BAGALKOT UNIVERSITY
JAMKHANDI

PROGRAM /COURSE STRUCTURE AND SYLLABUS
For

Bachelor of Science with PHYSICS
I and II Semester

w.e.f.
Academic Year 2024-25 and onwards

PROGRAM STRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years B.Sc. with Physics Undergraduate Programme with effect from 2024-25

First Semester B.Sc. With Physics Scheme

SEMESTER-I											
Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of Exam (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
L1	------	Language 1	20	80	100	4	-	-	3	3	-
L2	------	Language 2	20	80	100	4	-	-	3	3	-
Major	2A1PHYM01T	Mechanics and Properties of matter	20	80	100	4	-	-	3	3	Physics
	2A1PHYM01L	Mechanics and Properties of matter Lab	10	40	50	-	-	4	2	3	Physics
Major	---------	Major Subject 2	20	80	100	4	-	-	3	3	---
	-----------	Practical	10	40	50	-	-	4	2	3	---
Major	-----------	Major Subject 3	20	80	100	4	-	-	3	3	---
		Practical	10	40	50	-	-	4	2	3	---
	2S1XXXC01T	Constitutional Values/	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/ /Geography/ Botany
		Total Marks			700	Semester Credits			23		

Second Semester B.Sc. Physics Scheme

Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of exams (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
L3	------	Language 3	20	80	100	4	-	-	3	3	-
L4	------	Language 4	20	80	100	4	-	-	3	3	-
Major	2A2PHYM02T	Electricity & Magnetism	20	80	100	4	-	-	3	3	Physics
	2A2PHYM02L	Electricity & Magnetism Lab	10	40	50	-	-	4	2	3	Physics
Major	-------	Major Subject 2	20	80	100	4	-	-	3	3	-- -- --
	---------	Practical	10	40	50	-	-	4	2	3	-- -- --
Major		Major Subject 3	20	80	100	4	-	-	3	3	-- -- --
		Practical	10	40	50	-	-	4	2	3	-- -- --
____	2S1XXXC01T	Constitutional Values/	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/Geography/ Botany
Total Marks			700			Semester Credits			23		

Year	I	**Course Code:** **2A1PHYM01T**		**Credits**	03
Sem.	1	**Paper Title:** Mechanics and Properties of Matter		**Hours**	52
Internal Assessment Marks: 20		External Assessment Marks: 80		Duration of Exam: 03hrs.	
Unit No.		**Course content**		**Hours**	

Unit No.	Course content	Hours
Unit I	**Conservation Laws:** Law of conservation of linear momentum (statement). Centre of mass & Expressions for position vector, velocity, acceleration & force of centre of mass. Distinction between laboratory frame of reference and centre of mass frame of reference. Concept of elastic and inelastic collisions. Derivation of final velocities in case of elastic collision in (i) laboratory frame of reference (ii) centre of mass frame of reference. Derivation of final velocities in case of inelastic collision in (i) laboratory frame of reference (ii) centre of mass frame of reference. Conservation of linear momentum in case of variable mass. Principle of rocket and derivation for equation of motion for single stage rocket. Necessity of multistage rocket (Qualitative). Basics of angular momentum and torque, relation between angular momentum & torque (qualitative). Law of conservation of angular momentum with examples. Concept of work & power in terms of line integral. Law of conservation of energy. Work energy Principle.	13 Hours
Unit II	**Gravitation:** Newton's law of Gravitation (statement). Expressions for escape velocity and orbital velocity. Kepler's laws of planetary motion. Derivation for Kepler's 2nd and 3rd law. Concept of Satellite, derivation for binding energy of satellite. Artificial Satellite: Geostationary satellite and polar orbit satellite with different types of orbits (qualitative).	13 Hours

	Rigid Body Dynamics: Moment of Inertia. Radius of Gyration. Statements of theorem of parallel axis and theorem ofperpendicular axis. Theory of compound pendulum. Theory of flywheel and its applications.	
Unit III	**Elasticity:** Statement of Hook's law. Behavior of wire under stress. Modulus of elasticity. Derivation of expression for relations between elastic constants. Derivation of work done per unit volume in a deforming body. Derivation of twisting couple of cylindrical rod or wire. Torsion pendulum, Derivation for time-period of torsion pendulum. Derivation of Young's modulus by bending of beamsupported at its ends and loaded at middle.	13 Hours
Unit IV	**Surface tension:** Introduction to surface tension, derivations for Pressure difference across a curved liquid surface and expression for rise of liquid in a capillary tube. Effect of temperature and impurity on surface tension. Examples. **Viscosity:** Introduction to viscosity, streamline and turbulent flow. Derivation of Poiseuelli's formula for the flowof viscous fluid through a narrow tube. Motion of body in a viscous medium-Stoke's law with derivation and expression for terminal velocity example: velocity of rain drop	13 Hours
	REFERENCE BOOKS	

1. Fundamentals of Physics- R.Resnik, D. Halliday and Walker; Wiley (2001)
2) Physics-Classical and Modern, FJ Keller, E Gettys and J J Skove, McGraw Hill Second RevisedEdition (1993)
3) Classical Mechanics-K N Sreenivasa Rao, Universities Press- Orient Longman (2003 ed)
4) Concepts of Physics Vol (1)-H C Verma, Bharathi Bhavan Publishers, 2004 Edition
5) University Physics- F W Sears, M W Zemansky & H D Young, Pearson Education First ed.(2014)
6) Mechanics- J C Upadhaya, Himalaya (2014 ed)
7) Properties of Matter- J C Upadhaya, Himalaya (2014 ed)
8) Mechanics- Berkeley Physics Course

Vol(1)- SI units Charles Kittel etal, McGrawHill Education (India) 2e (2011).

9) Elements of Properties of matter – D S Mathur, S.chand(GL) 7 Co Ltd,Dehi 1ed(2010)

10) Properties of Matter - Brijlal & Subramanyam, S Chand & Co, (2002)

11) Newtonian Mechanics- A P French, Nelson & Sons UK, (1971)

12) Mechanics & Thermodynamics, G Basavaraju & Dipan Ghosh, McGrawHill Education India) 1ed(1985)

13) A treatise on general properties of matter, Sengupta and Chatterjee, New Central Book AgencyPvt Ltd, Calcutta (7th Revised edition -2010)

14) Advanced analytical Dynamics: Dynamic of rigid body, Utpal Chatterjee, AcademicPublishers, first edition,(2016).

15) Theory of mechanics, kinematics and Dynamics : V. R. Gupta, I K International publishinghouse Pvt. Ltd, (2013).

16) Dynamics of Rigid Body : A. K. Sharma, Discovery Publishing Group,(2007).

17) Properties of matter : R. Murugeshan, S Chand & Co Ltd Publication.

18) Theory of Elasticity : P. N. Chandramouli, Yes Dee publishers(2017).

19) An introduction to the theory of elasticity : R. J. Atkin & N. Fox, Dover Publications Inc.(2005).

20) Theory of elasticity : Dr. Sadhu Singh, Khanna publishers, (1978).

21) B.Sc Physics - C. L. Arora.

22) Mechanics, S P Taneja, R Chand & Co New Delhi

Paper Code: 2A1PHYM01L		
Paper Title: Mechanics and Properties of Matter Lab		
Lab Hours /week: 4	Formative Assessment Marks: 10 Summative Assessment Marks:40 Total Marks= 50	Credits: 2 Total Teaching hours :50

Syllabus

1. Error analysis, data analysis technique and graphing technique to be learnt (mandatory).
2. Moment of Inertia of Fly wheel
3. Young's modulus (Y) by Cantilever- Load Vs depression graph.
4. Young's modulus (Y) by uniform bending- Load Vs depression graph.
5. Bar pendulum- determination of g
6. Modulus of rigidity by Torsional pendulum
7. Spring Constant by Flat spiral Spring.
8. Verification of parallel axis theorem of Moment of Inertia.
9. Verification of perpendicular axis theorem of Moment of Inertia.
10. Verification of Hook's law.
11. Searle's double bar method to determine Young's Modulus.
12. Torsional pendulum- to determine C and rigidity modulus.
13. To determine rigidity modulus by dynamic method.
14. Surface tension by Quincke's method.
15. Coefficient of viscosity by Stoke's method.

Note :

1. Experiments are of three hours duration.
2. Minimum of eight experiments to be performed.

References

1. B Saraf etc, - Physics through experiments, Vikas Publications (**2013**)

2. D P Khandelwal – A Laboratory Manual of Physics for

   Undergraduate Classes, VikasPublications First ed (**1985**)

3. Advanced Practical Physics for Students – Worsnop & Flint, Methuen & Co, London.
4. An Advanced Course in Practical Physics , D Chattopadhyay, P C Rakshit, B Saha, New Central

   Book Agency (P) Limited, Kolkata, Sixth Revised Edition, (**2002)**
5. BSC, Practical Physics, CL Arora, SChand & Co, New Delhi, (**2007**) Revised Edition.
6. B.Sc. Practical Physics, Geeta Sanon R. Chand & Co. New Delhi

Year	I	**Course Code:** 2A2PHYM02T		**Credits**	03
Sem.	2	**Paper Title:** Electricity &Magnetism		**Hours**	52
Internal Assessment Marks: 20		External Assessment Marks: 80	Duration of Exam: 03hrs.		
Unit No.		**Course content**		**Hours**	

Unit No.	Course content	Hours
Unit I	**Vector Analysis:** Scalar and Vector Products. Gradient of scalar and its physical significance. Divergence of vector and its physical significance. Curl of vector and its physical significance. Vector integration; line, surface & volume integrals of a vector field (Qualitative). Gauss Divergence theorem & Stokes theorem (statement and explanation). **Maxwell's Electromagnetic Theory:** Derivation of Maxwell's equations in differential form. Mention of Maxwell's equations in integral form and their physical significances. Derivation for general plane wave equation in free space. Transverse nature of radiation. Derivation of Poynting's theorem.	13 Hours
Unit II	**DC Circuit Analysis:** Voltage and current sources. Kirchoff's current and voltage laws. Derivation of Thevenin's Theorem.Derivation of Norton's Theorem.. Derivation of Maximum Transfer Theorem. **Transient Circuits:** Theory of growth and decay of current in RL circuit. Theory of charging and discharging of capacitor in RC circuit. Time constants of RL and RC circuits Measurement of high resistance by leakage method.	13 Hours

| Unit III | **Magneto statics:**

Statement of Biot Savart's law. Mention of expressions for Magnetic field at a point (i) due to a straight conductor carrying current (ii) along the axis of the circular coil carrying current (iii) along the axis of solenoid. Principle, construction and theory of Helmholtz Galvanometer.

Magnetic Properties:

Magnetic intensity, Magnetic induction, Magnetic potential. Derivation of Magnetic intensity and magnetic potential due to dipole (magnet). Permeability and magnetic susceptibility. Distinction between dia, para, and ferromagnetic materials. Ampere Circuital Law (statement).

Electromagnetic induction:

Faraday's law of electromagnetic induction. Lenz's law. Self and mutual inductance.

Alternating Current:

Definitions of average, peak and rms values of AC. AC circuits containing LR, CR and their responses (using j operator). Expressions for impedance, current & phase angle in series LCR circuit using j operator. Expressions for admittance and condition for resonance in parallel LCR circuit using j operator. Concept of Series resonance & parallel resonance (sharpness, half power frequency, quality factor, voltage magnification). Comparison between Series resonance & parallel resonance. De Sauty's Bridge. | 13 Hours |
| Unit IV | Ballistic Galvanometer; Theory of Ballistic Galvanometer (Derivation for current and Charge). Constants of Ballistic Galvanometer and their relationship. Condition for moving coil galvanometer to be ballistic. Determination of self-inductance (L) by Rayleigh's method.

CRO block diagram. Use of CRO in the measurement of Voltage, Frequency and Phase.

Dielectrics:

Types of dielectrics (polar and non-polar molecules). Electric field (E), Electric displacement (D), Electric dipole moment (p), electric | 13 Hours |

| | | polarization (P). Gauss law in dielectrics. Derivation for Relation between D, E and P. Derivation for relation between dielectric constant and electric susceptibility. Boundary conditions for E & D | |

	REFERENCE BOOKS
	1) Electricity and magnetism by Brij Lal and N Subrahmanyam, Rathan PrakashanMandir, Nineteenth Edition, 1993**.** 2) Principles of Electronics by V K Mehta and Rohit Mehta, S Chand & Company,Eleventh Edition,**2008.** 3) Fundamentals of Magnetism & Electricity : d. N. Vasudeva, S Chand Publication, (2011). 4) Fundamentals of Electricity and Magnetism – Basudev Ghosh (Books & Allied New Central Book Agency, Calcutta, 2009). 5) Electricity & Magnetism : B. S. Agarwal, Kedarnath Ramnath Publication(2017). 6) Electricity & Magnetism : A. N. Matveev, Mir Publishers Moscow,(1987). 7) Electricity and Magnetism with Electronics **:** Dr. K.K.Tewari, S.Chand Publications(1995). 8) Fundamentals of electric circuit theory : Dr. D. Chattopashyay & Dr. P. C. Rakshit, S.Chand Publications, 7th Rev. Edn. (2006). 9) Electricity and Magnetism : John Yarwood, University Tutorial Press, (1973). 10) Feynman Lecture series, VolII, R P Feynnman et al, Narosa Publishing House, New Delhi 11) Electricity & Magnetism, N S Khare & S S Srivastava, AtmaRam & Sons, New Delhi. 12) Electricity & Magnetism, D L Sehgal, K L Chopra, N K Sehgal, S Chand & Co, Sixth Edition, (**1988**). 13) Electricity & Electronics, D C Tayal, Himalaya Publishing House, Sixth Edition(**1988**). 14) Basic Electronics & Linear Circuits, N N Bhargava, D C Kulshrestha & SC Gupta, TMH PublishingCompany Limited, 28th Reprint,(**1999**). 15) Fundamentals of Physics by Halliday, Resnick and Walker, Asian Books Private Limited,New Delhi, 5th Edition, (**1994**). 16) Introduction to Electrodynamics by D J Griffiths Pearson Education (**2015**). 17) Classical Electrodynamics : John David Jackson, John Wiley & Sons,(2007). 18) Electromagnetism by B B Laud 2ed. 19) An Introduction to vector analysis : B. Hague, Springer Science & Bussiness Media, (2012). 20) Electrical Networks, Theraja 3rd revised edition 21) Circuit Theory (Analysis & Synthesis) : A. Chankrabarti, Dhanpat Rai Publications,(1951). 22) Electricity and Magnetism, S P Taneja, R Chand & Co. New Delhi. 23) Introduction to Electromagnetic Theory, S P Taneja, R Chand & Co. New Delhi.

Paper Code: 2A2PHYM02L		
Paper Title: Electricity &Magnetism Lab		
Lab Hours /week: 4	Formative Assessment Marks: 10 Summative Assessment Marks:40 Total Marks= 50	Credits: 2 Total Teaching hours:50

Syllabus

1 Thevenin's & Norton's theorem (Ladder Network)
2 Thevenin's & Norton's theorem (Wheatstone's Bridge)
3 High resistance by leakage method
4 Time constant of RC circuit by charging and discharging method.
5 Calibration of Ammeter using Helmholtz Galvenometer
6 Constants of Ballistic Galvanometer
7 LCR series and parallel resonance circuit
8 De Sauty's AC bridge
9 Self-Inductance by Rayleigh's method
10 Use of CRO to find voltage, frequency and phase.
11 L & C by Equal Voltage Method
12 Black Box- Identify & Measure R, L & C
13 Anderson's Bridge to determine the self-inductance of the coil (L).
14   Verification of Superposition Theorem
15 Verification of maximum Power Transfer Theorem

Note :

1. Experiments are of three hours duration.
2.   Minimum of eight experiments to be performed.

References

1. Physics through experiments. B Saraf etc,- Vikas Publications (**2013**)
2.   D P Khandelwal – A Laboratory Manual of Physics for Undergraduate Classes, Vikas PublicationsFirst ed (**1985**)
3.   Advanced Practical Physics for Students – Worsnop & Flint, Methuen & Co, London.
4.   An Advanced Course in Practical Physics , D Chattopadhyay, P C Rakshit, B Saha, New Central BookAgency (P) Limited, Kolkata, Sixth Revised Edition, (**2002)**
5.   BSC, Practical Physics, CL Arora, SChand & Co, New Delhi, (**2007**) Revised Edition.
6. B.Sc. Practical Physics, Geeta Sanon R. Chand & Co. New Delhi