

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Programme with 144 credits

CBCS-Semester-Grading Pattern

w.e.f. June-2011

General Pattern/Scheme of study components along with credits for Science faculty.

Part/Class	Subject code	Study Component s	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
Sem -I B.Sc.		Semester-I					
		Core Compulsory (CC) Course					
	CC-I-1	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-1	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-1	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-1	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-1	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-1	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-1	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-1	Elective (Generic) Course -I	2		50	50	2
	ES-1	Elective (Subject) Course -I	2		50	50	2
		30	105	495	600	24	
Sem-II B.Sc.		Semester-II					
		Core Compulsory (CC)Course					
	CC-I-2	Core Course-I (Paper-1)	4	30	70	100	4
	CC-II-2	Core Course-II (Paper-1)	4	30	70	100	4
	CC-III-2	Core Course-III (Paper-1)	4	30	70	100	4
		Practical Core (PC) Course					
	PC-I-2	Practical Core Course-I (Paper-1)	4		50	50	2
	PC-II-2	Practical Core Course-II (Paper-1)	4		50	50	2
	PC-III-2	Practical Core Course-III (Paper-1)	4		50	50	2
		Foundation Course (FC)					
	FC-2	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
		Elective Course (E)					
	EG-2	Elective (Generic) Course -II	2		50	50	2
	ES-2	Elective (Subject) Course -II	2		50	50	2
		30	105	495	600	24	

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B. Sc. :: PHYSICS :: SEMESTER-I

CC PHY-101

(in force from June 2011)

Unit – I

(a) Vector analysis:

Triple Products of Vectors (2.20), Scalar Triple Product (2.21), Some Important Conclusions from Scalar Triple Product (2.22), The Vector Triple Product

$A \times (B \times C)$ (2.23), Differentiation of a Vector with Respect to time (3.1), Scalar and Vector Fields (3.3), Partial Differentiation and Gradient (3.4), Operations with ∇ (3.5), The rate of Flow of flux of a Vector Field (3.8), Vector Integration (3.9), Surface Integral (3.12), Gauss's Divergence Theorem (3.13), Stoke's Theorem (3.14), Derivation of Green's Theorem from Gauss Divergence theorem (3.18)

Basic reference:

Electricity and Magnetism By K.K. Tewari (S.Chand & Company Ltd.)

(b) Simple Harmonic Motion and Damped Vibration

Composition of Two Simple Harmonic Motions along the same direction of the same frequency (2.8), Composition of two simple harmonic motions acting upon a particle simultaneously at right angles to each other, same time period but different in phase (2.10), Motion in a resisting medium (3.5).

Basic reference:

A Textbook on Oscillations, Waves and Acoustics - By M.Ghosh & D.Bhattacharya, (S.Chand & Company Ltd.)

Other reference:

1. Mathematical methods in physical sciences By M.L.Boas (John Willey & Sons)

2. Waves And Oscillations By N.Subrahmanyam & Brij Lal

(Vikas Publishing House Pvt Ltd., New Delhi)

Unit – II

(a) D.C. Circuits:

Simple R-L Circuit - Growth and Decay of Current Helmholtz equation (11.24), R-C Circuit (11.25), Measurement of high resistance by method of leakage (11.26), Comparison of capacities by De Sauty's Method (11.27), Ideal L-C. Circuit (11.28), Series LCR Circuit (Charge case only) (11.29),

(b) Network Theorems:

Superposition Theorem (18.5), Thevenin's Theorem (18.6), Norton's Theorem (18.7), Maximum Power Theorem (18.8)

Basic reference: For (a) & (b)

Electricity and Magnetism By K.K.Tewari (S.Chand & Company Ltd.)

Other reference:

- 1.Electrical Circuit Analysis By Sony and Gupta
- 2.Network Analysis By G.K.Mittal (Khanna Publications)
- 3.Electricity and Magnetism By D.C. Tayal

Unit – III

(a) Heat and Thermodynamics:

Second Law of Thermodynamics (2.8), Carnot's Theorem (2.9), Thermodynamic Scale of Temperature (2.10), Identity of Perfect Gas Scale and Absolute Scale (2.11), Thermodynamics of Refrigeration (4.2)

(b) Entropy:

Entropy (2.13), Change of Entropy in a Reversible process (2.14), Change of Entropy in an Irreversible process (2.15), Principle of increase of entropy or degradation of energy (2.16), Formulation of the second law in terms of entropy (2.17), Entropy and Second Law (2.18)

Basic reference: For (a)& (b)

Thermodynamics and statistical Physics By Singhal, Agarwal and Prakash (Pragati Prakashan, Meerut)

Other reference:

1.Heat and Thermodynamics By Zeemansky

2.University Physics By Sears, Zeemansky and Young

(Narosa Publishing House)

3.Heat and Thermodynamics By Richard H.Dittmon, &

Mark W.Zemansky (TMH)

4.Heat and Thermodynamics By A.B.Gupta and H.P.Roy (New Central Book)

Unit – IV

(a) Rectifier and filter circuits:

The Half Wave Rectifier (2.2),Voltage regulation (2.3),Ripple factor(2.4) Ratio of Rectifications (2.5),Transformer utilization factor (2.6),The Full Wave Rectifier (2.8),The Bridge Rectifier (2.9),The Inductor filter (3.1),The Capacitor filter (3.3),Ripple factor (3.4),The Choke input filter (3.9),Ripple factor in LC filter (3.10),Value of Critical inductance (3.11),The CLC filter (3.13)

Basic reference:

Electronic Devices & Circuits by Allen Mottershead (PHI Pvt.Ltd)

(b) Transistors:

(Review of Construction of transistor)

Transistor current components (4.18), Detailed Transistor Leakage currents (4.18-1), C-B Configuration static characteristics (4.19-1),Load line (4.21),Operating point (4.22)

Basic reference:

Hand Book of Electronics by Gupta & Kumar (Pragati Prakashan, Meerut-Revised addition)

Other reference:

1. Electronics and Radio Engineering by M.L.Gupta.

2. Basic Electronics and Linear circuits by Bhargva Kulshreshth & Gupta

TMH Edition

3. Elements of Electronics by Bagde & Singh.

B.Sc.Semester-I

PC:PHY-102

LABORATORY EXPERIMENTS FOR PHYSICS

GROUP – I

1. Damping coefficient, Relaxation and quality factor in the damped motion of a simple Pendulum.
2. M.I. of a Fly wheel.
3. Verification of Steafan's law using A.C.Source.
4. Arrangement of Spectrometer for parallel rays using Schuster method and clibration of spectrometer.
5. Refractive index of liquid using convex lens.
6. Study of Resonator.
7. To determine the magnetic moment of a given Bar magnet using deflection magnetometer in Gauss A and B position.

GROUP – II

1. Determination of the capacity 'c' of condenser.
2. Study of the series resonance with frequency variation.
3. Decay of Potential across condenser.
4. P-N Junction diode as Half Wave Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
5. V-I characteristics of Zener diode and its use as Voltage regulator.
6. Verification of Thevenin's theorem.
7. Characteristics of common Emitter Transistor.

Unit – I

(a) Mechanics of a single particle & of particles:

Motion of a particle subjected to a resistive force 3.3(d) [1 to 5], mechanics of a system of particle(3.5), Motion of a system with variable mass(3.6)

(b) Motion in a central force field & Pendulum:

(i) Equivalent one body problem(5.1), Motion in central force field(5.2) General features of the motion(5.3), Motion in a inverse square law force field (5.4) Equation of the orbit(5.5). Kepler's law of planetary motion (5.6)

(ii) Compound Pendulum (6.4), Bar-Pendulum (6.9)

Basic reference: For (a) & (b)(i)

Introduction To Classical Mechanics By R.G. Takwale & P.S.Puranik (Tata McGraw-Hill Publishing Company Ltd.)

Basic reference: For (b)(ii)

Elements of Properties of Matter By D.S.Mathur (S.Chand & Company Ltd.)

Other reference:

1.Mechanics & Electrodynamics By Brij lal, N.Subrahmanyam & Jivan

Seshan –(S.Chand & Co.)

2.Classical Mechanics by Goldstain (Narosa Pub.)

Unit – II

(a) Refraction Through Lenses:

Principal Foci (2.3), Least possible distance between an object & its real image in a convex lens(2.4), Derivation produced by a thin lens(2.5), Equivalent Focal Length of Two Thin Lenses Separated by a Finite Distance (2.6), Cardinal Points of an Optical system (2.8), Principal Foci and Focal Planes (2.9), Principal Points and Principal Planes (2.10), Nodal Points (2.11) Aberrations(3.1),Spherical aberration in a Lens (3.5),Chromatic aberration (3.12).

(b) Interference:

Interference in thin films (8.15), Interference due to reflected light (8.16), Interference due to transmitted light (8.17), Newton's Rings (8.23), Determination of the wavelength of sodium light using Newton's Rings (8.24), Refractive Index of a Liquid using Newton's Rings (8.25)

Basic reference: For (a) & (b)

A Textbook of OPTICS By N.Subrahmanyam & Brij Lal (S.Chand & Company Ltd.)

Other reference:

- 1.Optics and Atomic Physics By D.P.Khandelval (Himalaya publishing house)
- 2.Principles of Optics By B.K.Mathur (S.Chand & Company Ltd.)
- 3.Optics By Ajoy Ghatak (TMH Edition)

Unit – III

(a) Electrostatics:

Gauss's Law (4.21), Gauss's Law in Differential Form (4.22), Gauss's Law and Coulomb's Law (4.23), Force on The surface of a charged Conductor (4.25), Electrostatic Energy in the medium surrounding the charged conductor (4.26), Millikan's Oil drop Method for Determination of Electronic charge (4.29),

(b) Steady Current:

Current and current density (8.6), Conservation of Charge i.e., Continuity Equation (8.8), Ohm's Law at a Point (8.11), Wiedmann and Franz Law (8.13), The Relaxation Time (8.14).

Basic reference: For (a) & (b)

Electricity and Magnetism By K.K.Tewari (S.Chand & Company Ltd.)

Other reference:

- 1.Electricity and Magnetism by Mahajan and Rangwala.
- 2.Electricity and Magnetism - Berkley Physics Course Vol-II

Unit – IV**(a) Waves:**

Theory of Resonator (6.16), Dependence of the Frequency of Resonator on the size and the Shape of the Mouth (6.17), Velocity of Transverse Waves along a Stretched String (7.1), Laws of Transverse Vibration of Strings (7.3), Melde's Experiment (7.5), Kundt's Tube (7.13)

(b) Ultrasonic waves:

Ultrasonics (11.23), Production of Ultrasonic Waves (11.24), Piezo-Electric Oscillator (11.24.3), Detection of Ultrasonic Waves (11.25), Applications of Ultrasonic waves (11.27)

Basic reference: For (a) & (b)

Waves and Oscillations By N.Subrahmanyam and Brij Lal (Vikas Publishing House Pvt. Ltd., New Delhi) – Second Revised Edition.

Other reference:

- 1.University Physics By Sears, Zeemansky and Young (Narosa Publishing House)
- 2.A Text Book on Oscillations, Waves and Acoustics By M.Ghosh & D.Bhattacharya (S.Chand)
- 3.Vibration, Waves & Heat By Sears and Zeemansky

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B. Sc. :: PHYSICS :: SEMESTER-I

PC PHY-104

(in force from June 2011)

LABORATORY EXPERIMENTS

GROUP – I

1. Bar Pendulum : Determination of 'K' and 'g'
2. Double Refraction by Calcite prism.
3. Newton's rings : Determination of R and λ using sodium light.
4. Melde's Experiment.
5. Find out Refractive index of prism using spectrometer.
6. Study of line spectra.
7. To determine the ratio of magnetic moments of two magnets by using vibrational magnetometer.

GROUP – II

1. Determination of self inductance 'L' of Inductor.
2. Study of parallel resonance with frequency variation.
3. Study of transformer.
4. P-N Junction diode as Full Wave Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
5. Bridge Rectifier (i) Without filter (ii) With Series inductor Filter (iii) With Shunt Capacitor Filter. Calculation of percentage of regulation.
6. Verification of Maximum power transfer theorem.
7. Basic Logic Gates AND , OR , NOT

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

List of Elective (Subject) Courses For Physics

(in force from June 2011)

Credits-2

Elementary Mechanics	Electrical Circuits and Electronics
Oscillations and Waves	Modern Physics
Mathematical Methods in Physics-I	Physics of Solids
Mathematical Methods in Physics-II	Mathematical Methods in Physics-III
Thermodynamics and Statistical Mechanics	Astronomy and Astrophysics
Electric and Magnetic Phenomena	Communication Physics
Optics	
NANO TECHNOLOGY	
Nuclear Energy	
ENERGY PHYSICS	
LASER	
Instrumentation Measurement and analysis	
Climate Change	

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
PHYSICS: SEMESTER-I of B.Sc.

Core Elective

NANO TECHNOLOGY

UNIT-I

INTRODUCTION: Pre- Nanotechnology, Origins of Concepts of Nano, Advances in Experimental Methods, Nanotechnology-Basics and Basis, Size of Nano, The Meaning of Nanotechnology, Four Generations of Nanotechnology Development, Technology of General Applicability, Multi-purpose Technology, Applications of Nanotechnology.

NANOCHEMISTRY: Introduction, Basic Concepts, Classification of Nanomaterials, Techniques of Production or Methodology, Size Concerns.

Fullerenes: Introduction, History of Discovery, Variations, Properties of Fullerenes.

UNIT-II

Carbon Nanotube: Introduction, Discovery, Description, 'Types of Carbon Nanotubes and Related Structures, Single-walled Nanotubes, Multi-walled Nanotubes, Introduction, Structure, Research, Self-assembled Monolayers, Applications.

NANOPHYSICS: Quantum Dot, Description, Quantum Confinement in Semiconductors, Optical Properties, Fabrication, Mass Production, Applications, Computing Field, Biology, Cellular Imaging, Quantum Dots for Tumour Targeting, Toxicity, Photovoltaic Devices, Light-emitting Devices, Quantum Wire, Carbon Nanotubes as Quantum Wires, Quantum Well, Fabrication, Applications, Quantum Point Contact, Fabrication, Properties, Applications. Nanocrystals, Nanocrystal solar cell.

References:

- (1) Nanotechnology by S. Shanmugam, MJP Publishers
- (2) Nanobiotechnology by Subbiah Balaji, MJP Publishers
- (3) Nanoscience and Technology by V S Muralidharan, A subramania, Ane Books Pvt Ltd

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
PHYSICS: SEMESTER-I of B.Sc.

Core Elective

Nuclear Energy

Unit-1

Mechanism of Nuclear Fission, Fission Cross sections, Fission reactors, Fission Rate & reactor Power, Fission neutrons and gamma rays, prompt neutrons, delayed neutrons, fission gamma rays, Fission products, Amounts and activities of fission products, Fission-product activity after shutdown, Heat generation after shutdown

Unit-2

Nuclear Fusion – Thermonuclear reactions – Energy production in stars.
Fundamental interactions & elementary particles, Strong, Weak & Electromagnetic interactions.

Books:

- Nuclear Physics : Theory and Experiments, R. Roy and B.P. Nigam, Wiley Eastern.
- Physics of Nuclei and Particles, P. Marmier and E. Sheldon, Vol.1, Academic Press Physics of the Nucleus, M.A. Preston Addison Wesley

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
PHYSICS: SEMESTER-I of B.Sc.

Core Elective

ENERGY PHYSICS

UNIT-I: Conventional Energy Sources

World's reserve: commercial energy sources and their availability – various forms of energy-renewable and conventional energy system-comparison-Coal, Oil and natural gas- applications – Merits and Demerits.

UNIT –II: Solar Energy

Renewable energy sources-solar energy-nature and solar radiation-components- solar heaters-crop dryers-solar cookers-water desalination (block diagram) Photovoltaic generation-merits and demerits

Books for Study:

“Renewable energy sources and emerging Technologies”, by D.P. Kothari, K.C. Singal & Rakesh Ranjan, Prentice Hall of India Pvt. Ltd., New Delhi(2008)

Books for Reference:

“Renewable energy sources and their environmental impact”- S.A. Abbasi and Nasema Abbasi PHI Learning Pvt. Ltd., New Delhi(2008)

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
PHYSICS: SEMESTER-I of B.Sc.

Core Elective

LASER

UNIT-I: Fundamentals of LASER

Spontaneous emission-stimulated emission-meta stable state- Population inversion-pumping – Laser Characteristics.

UNIT-II: Production of LASER

Helium-Neon Laser-Ruby Laser-CO₂ Laser- Semiconductor Laser, Laser for cutting, welding & drilling.

Book for Study:

An introduction to LASERS- N. Avadhanulu, S. Chand & Company (2001)

Books for Reference:

1. Laser Fundamentals- William T. Silfvast Cambridge University Press- Published in South Asia by foundation books,23, Ansari Road, New Delhi
2. LASER Theory and Application- K. Thyagrajan and A.K. Ghatak, Mac millan, India Ltd.

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
PHYSICS: SEMESTER-I of B.Sc.

Core Elective

Instrumentation Measurement and analysis

UNIT-I:

Vernier Calipers: Introduction, Theory, Figure, Description of the instrument, Detail study of Least count, Errors, Positive error, negative error, Determination of magnitude of positive and negative errors.

Micrometer Screw: Introduction, Theory, Figure, Description of the instrument, Definition of pitch and its determination, study of least count, Meaning of the error and explanation of positive and negative errors. Determination of positive and negative errors. Method of taking observation with the help of Micrometer Screw.

Spherometer : Introduction, Theory, Figure, Description of the instrument, To determine the pitch of the screw, To determine the least count of the spherometer, Zero error, Derivation of the formula for the radius of curvature of a curved surface.

UNIT-II

Wheastone Bridge: Introduction, Theory with figure, The figure of meter bridge used in laboratory, construction of Meter bridge.

Post-Office box: Introduction, Theory, Circuit Diagram, Theoretical Circuit diagram, explanation of working with necessary formula.

Construction of Galvanometer: Introduction, Theory, Sensitivity and Figure of Merit of Galvanometer.

Spectrometer: Introduction, Construction and explanation of three main parts of Spectrometer, Mercury Discharge lamp, Sodium Discharge lamp, The adjustment, leveling and the method of recording the observation of Spectrometer.

Book for Study: Experimental Book for Physics.

HEMCHANDRACHARYANORTH GUJARAT UNIVERSITY, PATAN
PHYSICS: SEMESTER-I of B.Sc.

Core Elective

Climate Change

UNIT-1: Global Warming and Greenhouse Effect

- 1.Introduction,**
- 2.Greenhouse Gases and Global Climate Changes**
- 3. Global Warming Potential**
- 4. Possible Impact of Warming**
- 5. Greenhouse Effect-Policy Response,**

UNIT-2: Global Ozone Problem:

- 1. Ozone in the Atmosphere**
- 2. Ozone Depletion Process**
- 3. Ozone Hole**
- 4. The Montreal Protocol**
- 5. Consequences of Ozone Depletion,**

Book for Study:

Chapter 16 & 17 of Environment Science by SC Santra, New Central Book Agency(P) Ltd.Kolkata, India

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
List of Elective (Generic) Courses
(in force from June 2011)
Credits-2

Elective (Generic) Course	
Semester-I	
Computer Skill-1	National Ethics
Human Society and Ethics	Indian Culture and Heritage
Society an Technology	Stress management
Indian Constitution	
Semester-II	
Environment science	Disaster management
Semester-III	
Computer Skill-II	Cultural heritage of Gujarat
Value Oriented education	Human resource development
Personality Development	
Semester-IV	
Basic computer applications	Presentation skills
Social ethics	Indian knowledge system
First aid and emergency care	
Semester-V	
Gandhi and phyloshopy	Library - a learning resource center
Indian religions	Handling of household equipments
Indian history	E-marketing (Telemarketing)
Indian geography	
Semester-VI	
Fundamental rights and duties	Hospitality
Vedic sciences	International relations
Indian Tribal Culture	