PROPOSED UNIFORM SYLLABUS FOR
U.P. STATE UNIVERSITIES

Three Years Degree Course
PHYSICS
B.Sc.- FIRST YEAR

		Max. Marks
PAPER I	MECHANICS AND WAVE MOTION	50
PAPER II	KINETIC THEORY AND THERMODYNAMICS	50
PAPER III	CIRCUIT FUNDAMENTALS AND BASIC ELECTRONICS	50
PRACTICAL	TWO PRACTICALS (30 MARKS) + VIVA (10 MARKS) + RECORD (10 MARKS)	50
TOTAL		200

Candidate must obtain minimum pass marks in Theory and Practical Examinations separately.

PAPER I - MECHANICS AND WAVE MOTION

UNIT-I

Inertial reference frame, Newton's laws of motion, Dynamics of particle in rectilinear and circular motion, Conservative and Non -conservative forces, Conservation of energy, liner momentum and angular momentum, Collision in one and two dimensions, cross section.

UNIT -II

Rotational energy and rotational inertia for simple bodies, the combined translation and rotational and motion of a rigid body on horizontal and inclined planes, Simple treatment of the motions of a top. Relations between elastic constants, bending of Beams and Torsion of Cylinder.

UNIT - III

Central forces, Two particle central force problem, reduced mass, relative and centre of mass motion, Law of gravitation, Kepler's laws, motions of planets and satellites, geo-stationary satellites.

UNIT IV

Simple harmonic motion, differential equation of S. H. M. and its solution, uses of complex notation, damped and forced vibrations, composition of simple harmonic motion.

Differential equation of wave motion, plane progressive waves in fluid media, reflection of waves, phase change on reflection, superposition, stationary waves, pressure and energy distribution, phase and group velocity.

Text and Reference Books

EM Purcell. Ed: "Berkeley Physics Course, Vol. 1. Mechanics" (McGraw-Hill). RP Feymman. RB Lighton and M Sands: "The Feymman Lectures in Physics", Vol. 1 (BI Publications. Bombay, Delhi, Calcutta, Madras).
J.C. Upadhyay: 'Mechanics'.

D.S. Mathur "Mechanics",
P.K. Srivastava: "Mechanics" (New Age International).

PAPER II- KINETIC THEORY AND THERMODYNAMICS

UNIT-I

Ideal Gas: Kinetic model, Deduction of Boyle's law, interpretation of temperature, estimation of r.m.s. speeds of molecules. Brownian motion, estimate of the Avogadro number. Equipartition of energy, specific heat of monatomic gas, extension to di- and triatomic gases, Behaviour at low temperatures. Adiabatic expansion of an ideal gas, applications to atmospheric physics.

Real Gas: Vander Waals gas, equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants, gas and vapour. Joule expansion of ideal gas, and of a Vander Waals gas, Joule coefficient, estimates of J-T cooling.

UNIT -II

Liquefaction of gases: Boyle temperature and inversion temperature. Principle of regenerative cooling and of cascade cooling, liquefaction of hydrogen and helium. Refrigeration cycles, meaning of efficiency.

Transport phenomena in gases: Molecular collisions, mean free path and collision cross sections. Estimates of molecular diameter and mean free path. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

UNIT - III

The laws of thermodynamics: The Zeroth law, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency. Carnot theorem and the second law of thermodynamics. Different versions of the second law, practical cycles used in internal combustion engines. Entropy, principle of increase of entropy. The

thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero;

third law of thermodynamics. Thermodynamic relationships: Thermodynamic variables; extensive and intensive, Maxwell's general relationships, application to Joule-Thomson cooling and adiabatic cooling in a general system, Van der Waals gas, Clausius-Clapeyron heat equation. Thermodynamic potentials and equilibrium of thermodynamical systems, relation with thermodynamical variables. Cooling due to adiabatic demagnetization, production and measurement of very low temperatures.

UNIT -IV

Blackbody radiation: Pure temperature dependence, Stefan-Boltzmann law, pressure of radiation, spectral distribution of Black body radiation. Wien's displacement law, Rayleigh-Jean's law, Plank's law the ultraviolet catastrophy.

Text and Reference Books

G.G. Agarwal and H.P. Sinha "Thermal Physics"

S.K. Agarwal and B.K. Agarwal "Thermal Physics"

PAPER III - CIRCUIT FUNDAMENTALS AND BASIC ELECTRONICS

UNIT-I

Growth and decay of currents through inductive resistances, charging and discharging

in R.C. and R.L.C. circuits, Time constant, Measurement of high resistance.

A.C. Bridges, Maxwell's and Scherings Bridges, Wien Bridge.

THINLY, NORTON and Superposition theorems and their applications.

UNIT -II

Semiconductors, intrinsic and extrinsic semiconductors, n-type and p-type semiconductors, unbiased diode forward bias and reverse bias diodes, diode as

a rectifier, diode characteristics, zener diode, avalanche and zener breakdown, power supplies, rectifier, bridge rectifier, capacitor input filter, voltage regulation, zener regulator.

Bipolar transistors, three doped regions, forward and reverse bias, DC alpha, DC beta

transistor curves.

UNIT - III

Transistor biasing circuits: base bias, emitter bias and voltage divider bias, DC load line.

Basic AC equivalent circuits, low frequency model, small signal amplifiers, common emitter amplifier, common collector amplifiers, and common base amplifiers, current and voltage gain, R.C. coupled amplifier, gain, frequency response, equivalent circuit at low, medium and high frequencies, feedback principles.

UNIT-IV

Input and output impedance, transistor as an oscillator, general discussion and theory of Hartley oscillator only.

Elements of transmission and reception, basic principles of amplitude modulation and demodulation. Principle and design of linear multimeters and their application, cathode ray oscillograph and its simple applications.

Text and Reference Books

B.G. Streetman; "Solid State Electronic Devices", IInTdi Edition (Prentice Hall of India, New Delhi, 1986).

W.D. Stanley: "Electronic Devices, Circuits and Applications" (Prentice-Hall, New TTC'A 1flOO\ JL4y, JJI. 1OO).

J.D. Ryder, "Electronics Fundamentals and Applications", II'' Edition (Prentice-Hall of India, New Delhi, 1986).

J Millman and A Grabel, "Microelectronics". International Edition (McGraw Hill Book Company, New York, 1988).

PRACTICALS

Every institution may add any experiment of the same standard in the subject.

Mechanics

1. Study of laws of parallel and perpendicular axes for moment of inertia.
2. Study of conservation of momentum in two dimensional oscillations.

Oscillations

1. Study of a compound pendulum.
2. Study of damping of a bar pendulum under various mechanics.
3. Study of oscillations under a bifilar suspension.
4. Potential energy curves of a 1-Dimensional system and oscillations in it for various amplitudes.
5. Study of oscillations of a mass under different combinations of springs.

Properties of matter

1. Study of bending of a cantilever or a beam.
2. Study of torsion of a wire (static and dynamic methods)

Kinetic theory of matter

1. Study of Brownian motion.
2. Study of adiabatic expansion of a gas.
3. Study of conversion of mechanical energy into heat.
4. Heating efficiency of electrical kettle with varying voltages.

Thermodynamics

1. Study of temperature dependence of total radiation.
2. Study of temperature dependence of spectral density of radiation.
3. Resistance thermometry.

4.   Thermo-emf thermometry

5.   Conduction of heat through poor conductors of different geometries.

Circuit fundamentals

1.   Charging and discharging in R.C. and R.C.L. circuits.

2.   High resistance by leakage.

3.   A.C. Bridges.

4.   Half wave and full wave rectifiers.

5.   Characteristics of a transistor in CE,CB and CC configurations

6.   Frequency response of R.C. coupled amplifier.

Waves

I.   Speed of waves on a stretched string.

2.   Studies on torsional waves in a lumped system.

3.   Study of interference with two coherent sources of sound.

Text and reference books

D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing

House, New Delhi).

S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).

Worsnop and Flint- Advanced Practical physics for students.