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B.Sc. (Physics) (Maths Combinations)

Scheme of instruction and examination to be followed w.e.f. 2015-2016

S.No	Semester	Title of the paper	Instruction Hrs/week	Duration o f exam (hrs)	Max Marks (external)
		Thoery			
1	First	Paper I : Mechanics & Properties of Matter			75
2	Second	Paper II: Waves & Oscillations			75
1	First	Practical 1			75
2	Second	Practical II			75

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[Model question Paper for all theory papers

Time : 3 hrs **Max marks : 75**

Section A

Answer any five out of 8 questions

Marks: 5 x3 = 15

Section B

Answer All questions with internal choice from all units (I to V) **Marks : 5 x 12 =60**

****** At least three problems must be included each with a weightage of 5 marks**

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SEMESTER PATTERN UNDER CHOICE BASED CREDIT SYSTEM
COMMON CORE SYLLUBUS
B.Sc. 1st Semester Physics
Paper I: Mechanics & Properties of Matter
(For Maths Combinations)

Work load:60 hrs per semester **4 hrs/week**

UNIT I (16 hrs)

1. Vector Analysis : 8 hrs

Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), State and proof of Gauss and Stokes theorem.

UNIT II

2. Mechanics of particles :10 hrs

Laws of motion, motion of variable mass system, motion of a rocket. Conservation of energy and momentum. Collisions in two and three dimensions. Concept of impact parameter, scattering cross-section. Rutherford scattering-derivation.

UNIT III (16 hrs)

3. Mechanics of Rigid bodies : 10 hrs

Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum. Euler equation, precession of a top. Gyroscope, precession of the equinoxes.

4. Mechanics of continuous media :6 hrs

Elastic constants of isotropic solids and their relation, Poisson's ratio and expression for Poisson's ratio in terms of y, n, k. Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions.

UNIT IV (10Hrs)

5. Central forces : 12 hrs

Central forces, definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force. Derivation of Kepler's laws. Motion of satellites.

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UNIT V (12 hrs)

6. Special theory of relativity : 12 hrs

Galilean relativity, absolute frames. Michelson-Morley experiment, negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four-vector formalism.

Reference Books:

1. BSc Physics -Telugu Akademy, Hyderabad
2. Mechanics - D.S. Mathur, *Sulthan Chand & Co, New Delhi*
3. Mechanics - J.C. Upadhyaya, *Ramprasad & Co., Agra*
4. Properties of Matter - D.S. Mathur, *S.Chand & Co, New Delhi ,11th Edn., 2000*
5. Physics Vol. I - Resnick-Halliday-Krane ,*Wiley, 2001*
6. Properties of Matter - Brijlal& Subrmanyam ,*S.Chand &Co. 1982*
7. Dynamics of Particles and Rigid bodies– Anil Rao, *Cambridge Univ Press, 2006*
8. Mechanics-EM Purcell, *Mc Graw Hill*
9. University Physics-FW Sears, MW Zemansky & HD Young, *Narosa Publications, Delhi*
10. College Physics-I. T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*.
11. S.G.Venkatachalapathy, Mechanics, *Margham Publication, 2003.*

Practical paper 1: Mechanics

Work load: 30 hrs per semester **3 hrs/week**

Minimum of 8 experiments to be done and recorded

1. Volume resonator
2. Viscosity of liquid by the flow method (Poiseuille's method)
3. Young's modulus material a rod by uniform bending
4. Young's modulus material a rod by non- uniform bending
5. Surface tension of a liquid by the method of drops
6. Surface tension of a liquid by capillary rise method
7. Determination of radius of capillary tube by Hg thread method
8. Viscosity of liquid by logarithmic decrement method
9. Bifilar suspension –moment of inertia.
10. Rigidity modulus of material of a wire-dynamic method (torsional pendulum)
11. Fly-wheel
12. Determination of Y of bar –cantilever.

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Paper II: Waves & Oscillations
(For Maths Combinations)
II SEMESTER

Work load:60 hrs per semester **4 hrs/week**

UNIT I

1. Simple Harmonic oscillations :12 hrs

Simple harmonic oscillator and solution of the differential equation-Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum-measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.

UNIT II

2. Damped and forced oscillations :12 hrs

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance.

UNIT III

3. Complex vibrations : 10 hrs

Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave

UNIT IV

4. Vibrating strings :8 hrs

Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport and transverse impedance.

5. Vibrations of bars :9 hrs

Longitudinal vibrations in bars-wave equation and its general solution. Special cases i) bar fixed at both ends ii) bar fixed at the mid point iii) bar free at both ends iv) bar fixed at one end. Tuning fork.

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UNIT V

6. Ultrasonics :9 hrs

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications of ultrasonic waves.

Reference Books:

1. BSc Physics -Telugu Akademy, Hyderabad
2. First Year Physics - *Telugu Academy*.
3. Fundamentals of Physics. Halliday/Resnick/Walker ,*Wiley India Edition 2007*.
4. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy *Orient Longman*.
5. Mechanics of Particles, Waves and Oscillations. Anwar Kamal, *New Age International*.
6. College Physics-I. T. Bhimasankaram and G. Prasad. *Himalaya Publishing House*.
7. Introduction to Physics for Scientists and Engineers. F.J. Ruche. *McGraw Hill*.
8. Waves and Oscillations. N. Subramaniyam and Brijlal *Vikas Publishing House Private Limited*.
9. Unified Physics Vol.I Mechanics, Waves and Oscillations – *Jai Prakash Nath & Co.Ltd.*
10. *Meerut*.
11. Science and Technology of Ultrasonics- Bladevraj, *Narosa, New Delhi,2004*

Practical Paper 2: Waves & Oscillations

Work load:30 hrs per semester 3 hrs/week

Minimum of 8 experiments to be done and recorded

1. Determination of 'g' by compound/bar pendulum
2. Simple pendulum normal distribution of errors-estimation of time period and the error of the mean by statistical analysis
3. Determination of the force constant by static and dynamic method and evaluation of 'g'.
4. Determination of the elastic constants of the material of a flat spiral spring.
5. Determination of moment of inertia of a cylindrical rod -bifilar suspension
6. Coupled oscillators
7. Verification of laws of vibrations of stretched string –sonometer
8. Determination of velocity of transverse wave along a stretched string-sonometer
9. Determination of frequency of a bar –Melde's experiment.
10. Study of a damped oscillation using the torsional pendulum immersed in liquid-decay constant and damping correction of the amplitude.
11. Searls viscometer
12. Lissajous figures-CRO

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B.Sc. (Physics) (Non-Mathematics Combinations)
Scheme of instruction and examination to be followed w.e.f. 2015-2016

S.No	Semester	Title of the paper	Instruction Hrs/week	Duration o f exam (hrs)	Max Marks (external)
		Thoery			
1	First	Paper I: Mechanics & Properties of Matter			75
2	Second	Paper II: Waves & Oscillations			75
1	First	Practical 1			75
2	Second	Practical II			75

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SEMESTER PATTERN UNDER CHOICE BASED CREDIT SYSTEM
COMMON CORE SYLLUBUS
B.Sc. 1st Semester Physics
Paper I: Mechanics & Properties of Matter
(For Non-Mathematics Combinations)

Work load:60 hrs per semester **4 hrs/week**

UNIT -I

1. Mathematical Background: 8 hours

Scalars and vectors –vector addition-scalar and vector products of vector and their physical significance-vector calculus-gradient of a scalar point function-divergence and curl of vector-statements of stokes and Gauss theorems -examples (no derivations).

2.Motion of system: 8 hours

Collisions- Elastic and inelastic collisions-Collisions in one and two dimension-Rocket propulsion-Center of mass-Motion of the centre of mass-Impact parameter-Scattering cross-section, Rutherford scattering (No derivation-Qualitative ideas only)

UNIT II

3. Mechanics of Rigid body: 12 hours

Rotational kinetic energy and moment of inertia -Calculating the moment of inertia in simple cases (Rod, disc, sphere and cylinder)-parallel & Perpendicular axes theorems-Torque-relation between torque and angular momentum.

Angular momentum of a particle-Torque and angular momentum for a system of particles-conservation of angular momentum-Translation and rotational motion of system-Elementary ideas about gyroscopic motion (No derivation –discussion of results)- precission of the equinoxes

UNIT-III

4.Central forces :10 hours

Central force- Def & examples- General properties of central forces-Conservative nature of central forces, Planetary motion-Kepler's laws (Statements & Explanation), Newton's law of gravitation from Kepler's law, Geostationary Satellite Motion.

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UNIT-IV

5. Fluid Flow :10 hours

The flow of ideal fluids-Equation of continuity –Bernoulli's equation-Torricelli's theorem-The venture meter-Pitot's tube-Viscosity and the flow of real fluids- Poisellious equation.

UNIT V

6. Relativistic effects :12 hours

Moving reference frames-Inertial reference frames-Galilean relativity (Elementary treatment only, application to be covered)–Special theory of relativity-Statements of the two basic postulates-Lorentz transformation equations-length contraction-time dilation-addition of velocities-Momentum and relativistic mass- Mass –Energy equation, rest mass & momentum of a particle.

Reference Books :

1. BSc Physics -Telugu Akademy, Hyderabad
2. Properties of Matter - D.S. Mathur, *S.Chand & Co, New Delhi ,11th Edn., 2000*
3. Properties of Matter - Brijlal& Subrmanyam ,*S.Chand &Co. 1982*
4. Physics for Biology and Premedical Students –D.N. Burns & SGG Mac Donald
5. Unified Physics Vol.I Mechanics,Waves and Oscillations – *Jai Prakash Nath & Co.Ltd., Meerut.*

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Paper II: Waves & Oscillations
(For Non-Maths Combinations)
II SEMESTER

Work load:60 hrs per semester **4 hrs/week**

UNIT-I: **15 hrs.**

1.Oscillatory Motion

Simple harmonic motion-Equation of motion and solution-Simple harmonic motion from the standpoint of energy-The rotor diagram representation of simple harmonic motion-Compound pendulum-determination of g and k, torsional pendulum-determination of n, Combination of Simple harmonic motions along a line and perpendicular to each other-Lissajous figures-

UNIT II: **14 hrs**

2.Damped Oscillators

Damped Vibrations- examples, damped harmonic oscillator-Equation of motion-Assumption of solution for various boundary conditions- Over damping under damping and critical damping-The harmonic oscillator-Equation of motion –Resonance-Sharpness of resonance-Q-factor.

UNIT-III: **11 hrs**

3. Wave Motion

Progressive waves-Equation of a progressive wave-sinusoidal waves-Velocity of waves in elastic media-Standing waves-Transverse vibrations of stretched strings, overtones and harmonics. Sonometer verification of laws of transverse vibrations in a stretched string, beats (qualitative analysis Only).

UNIT-IV: **10 hrs**

4.Acoustics

Classification of sound, Characteristics of musical sound, Acoustics of Buildings, Reverberation, Sabine's formula (without derivation) Absorption coefficient, Factors affecting acoustics of buildings, Intensity of sound, Sound distribution in an auditorium.

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UNIT V: **10 hrs.**

5. Ultrasonics

Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications of ultrasonic waves.

Reference Books:

1. Physics for Biology and Premedical Students –D.N. Burns & SGG Mac Donald
2. BSc Physics -Telugu Akademy, Hyderabad
3. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy Orient Longman.
4. Waves and Oscillations. N. Subramaniyam and Brijlal Vikas Publishing House Private Limited.
5. Unified Physics Vol.I Mechanics, Waves and Oscillations – Jai Prakash Nath & Co.Ltd., Meerut.
6. Properties of Matter and Acoustics – R Murugeshan and K. Shivaprasath, S Chand & Co.Ltd. (2005-Ed)
7. Acoustics – Waves and Oscillations - S. N. Sen – Wiley Estern Ltd
8. Text Book of Sound-S.R.Shankara Narayana, Sultan Chand & Sons, New Delhi

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