HEMCHANDRACHARYA
NORTH GUJARAT UNIVERSITY
PATAN-384 265

NAAC'B' (CGPA) Accredited (State University)

U.G. (B. Sc.) Programme

CBCS :: Semester :: Grading Pattern

With effect from: June 2013 (In Continuation)

Faculty

Science

Subject

PHYSICS

SYLLABUS

B.Sc. Semesters- V & VI

Total Pages: **1 to 31**

Submitted on **Chairman**

Date: **B.O.S. PHYSICS**

Choice Based Credit System-Semester-Grading System In Under Graduate B Sc Programme

The 11th Five Year plan of India proposed various measures for academic reforms in higher education. Keeping in view the challenges of the changed times and make the higher education in Indian Universities compatible with the universities in developed nations, the UGC (11th Plan, March 2009) and later on the Association of Indian Universities (AIU) stressed on the following recommendations:

- Semester System
- Choice Based Credit System.
- Curriculum Development
- Examination Reforms
- Administrative Reforms

All the above recommendations for reforms have been reviewed in by representatives of various universities in the Gujarat State and considered for implementation with the aim of transforming Higher Education-**a transformation where students change from being passive recipients of knowledge to becoming active participants of the knowledge imbibing process**. The education system in the State thus changes from a teacher-centric to **learner-centric** mode. It should aim at all-round integral development of students' personality so that they become good citizens of the new world order.

Salient Features of CBCS in UG programme:

1. Physics subject in the Universities/Affiliated Colleges shall offer undergraduate programme in Faculty of Science from the Academic year 2011-12.
2. A student will have to get enrolled a **Core course** depending upon his/her requirement of a degree in the said discipline of study. A student will have a choice of selecting an **Elective** as well as **Foundation** courses from a pool of courses.
3. Each course shall be assigned a specific number of **Credits**.
4. A Core course is the course which should compulsorily be studied by a candidate as a Core requirement so as to get degree in a said discipline of study.
5. There shall be four **Core Compulsory** courses (Theory) each with **3 credits** and their practical's each with **1.5 credits**. Thus, a credit weight-age in Sem-V&VI of **B Sc** programme for each core course shall be of **4.5 credits**. In short, 4.5 credits multiplied by 4 core compulsory courses equal to total of **18 credits**.
6. In addition to the Core courses, a student will have to choose Elective as well as Foundation courses from a pool of courses.

7. **Two** courses of **Elective**, one each from **Generic Elective** and Interdisciplinary / Multidisciplinary / **Subject centric electives** shall have to be offered. The credit weight-age for each Elective course shall be of **02 Credits**. Hence, a total credit weight-age for Elective courses shall be of **4 credits**.
8. One **Foundation** (English Language) course shall have to be offered. The credit weight-age for Foundation course shall be of **02 credits**.

Each course shall have a unique Course code. The Core courses, Elective courses and the Foundation courses shall be abbreviated respectively as **CC, PC, EG, ES and FC.**

1. Core Compulsory -**CC**
   Practical Core -**PC**
2. Elective Generic - **EG**
   Elective Subject - **ES**
3. Foundation Compulsory- **FC**

Each Academic year shall consist of **two** semesters, each of **15 weeks** of teaching equivalent to 90 working days. The Odd semester period shall be from **July to November** and the Even semester period shall be from **December to April**.

The course with **4 credits** shall be of **60 hrs** (15 weeks x 4 credits) duration. The course with **3 credits** shall be of **45 hrs** (15 weeks x 3 credits) duration. The course with **2 credits** shall be of **30 hrs** (15 weeks x 2 credits) duration.

A general framework for Bachelor of Science (B Sc) programme shall be as follows:

Semester wise credits						Total credits of the Programme
I	**II**	**III**	**IV**	**V**	**VI**	
24	24	24	24	24	24	**144**

The semester wise weightage of core, elective and foundation courses shall be as follows:

Academic Year	Core compulsory Courses	Elective courses	Foundation courses
Semester I & II	65-75%	15-20%	10-15%
Semester III & IV	65-75%	15-20%	10-15%
Semester V & VI	65-75%	15-20%	10-15%

Attendance:

The Attendance Rules as per the norms of Hemchandracharya North Gujarat University.

Medium of Instruction:

The Medium of Instruction shall be of **Gujarati medium**. Student is free to write answers either in **Gujarati** or **English** language.

Language of Question paper:

Question paper should be drawn in **Gujarati** language and its **English** version should be given.

Evaluation Methods:

1. A student shall be evaluated through Comprehensive Continuous Assessment (**CCA**)/ (**Internal Evaluation**) as well as the **End of Semester examination** (**External Evaluation**). The weight-age of CCA shall be 30%, where as the weight-age of the Semester end examination shall be 70%. There will be **no internal evaluation in practical courses** as well as in **elective courses**.

2. The Semester assessment (**CCA**)/ (**Internal Evaluation**) is spread through the duration of the course and is to be done by the Teacher teaching the course. The assessment is to be done by various means including:

    - ✓ Internal Test - 20Marks
    - ✓ Assignments - 05Marks
    - ✓ Attendance - 05Marks

The performance of student in each course is evaluated in terms of percentage of marks with a provision for conversion to grade points. Evaluation for each course shall be done by continuous internal assessment as well as semester end exam and will be consolidated at the end of the course.

3. The **End of Semester examination** (**External Evaluation**) shall have an assessment based upon following perspective with respect to all the courses:

    - ✓ Evaluation with respect to Knowledge
    - ✓ Evaluation with respect to Understanding
    - ✓ Evaluation with respect to Skill
    - ✓ Evaluation with respect to Application
    - ✓ Higher Order Thinking Skills

4. With respect to all the above components, there shall be following types of Questions from each unit of the course.

    - ✓ MCQs/Fill in the blanks/ Match the pairs, etc
    - ✓ Short answer questions
    - ✓ Medium answer questions
    - ✓ Long answer questions
    - ✓ Examples/ Problems, etc

5. The End of Semester Examination (Theory) will be conducted by the University. A certified journal of the respective core compulsory course shall be produced at the time of practical examination. In Practical Exam there will be four practicals (each from PC-501 to PC-504 for Sem-V & PC-601 to PC-404 for Sem-VI) each of 50 marks (35-marks for practical+15marks for Viva) and duration of each practical will be 3 hours. Numbers of student in a practical exam will be 16 per batch and examiners will be 2.

6. It will be compulsory for a candidate to obtain passing percentage in both Internal as well as External Evaluation. The passing marks shall be **40%**, or as decided by concern Board of Studies of the Subject.
7. Promotion, Re-Admission and Time for Completion of Course, Procedure for Awarding Grades, Provision for Appeal, etc. as decided by the Hemchandracharya North Gujarat University.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

B.Sc. Programme with 144 credits

CBCS-Semester-Grading Pattern

w.e.f. June-2013

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

Part/Class	Course	Study Components	Instruction Hrs/ Week	Examination			Credit
				Internal	Uni. Exam	Total	
B. Sc. Sem –V		**Semester-V**					
		Core Compulsory (CC) Course					
	CC-I- 7	Core Course-I (Paper-7)	3	30	70	100	3
	CC-I- 8	Core Course-I (Paper-8)	3	30	70	100	3
	CC-I- 9	Core Course-I(Paper-9)	3	30	70	100	3
	CC-I-10	Core Course-I(Paper-10)	3	30	70	100	3
		Practical Core (PC) Course					
	PC-I- 7	Practical Core Course-I (Paper-7)	3		50	50	1.5
	PC-I- 8	Practical Core Course-I (Paper-8)	3		50	50	1.5
	PC-I- 9	Practical Core Course-I(Paper-9)	3		50	50	1.5
	PC-I-10	Practical Core Course-I(Paper-10)	3		50	50	1.5
		Foundation Course (FC)					
	FC-5	Foundation (**Generic**) Course – V Compulsory English (L.L.)	2	30	70	100	2
		Elective Course (E)					
	EG-5	Elective (**Generic**) Course –V	2		50	50	2
	ES-5	Elective (**Subject**) Course –V	2		50	50	2
			30	**150**	**650**	**800**	**24**

B. Sc. Sem-VI		**Semester-VI**					
		Core Compulsory (CC)Course					
	CC-I- 11	Core Course-I (Paper-11)	3	30	70	100	3
	CC-I- 12	Core Course-I (Paper-12)	3	30	70	100	3
	CC-I-13	Core Course-II (Paper-13)	3	30	70	100	3
	CC-I-14	Core Course-II (Paper-14)	3	30	70	100	3
		Practical Core (PC) Course					
	PC-I- 11	Practical Core Course-I (Paper-11)	3		50	50	1.5
	PC-I- 12	Practical Core Course-I (Paper-12)	3		50	50	1.5
	PC-I-13	Practical Core Course-II (Paper-13)	3		50	50	1.5
	PC-I-14	Practical Core Course-II (Paper-14)	3		50	50	1.5
		Foundation Course (FC)					
	FC-6	Foundation (**Generic**) Course – VI Compulsory English (L.L.)	2	30	70	100	2
		Elective Course (E)					
	EG-6	Elective (**Generic**) Course –VI	2		50	50	2
	ES-6	Elective (**Subject**) Course –VI	2		50	50	2
			30	**150**	**650**	**800**	**24**

Hemchandracharya North Gujarat University, Patan

B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester end Examination (Sem-V & VI)

Format for Question paper Elective Courses (Subject) in Physics

There will be three questions. First question will be from Unit - I, Second question from Unit-II, and Third question will be from both the Units. All the questions are detailed as under.

Time: 2Hrs **Total Marks: 50**

1 (a) Answer the following (Any two out of three) 08 Marks
(Theory questions)

(b) Attempt any two of following (Out of three) 06 Marks
(Theorytype **or** Application/Example/Problem)

(c) Attempt any three (Out of five) 06 Marks
(Short answer or objective type questions)

2 (a) Answer the following (Any two out of three) 08 Marks
(Theory questions)

(b) Attempt any two of following (Out of three) 06 Marks
(Theorytype **or** Application/Example/Problem)

(c) Attempt any three (Out of five) 06 Marks
(Short answer or objective type questions)

3 Answer the following (Any ten out of twelve) 10 Marks

(M.C.Q. Type **or** objective type)

Hemchandracharya North Gujarat University, Patan

B.Sc. Programme (CBCS-Semester-Grading pattern)

Semester end Examination (Sem-V & VI)

Format for Question paper Core Compulsory Courses in Physics

There will be four questions. First three questions are of 20 marks each and forth question is of 10 marks. First question will be from Unit - I, Second question from Unit-II, Third question from Unit-III, Forth question will be from all three Units. All the questions are detailed as under.

Time: 3Hrs **Total Marks: 70**

1 (a) Answer the following (Any two out of three) (Theory questions)	12 Marks
(b) Attempt any four (Out of five) (Short answer/ objective/ MCQ type questions)	04 Marks
(c) Attempt any one (Out of two) (Application/Example/Problem)	04 Marks
2 (a) Answer the following (Any two out of three) (Theory questions)	12 Marks
(b) Attempt any four (Out of five) (Short answer/ objective/ MCQ type questions)	04 Marks
(c) Attempt any one (Out of two) (Application/Example/Problem)	04 Marks
3 (a) Answer the following (Any two out of three) (Theory questions)	12 Marks
(b) Attempt any four (Out of five) (Short answer/ objective/ MCQ type questions)	04 Marks
(c) Attempt any one (Out of two) (Application/Example/Problem)	04 Marks
4 Answer the following (Any five out of Eight) (Short answer or objective type questions)	10 Marks

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-V

PHYSICS SYLLABUS

CC: PHY-501

UNIT - I Mathematical Physics

(a) Differential Equations

Some partial differential Equations Physics (2.1), The method of separation of variables (2.2A), Separation of Helmholtz equation in Cartesian Coordinates (2.2B), Separation of Helmholtz equation in spherical polar Coordinates (2.2C), separation of Helmholtz equation in cylindrical coordinates(2.2D), Laplace's equation in various coordinate systems (2.2E).

(b) Second order differential Equations

Ordinary and singular points (3.1). Series solution around and ordinary point (3.2), Series Solution around a regular singular point (The method of Forbenius) (3.3).

Basic Reference : Mathematical Physics by P. K. Chatopadhyay. Wiley East Ltd.

Other References:

1**.** Mathematical Physics by B.D.Gupta.

2. Mathematical Physics by H.K.Dass.

UNIT- II CLASSICAL MECHANICS

(a) Lagrangian Formulation

Constraints (8.1), generalized coordinates (8.2), D'aleffibert's principle (8.3), Lagrange's equation

ns (8.4), A general expression for kinetic energy (8.5), Symmetries and the laws of conservation (8.6), Cyclic or ignorable coordinates (8.7), Velocity dependent potential of electromagnatic field (8.8)

(b) Motion of Rigid Body

Euler's theorem (10.1), Angular momentum and kinetic energy (10.2), The inertia tensor (10.3), Euler's equation motion (10.4).

Basic Reference: Introduction to classical mechanics by Takawale and Puranic. THM Publication.

Other References :

1. Classical Mechanics, by Goldstein. Narosa Publishing House, New Delhi.
2. Classical Mechanics by Yasvant Waghmare.
3. Classical Mechanics by N.C.Rana and P.S.Joag, THM

UNIT -III QUANTUM MECHANICS

General formalism of Wave Mechanics

The Schrodinger equation and Probability interaction for N- particle system (3.1), The fundamental postulates of wave mechanics (3.2), Adjoint of an operator and self Adjointness, (3.3), The Eigen value problem (3.4), Degenrecy (3.5), Eigen values and Eigen functions of self-adjoint operators (3.6), The Dirac delta function (3.7), Observables, completeness and normalization of Eigen functions (3.8), Closer, physical interpretation of Eigen values, Eigen function and expansion coefficients (3.9), Momentum eigen functions : wave functions in momentum space (3.10), uncertainly Principle (3.11), States with minimum value for uncertainly product (3.12), commuting observable : Removal of degeneracy (3.13). Evolution of system with time Constants of the motion (3.14).

Basic Reference : A text book of Quantum Mechanics by P.M. Methews and K. Venkateshan, THM.

Other References :

1. Quantum Mechanics by Ghatak and Loknathan, The Macmillan company of India Limited.
2. Quantum Mechanics by Fschwabi, Narosa Publishing House, New Delhi.
3. Quantum Mechanics by John, L. Powell and B. Crasemann.
4. Quantum Mechanics by Schiff.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B.Sc. Semester-V
PHYSICS SYLLABUS

CC: PHY-502

UNIT- I STATISTICAL MECHANICS

(a) Macroscopic and Microscopic states
Macroscopic States (4.1), Microscopic States (4.2), Phase Space (4.3), μ-Space (4.4), τ-Space (4.5), Postulate of equal a priori probability (4.6).

(b) Statistical Ensembles
Micro canonical ensemble (5.1), Canonical ensemble (5.2), Alternative method for the derivation of canonical distribution (5.3), Mean value and Fluctuations (5.4), Grand Canonical Ensemble(5.5), Alternative derivation of Grand Canonical Distribution(5.6), Fluctuations in the number of particle of a system in a grand canonical ensemble(5.7), Reduction of a Gibb's distribution to Maxwell's and Boltzman distribution(5.8), Barometric formula (5.9), Experimental verification of the Boltzman's distribution (5.10).

Basic Reference : Fundamentals of Statistical Mechanics by B. B. Laud. New Age International Publisher (copy right 1998)

Other Reference :
Statistical Mechanics and Properties of Matter by E.S.R.Gopa

UNIT-II SOLID STATE PHYSICS

(a) Free Electron Theory of Metal
Thermal conductivity of metals(6.1.2), The F.D. distribution function(6.3), The Sommerfield Model(6.4), Density of states(6.4.1), The free electron gas at 0° K(6.4.2), Energy of electron at 0° K(6.4.3), The electron heat capacity(6.5), The Sommerfield Theory of conduction in metals(6.6), The Hall coefficient(6.6.1).

(b) Application to Plasmons, Polaritons and Polarons

(Note: Qualitative description of dielectric constant ϵ(W) should be given equation 10.45 and 10.49) Application to Plasma(10.7), Plasma ossilations(10.7.1), Transeverse optical mode in plasma(10.7.2), Application to optical phonon modes in ionic crystals(10.8), The longitudinal

optical mode(10.8.1), Transeverse optical mode(10.8.2), The interaction of electromagnetic waves with optical modes(10.9).

Basic Reference: Elements of Solid State Physics by J.P. Srivastava,PHI New Delhi 2003

Other References :

1. Solid State Physics by A. J. Dekker.
2.Introduction to Solid State Physics by C. Kittel. 7^{th} Edition, John Willy and Sons

UNIT- III PLASMA PHYSICS

(a) Characteristics of a Plasma in a Magnetic field

Description of plasma as a gas mixture, (3.1), Properties of plasma in magnetic field (3.2), Force on plasma in magnetic field (3.3), Current in Magnetised Plasma (3.4), Diffusion in a Magnetic field (3.5), Collisions in fully ionized magneto-plasma (3.6), Pinch Effect (3.7), Oscillations and waves in the plasma (3.8), Plasma frequency (3.8.1), Maxwell's equation in a homogenous plasma (3.8.2), Electromagnetic or Transverse Oscillations (3.8.3), Electostatic or Longitudinal oscillations ($B_a^{\rightarrow}=0$) (3.8.4), Oscillations of the plasma ($B_a^{\rightarrow}\neq0$)(3.8.5), Hydromagnetic waves (3.8.6), Resonances and cut-offs or reflection points (3.8.7).

(b) Applications of Plasma

Controlled Thermonuclear Reactions (7.1), Lawson criterion (7.1.1), The Coulumb Barrier (7.1.2), Heating and Confinment of the Plasma (7.1.3), Readiation loss of energy (7.1.4), Magnetohydrodymic conversion of energy (7.2), Plasma propulsion (7.3), Other plasma devices (7.4).

Basic Reference: Elements of Plasma Physics by S. N. Goswami New Central Book Agency (P). Ltd. Calcutta. reprint 2000.

Other References :

1. Introduction to Plasma Physics by F.F.Chen. Plenum Press.
2. Plasma Physics by S. N. Sen, Pragati Prakashan, Meerut.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-V

PHYSICS SYLLABUS

CC: PHY-503

UNIT - I RADIO ACTIVITY

(a) Alpha Rays : Spectra and Decay

Range of Alpha Particles (4.II.1), Disintegration energy of the Spontaneous Alpha-Decay (4.II.2), Alpha-Decay Paradox-Barrier Penetration (4.II.3).

(b) Beta Rays : Spectra and Decay

Introduction (4.III.1), Continuous Beta ray spectrum-Difficulties in understanding it (4.III.2), Pauli's Neutrino Hypothesis (4.III.3), Fermi's theory of Beta-dacy (4.III.4), The Detection of Neutron (4.III.5).

(c) Gamma-Ray Emission:

Introduction (4. IV. 1), Gamma - ray emission - selection rules (4.IV.2), Internal conversion (4.IV.3).

Basic Reference :

Nuclear Physics (An Introduction) by S. B. Patel, Willey Eastern Ltd.

UNIT-II NUCLEAR PHYSICS

(a) Nuclear Energy:

Introduction (6.1), Neutron Induced Fission (6.2), Asymmetrical Fission-Mass Yield (6.3), Emission of Delayed Neutrons by Fission Fragments(6.4), Energy Released in the Fission of U--235 (6.5), Fission of Lighter Nuclei (6.6), Fission Chain Reaction (6.7), neutron cycle in a Thermal Nuclear Reactor (6.8), Nuclear Reactors (6.9).

Basic Reference :

Nuclear Physics (An Introduction) by S. B. Patel, Willey Eastern Ltd.

(b) Elementary Particles:

Leptons (14.4), Hadrons (14.5), Elementary particle quantum numbers (14.6), Isospin (14.7), Symmetries and- conservation principles, (14.8), Quarks (14.9), fundamental Interactions (14.10).

Basic Reference :

Nuclear Physics (An Introduction) by S. B. Patel, Willey Eastern Ltd.&

Concept of Modern Physics by A.Beiser. 5th edition , McGraw-Hill.(for (b))

UNIT-III MOLECULAR SPECTRA

(a) Pure Rotational and Vibrational - Rotational Spectra

Types of Molecular Spectra (17.2), Salient Features of Rotational Spectra (18.1), Molecular requirement for Rotational Spectra (18.2), Experimental Arrangement (18.3), The molecule as a rigid rotator: Explanation of rotational spectra (I8.4) The Non-rigid Rotator (18.5),The Isotope Effect (18.6), Salient Features of Vibrational-Rotational Spectra (19.1), The Molecule as a Harmonic Oscillator (19.2).

(b) Raman and Electronic Spectra

Nature of the Raman Effect (20.1), Experimental Arrangement for Raman Spectra (20.2), Classical Theory of Raman Effect (20.3), Quantum theory of Raman Effect (20.4), Raman Spectra and Molecular Structure (20.5), Infra-red Spectra Versus Raman Spectra (20.6), Salient Features of Molecular Electronic Spectra (21.1), Formation of Electronic Spectra (21.2).

Basic Reference:
Atomic & Molecular-Spectra by RajKumar, KedarNath RamNath, Delhi.

Other References:

1. Molecular spectroscopy by Herz-Berg.
2. Molecular spectroscopy by Banewell

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-V

PHYSICS SYLLABUS

CC: PHY-504

UNIT – I

(a) **Network Transformations:**
Principle of duality (1.3), Reduction of Complicated network (1.4), Conversions between T and π sections (1.5), The bridged-T network (1.6), The Lattice Network (1.7), The Reciprocity theorem (1.9), The compensation theorem (1.12), Driving point impedance, transfer impedance (1.14), The parallel-T network (1.17).

Basic Reference :

Networks, Lines and Fields by J. D.Ryder. Pretice Hall.

(b) **Photo Electric Devices and Thyristors**
Classification of Photoelectric devices (27.1), Photoconductive cells (27.10), Photovoltaic cells (27.11), SCR (26.1, 26.1.1 to 26.1.4), Triac (26.4), Diac (26.5)
Basic Reference :

Electronics and Radio Engineering by M. L. Gupta. 9th Enlarged Edition reprint 2002. Dhanpat Rai Publication Co.

UNIT - II

(a) **Basic Transistor Amplifiers:**
Current and Voltage amplifires (9,10), Common Emitter Amplifiers with Emitter Resistor (9.11), Simplified Common Emitter Hybrid Model (9.12), Effect of An Emitter Bypass Capacitor in low frequency Response.

(b) **Multistage Amplifiers**
Multistage Transistor Amplifiers (10.1), R-C- coupled Amplifiers (10.2), Transformer Coupled Amplifiers (10.3), Direct coupled Amplifiers (10.4), Effect of cascading on Band width (10.5).

Basic Reference :

Hand Book of Electronics by Gupta and Kumar. 30th revised Edition 2002.

UNIT - III

(a) Regulated DC Power Supply

Transistor Series voltage Regulator (25.2.), Negative Feed back Voltage Regulator (25.3), Transistor Shunt Regulator (25.4), Transistor Current Regulator (25.5), Glow-tube Voltage regulator (25.6).

Basic Reference: Electronics and Radio Engineering by M. L. Gupta. 9th reprint 2002. Dhanpat Rai.

(b)Constants, Variables & Data Types: (Programming in C)

Introduction (2.1), Character Set (2.2), C Tokens(2.3), Keywords and Identifiers (2.4), Constants (2.5), Variables (2.6), Data Types (2.7), Declaration of Variables (2.8), Declaration of Storage Class (2.9), Assigning Values of Variables (2.10), Defining Symbolic Constants (2.11), Declaring a Variable as Constant (2.12), Declaring a Variable as Volatile (2.13), Overflow and Underflow of Data (2.14).

Basic Reference : Programming in ANSI C by E.Balaguruswami (THM) (3rd Edition)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-V

PHYSICS SYLLABUS

LABORATORY EXPERIMENTS

PC: PHY-501

1. Acceleration due to gravity (g) using Kater's pendulum (with movable and fixed knife edges)
2. Determination of Thermal conductivity 'K' of a rubber tube.
3. Study of thermocouple
4. Velocity of sound in air using CRO
5. G.M. Counter (Plateau Characteristics)

PC: PHY-502

1. Refractive index ' μ ' by total internal Reflection method usingGauss eye piece
2. Resolving power of grating
3. To study absorption spectra of Iodine gas molecule
4. Newton's Ring (determination of R)
5. To study absorption spectra of liquid ($KMnO_4$)

PC: PHY-503

1. Comparison of capacity (C_1/C_2) using method of mixture
2. Measurement of frequency f and phase difference 'θ' of a.c wave using CRO
3. Calibration of magnetic field
4. Determination of M and H using Deflection and Vibrational Magnetometer
5. e/m Thomson method

PC: PHY-504

1. A study of transistorized Hartley Oscillator using CRO/Wave meter
2. I/P and O/P impedance of a R-C CE amplifier at different frequency using VTVM/CRO
3. A study of Transformer coupled Amplifier using VTVM/CRO (voltage gain frequency response and band width)
4. Diac characteristics
5. Characteristic of SCR

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

CC: PHY-601

UNIT - I Mathematical Physics

(a) Curvilinear Coordinates

General Curvilinear coordinates (10.8) Vector operators in orthogonal Curvilinear Coordinates (10.9)

Note : The expressions for Divergence and curl are not to be derive but directly expressions are to be given.

Basic Reference: Mathematical Methods in Physical Sciences 2nd Edition by M.L. Boas. John Wiley & Sons.

(a) Special Functions

Legendre differential equation (6.1), Generating Function of Legendre Polynomial (6.2), Rodriguez's formula for Legendre Polynomial (6.3), Orthogonal properties of Legendre Polynomial (6.4), Hermite differential equation and Hermite Polynomial (6.11), Generating function of Hermite Polynomial (6.12), Recurrence formula for Hermite Polynomial (6.13), Rodriguez's formula for Hermite Polynomial (6.14).

Basic Reference: Quantum Mechanics by Satya Prakash, Pragati Prakashan (Reprint-2008)

Other References:

1. Mathematical Physics by B.D.Gupta.
2. Mathematical Physics by H.K.Dass.

UNIT- II CLASSICAL MECHANICS

Variational Principle: Lagrange's and Hemilton's Equations

Configuration space (11.1), Some techniques of caclulus of variat:ion (11.2), Applications of the Variational principle (11.3), Hemilton's principle (11.4). Equivalence of Lagrange's and Newton's equations (11.5), Advantages of the Lagrangion formulation-Electromechanical analogies (11.6), Lagrange's undertermind multipliers (11.7), Lagrange's equation for non-holononiic system (11.8), Application of the Lagrangeian method of undetermined multipliers (11.9), Hemilton's equations of motion (11.10), Some applications of the Hamiltonian formulation (11.11), Phase space (11.12), Comments on the Hamiltonian formulation (11.13).

Basic Reference: Introduction to classical mechanics by Takawale and Puranic. THM Publication.

Other References:

1. Classical Mechanics, by Goldstein. Narosa Publishing House, New Delhi.
2. Classical Mechanics by Yasvant Waghmare.
3. Classical Mechanics by N.C.Rana and P.S.Joag, THM

UNIT -III QUANTUM MECHANICS

(a) Exactly Soluble Eigen Value Problems : The simple harmonic Oscillator
The schrodinger equation and energy eigen values (4.1), The energy eigen functions (4.2), Properties of Stationary States (4.3), The abstract operator method (4.4), Coherent States (4.5).

(b) **Angular Momentum and Parity**
The Angular momentum operators (4.6),The eigen value equation for L : Separation of variables (4.7), Admissibility conditions on solutions : eigen values (4.8), The eigen functions : Spherical harmonics (4.9), physical interpretation (4.10), Parity (4.11).

Basic Reference: A text book of Quantum Mechanics by P.M. Methews and K. Venkateshan, THM.

Other References:
1. Quantum Mechanics by Ghatak and Loknathan, The Macmillan company of India Limited.
2. Quantum Mechanics by Fschwabi, Narosa Publishing House, New Delhi.
3. Quantum Mechanics by John, L. Powell and B. Crasemann.
4. Quantum Mechanics by Schiff.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

CC: PHY-602

UNIT- I STATISTICAL MECHANICS

(a) Some Application of Statistical Mechanics

Thermodynamics (6.3), Reversible and Irreversible processes (6.3.1), The Laws of Thermodynamics (6.3.2) ((i) Zeros (ii) First Law (iii) Second Law), Statistical interpretation of the basics thermodynamic variables (6.4, 6.4.1 to 6.4.8), Thermodynamic functions in terms of grand partition function (6.7), Ideal gas (6.8), Gibbs's Paradox (Inclusive Sackur-Tetrode equation) (6.9), The equipartition theorem (6.10).

(b) B.E. and F.D. distribution

Symmetry of wave function(8.1), The quantum distribution functions(8.2), The Boltzman limit of Boson and Fermion gases(8.3), Evaluation of partition function(8.4), Partition function for Diatomic molacules(8.5), Equation of state for an ideal gas(8.6), The quantum mechanical paramagnetic susceptibility(8.7).

Basic Reference: Fundamentals of Statistical Mechanics by B. B. Laud, New AGE Int.Pub.Copyright 1998

Other Reference :

1.Statistical Mechanics and Properties of Matter, by E.S.R.Gopal Pub. McMillan Company of India Ltd.
2. Statistical Mechanics by B. K. Agarwal- Melvin Eisner. NewAge Int. Pub.

UNIT-II SOLID STATE PHYSICS

Superconductivity :

Phenomena without observable Quantization(15.1), Zero resistance and persistent currents(15.1.1), Perfect Diamagnetisms : Meissner Effect (15.1.2), London Equation (15.1.3), Critical Field : Type I and Type II super conductors (15.1.4), BCS Theory : A qualitative approach (15.5), Cooper pair formation (15.5.1), BCS ground state (15.5.2), Important predictions of the BCS theory and comparison with experiments (15.6), Critical temperature (15.6.1), Ginzburg-Landau Theory (15.7), Magnetic flux Quantization (15.7.1), Coherence Length (15.7.2), Type-II superconductivity (15.7.3), Josephson tunneling (15.7.4),Applications(15.9).

Basic Reference: Elements of Solid State Physics by J.P. Srivastava,PHI New Delhi 2003

Other Reference :

1. Solid State Physics by C. Kittel. John Willy and Sons.
2. Solid State Physics by Saxena. Pragati Prakashan.
3. Solid State Physics by C. M. Kachhawa.

UNIT-III Holography and Fiber Optics

(a) Holography

Introduction (23.1), Principle of Holography (23.2, 23.2.1 & 23.1.2), Theory (23.3), Important properties of Hologram (23.4), Advances (23.5-complete), Applications (23.6, 23.6.1-23.6.3).

(b) Fiber Optics

Introduction (24.1), Optical Fibre (24.2), Critical angle of Propagation (24.3), Modes of Propagation (24.40, Acceptance angle (24.5), Fraction of refractive index (24.6), Numerical aperture (24.7), Types of optical fibre (24.8-24.8.1 to 24.8.3), Normalizesd frequency (24.9), Pulse dispersion (24.10-24.10.1 to 24.10.3), Attenuation (24.11-24.11.1), Applications (24.12-24.12.1 to 24.12.5), Fibre optic Communication system (24.13), Advantages (24.14).

Basic Reference: A textbook of Optics by Dr.N.Subrahmanyam, Brijlal and Dr.M.N. Avadhanulu, S. Chand & Co.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

CC: PHY-603

UNIT- I ELECTROMAGNETICS

Boundary Value Problems in Electrostatic Fields :Special Techniques

Laplace's Equation (3.1), Introduction (3.1.1), Laplace's Equation in two dimensions (3.1.3), Laplace's Equation in three dimensions (3.1.4), Boundary conditions and Uniqueness theorems (3.1.5), The method of images (3.2), The classic image problem (3.2.1), Induced surface charge (3.2.2), Force and energy (3.2.3), other image problems (3.2.4) Separation of variables (3.3), Cartesian Coordinates (3.3.1), Spherical coordinates (3.3.2), Multipole Expansion (3.4), Approximate Potential at large distances (3.4.1), The monopole and dipole terms (3.4.2), Origin of Coordinates in multipole Expansions (3.4.3).

UNIT - II ELECTROMAGNETICS

(a) Electromagnetic Induction:

Faraday's law (7.2.1), The Induced Electric Field (7.2.2), Maxwell's Equation : Electrodynamics before Maxwell (7.3.1), How Maxwell fixed Ampere's Law (7.3.2), Maxwell's Equations (7.3.3), The Potential Formulation : Scalar and Vector Potentials (10.1.1), Gauge Transformations (10.1.2), Coulomb Gauge and Lorentz Gauge (10.1.3)

(b) Electromagnetic Waves:

Electromagnetic Waves in Vacuum: The Wave equation for E and B (9.2.1), Energy and Momentum in Electromagnetic Waves (9.2.3), Electromagnetic Waves in Matter : Propagation in Linear Media (9.3.1), Electromagnetic Waves in conductors (9.4.1), The frequency dependence of permittivity (9.4.3).

Basic Reference: Introduction to Electrodynamics by David J. Griffths. 3rd EditionPearson Education Asia.

Other Reference:

Electromagnetics by B. B. Laud. Willley Eastern Ltd.

UNIT - III ENERGY TECHNOLOGY

(a) Fundamentals and Applications of Solar Energy

Introduction (3.1), Applications (3.2), Essential subsystems in a Solar energy plant (3.3), Solar energy chains (routes) and their prospects (3.4), Terms and definitions of some basic entities (3.4.a.), Units of solar power and solar energy (3.5). Merits and Limitations of Solar energy conversion and utilization (3.6). Energy from the Sun (3.10), Solar constant (3.11).

(b) Solar energy conversion systems and thermal power plants:

Solar thermal power supply system for space station (4.18), Solar energy from satellite station through microwaves to Earth station (4.19), Solar thermoelectric power (4.20).

Solar photovoltaic systems: V-I characteristics of a solar cell (5.6), Inter connections of solar cell (5.7), Efficiency of solar cell (5.8).

Basic Reference: Energy Technology by S. Rao and Dr. B. B. Parulekar. Khanna Publisher, Delhi. 1st edition 1985.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

CC: PHY-604

UNIT – I

(a) Feedback Amplifier

Feedback (11.1), Principle of Feedback Amplifiers (11.2), Advantages of Negative Feedback (11.3), Reasons for Negative Feedback (11.4).

(b) Transistor Oscillators (Sinusoidal):

Tuned Collector Oscillators(14.1), Hatley Oscillator (14.4), Colpitt's Oscillators (Circuit operation and alternative treatment only) (14.5), Phase Shift oscillator (14.6), R-C- Oscillator (14.6.1), Wien Bridge Oscillator (14.6.2), Crystal Oscillator (14.7).

Basic Reference: Hand book of Electronics by Gupta & Kumar 30th Revised Edition,2002Pragati Prakashan

UNIT - II

(a) Modulation

Introduction (20.1), Expression for Amplitude modulated voltage (20.2), Wave form Amplitude modulated voltage (20.3), Side band produced in Amplitude modulated wave (20.4), Modulated power output (20.5), Frequency Modulation (20.6), Frequency deviation and carrier swing (20.7), Modulation index (20.8, 20.8.1. to 20.8.3), Expression for frequency modulated wave (20.9), Phase modulation (20.10)

Basic Reference: Electronics and Radio Engineering by M. L. Gupta. 9th Enlarged Edition reprint 2002. Dhanpat Rai Publication Co.

(b) Digital Electronics:

Simplification using Karnaugh Maps (21.10-Complete), Don't Care Conditions (21.12), BCD-to-7 Segment Decoder (21.13), Digital Comparator (21.14), Multiplexer (21.15), Demultiplexer (21.16).

Basic Reference: Hand Book of Electronics by Gupta and Kumar. 30th revised Edition 2002.

UNIT - III Programming in C

(a) Operators and Expressions

Introduction (3.1), Operators: Arithmetic, Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special (3.2 to 3.9).

Arithmetic Expressions (3.10), Evolution of Expressions (3.11), Precedence of Arithmetic Operators (3.12), Some Computational Problems (3.13), Type Conversion in Expressions (3.14), Operator Precedence and Associatively (3.15), Mathematical Functions (3.16).

(b) Managing Input and Output Operations

Introduction (4.1), Reading and writing a Character (4.2 & 4.3), Formatted Input and Output (4.4 & 4.5)

(c) Decision making and branching

Introduction (5.1), Decision making with if statement (5.2), simple if statement (5.3), The if----else statement (5.4), Nesting of if---else statement (5.5), The else if ladder (5.6), The switch statement (5.7), The ? : operator (5.8), The Goto statement (6.9).

Basic Reference :

Programming in ANSI C (IIInd Ed.), TMH Pub. **E Balagurusamy**.(Ch:3,4)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

B.Sc. Semester-VI

PHYSICS SYLLABUS

LABORATORY EXPERIMENTS

PC: PHY-601

1. Young modulus 'y' by Koening method.
2. Optical Lever
3. Viscosity by Log decrement
4. I-V Characteristic of solar cell and determination of F.F, V.F.&n.
5. G.M. Counter (Comparison of Intensities)

PC: PHY-602

1. To determine air gape '**t**' between two plates of F.P. Etalon and determination of wavelength ' λ ' of monochromatic light
2. Temperature of Flame
3. Newton's Ring (Determination of Wave length of Light)
4. To determine λ and $d\lambda$ of sodium light using Michelson interferometer
5. Determination of wavelength of light by Lloyd's mirror.

PC: PHY-603

1. Mutual induction 'M' of two coil using B.G.
2. High resistance 'R' using leakage method
3. Maxwell's Bridge
4. Solenoid Inductor
5. Susceptibility of $FeCl_3$ using Quienk's method

PC: PHY-604

1. A study of transistorized Colpit's oscillator using CRO/Wave meter
2. Negative Feedback Amplifier
3. A study of Half subtractor and Full subtractor
4. To determine frequency of AFO using Wein bridge
5. Use of Computer- Programming in 'c' language.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS - Semester - Grading Pattern

List of Elective (Subject) Courses For Vth and VIth Sem.

(in force from June 2011)

Credits-2

1. INSTRUMENTS

2. OPTOELECTRONIC INSTRUMENTS

3. PROGRAMMING IN FORTRAN 90 AND 95

4. REMOTE SENSING AND TRANSDUCERS

DETAIL SYLLABUS

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-V & VI

ES PHY-07: INSTRUMENTS

UNIT-I

Michelson's Interferometer (15.7):-Principle, Construction, Working, Circular fringes ,Localized fringes, White light fringes, Visibility of fringes(15.7.1 to 15.7.7), Applications of Michelson Interferometer (15.8)-Measurement of wavelength, Determination of difference in the wavelengths of two waves, Thickness of a thin transparent sheet, Determination of the refractive index (15.8.1 to 15.8.4)

Babinet Compensator (20.21):-Construction(20.21.1), Production of polarized light (20.21.2), analysis of elliptically polarized light (20.21.3).

UNIT-II

C.R.O.:-CR Tube (3.5), Electrostatic Deflection Sensitivity (3.5.1), Magnetic Deflection Sensitivity (3.5.2), CRT connections (3.5.3), Uses of C.R.O. (3.5.4)

G. M. Counter: Principle, Construction, Working, Dead time, recovery time, True counting rate, Efficiency of counting, Quenching of G M counter, Operation and testing of G.M. counter, Plateau, Applications of GMC, Advantages and limitations of GMC.

Basic references:

1. A textbook of Optics by Dr.N.Subrahmanyam, Brijlal and Dr.M.N. Avadhanulu, S. Chand & Co. (for M.I, B.C.)

2. Hand Book of Electronics by Gupta and Kumar. 30th revised Edition 2002.(for CRO)

3. Refresher Course in Physics Vol-III, S. Chand & Co. Ltd.(7th edition-2006) (for GMC,Ch-28)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-V & VI

ES PHY-08: OPTOELECTRONIC INSTRUMENTS

UNIT-I

Introduction (22.1), Attenuation of light in optical medium (22.2), Thermal Equilibrium (22.3), Interaction of light with matter (22.4 -22.4.1 to 22.4.4), Einstein relations (22.5), Light amplification (22.6-22.6.1 to 22.6.2), Population inversion (22.7), Active medium (22.8), Pumping (22.9), Metastable states (22.10), Principal pumping schemes (22.11-22.11.1 to 22.11.4), optical resonant cavity(22.12-22.12.1 to 22.12.3), Axial modes (22.13-22.13.1), Gain curve and laser operating frequencies (22.14), Transverse modes (22.15), Types of Lasers, Rubby Lasers, Helium-Neon Laser, (22.16), Applications (22.20).

Basic Reference: A textbook of Optics by Dr.N.Subrahmanyam, Brijlal and Dr.M.N. Avadhanulu, S. Chand & Co.

UNIT-II

Fabry- Parot Interferometer and Etalon (15.12), Formation of fringes, Determination of wavelength, Measurement of difference in wavelength (15.12.1 to 15.12.3)

Electron Microscope: Principle, electrostatic fousing, magnetic fousing, description, use of electron microscope. (page 204 to 213)

Basic references:

1. A textbook of Optics by Dr.N.Subrahmanyam, Brijlal and Dr.M.N. Avadhanulu, S. Chand & Co. (for F P)

2. Atomic Physics by J.B. Rajam, S.Chand&Co.(1960)(for Ele. Microscope)

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-V & VI

ES PHY-09: PROGRAMMING IN FORTRAN 90 AND 95

UNIT-I

Introduction , Evolution of Fortran 90 (1.1), Writing a Program (2.1), Input Statement (2.2), Some Fortran 90 Program Examples (2.3), Constants (3.1), Scalar Variables (3.2), Declaring Variable names (3.3), Implicit Declaration (3.4), Named Constants (3.5).

UNIT-II

Arithmetic Operators and Modes of Expressions (4.1), Integer Expressions (4.2), Real Expressions (4.3), Precedence of Operations in Expressions (4.4), Examples of Arithmetic Expressions (4.5), Assignment Statements (4.6), Defining Variables (4.7), Some Problems due to Rounding of Real Numbers (4.8), Mixed Mode Expressions (4.9), Intrinsic Functions (4.10), Examples of use of Functions (4.11).

Basic Reference: COMPUTER PROGRAMMING IN FORTRAN 90 AND 95 by V. Rajaraman (Sept.-2008)) PHI, New Delhi.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS - Semester - Grading Pattern
B. Sc. :: PHYSICS :: SEMESTER-V & VI

ES PHY-10: REMOTE SENSING AND TRANSDUCERS

UNIT-I

Remote Sensing

Introduction, Beginning of Remote Sensing in India, History, Electromagnetic energy, Visible and non-visible radiation, Emission of EM radiation, Atmospheric effect, Solar constant Remote Sensing-a developing Science: Atmospheric Window, Human vision and Human Eye, Useful instruments, Micro-resolution, Photo-geometry.

New Technology: Detectors, Optical Sensors, Types of Optical Sensors, Optical mechanical sensor, Scanning radiometer, IR Scanner, Multi-spectra Scanner. TV, Radar and Slar systems, Applications of RS in different fields –Land set satellites, Earth resource satellites.

Basic Reference: 1. Remote Sensing by Suresh Shah (in Gujarati) Uni. Granth Nirman Board, Ahmedabad. 2. Introduction to Optical Remote Sensing by P. S. Phisaroty (ISRO-Banglore).

UNIT-II

Transducers

What is Transducers? , Classification of Transducers, Classification based on electrical principle involved, Resistive Position Transducers, Resistive Pressure Transducer, Linear Variable Differential Transducer, Piezoelectric Transducer, Strain gauze Transducer, Temperature Transducers, Resistance temperature Detector, Thermistor, Thermocouple, Various types of Microphones, Carbon microphones, Ribbon microphones, Loudspeaker, Moving coil microphones.

Basic Reference: Book- Basic Electronics (solidstate) by B. L. Tharaja , Pub. S. Chand & Compny (5^{th} Edition)