). Operational amplifiers: Characteristics, CMRR inverting, non-inverting modes.

4. Oscillators **4 hrs**

Damped and undamped oscillators. Concept of positive & negative feedback. Barkhausen criteria for sustained oscillations. RC Phase shift, Wien Bridge Oscillators.

5. Communications **4 hrs**

Modulation: Need for modulation, AM and FM modulation (LSB & USB) and their comparison. Demodulation: Concept, need for demodulation. Concept of Noise. Satellite communication (qualitative).

6. Logic functions **4 hrs**

Basics of Digital Integrated Circuits (IC's). Decimal and Binary system of numbers and their inter conversions. Logic Gates; AND, OR, NOT, NOR, NAND, X-OR & X-NOR and their realizations using IC's.

7. Astrophysics **5 hrs**

Scope of Astronomy and Astrophysics. Physical Properties of Stars,. Classification of stars. Harvartds classification system. H–R diagram. Stellar Evolution, Formation of Stars, Chandrasekhar Limit, Black holes, Supernova explosion , Photon diffusion time, internal temperature and pressure of stars.

8. Plasma Physics **5 hrs**

Introduction, Characteristics of plasma, collisions , surface phenomenon , Transport phenomena (transfer), diffusion and mobility (ambipolar diffusion), Viscosity, recombination, plasma diagnostics, confinement of plasma.

9. Radiology and Diagnostic Physics **6 hrs**

Blood pressure measuring techniques, diastolic and systolic, ECG, EEG Scanning, ultra sound MRI, Principles of Doppler, echo, Sonography, CT scanning, Imaging X-ray techniques. Radiation measurements. Body temperature measurements using LCD.

Reference books

1. Basic Electrical Principles - B.L.Thereja
2. Integrated Electronics - Millmun & Halkias
3. Electronic Devices & circuits - Allen Moltershed

4. Elements of Plasma Physics by S N Goswami.
5. An Introduction to Astrophysics by Baidyanath Basu.
6. Astronomy by Fundamentals and Frontiers –R jastrow and M H Thompson.
7. Astrophysics I & II by R.Bowers and T.Deeming.

Laboratory Course for B.Sc (Semester VI) Physics

Paper: Practical 6.2

Instructions

1. One laboratory session of 3 hours duration per week is to be conducted under Practical 6.2.
2. Minimum of 8 experiments and 4 assignments from the list mentioned below should be performed.
3. Results must be written with correct physical units in SI system.
4. A certified record book consisting of practical work carried out under Practical 6.1 & 6.2 must be produced in the examination for assessment. Practical internal Assessment tests (10 marks each) and semester end examinations (40 marks each) for practical courses 6.1 and 6.2 must be conducted separately.

Experiments

1. Characteristics of PN junction and Zener diode
2. Characteristics of Transistor, C-E Configuration
3. Characteristics of Transistor, C-B configuration
4. Characteristics of Silicon Controlled Rectifier (SCR)
5. Characteristics of FET
6. CE amplifier- study of frequency Response and measurement of gain & band width
7. Phase shift oscillator- construction & determination of frequency
8 Wein-bridge Oscillator- construction & determination of frequency
9 Hartely Oscillator- construction & determination of frequency
10 Transistor - Astable Multivibrator
11. Transistor – Mono stable Multivibrator
12. Study of logic gates using basic devices (diodes/transistors)
    Study of logic gates using ICs
13. Inverting & Non- Inverting Op-Amp
14. Summing & Difference Operational Amplifier
15. H-R diagram
16. Measurement of Blood Pressure.
17. Determination of temperature of stars using stallar data
17. Assignment I
18. Assignment II
19. Assignment III
20. Assignment IV