SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

B. Sc. III Year Physics

(Revised Syllabus Effective from June 2013)

Salient Features of Revised B. Sc. Physics Syllabi

As per the considerations of examination reform the syllabi of B. Sc. Physics is revised and effectively implemented from June, 2013 academic year. The Syllabi is framed as per the guidelines given in the UGC curriculum. The numbers of objectives are taken in to consideration while reforming the syllabi.

The main objective is to create skilled minds and therefore understanding of theoretical and mathematical knowledge essential for finding solutions of various interacting physical phenomenon, the full paper on mathematical methods is included. It helps in general to improve scientific attitude to solve the research oriented problems, problems of interacting systems.

The professional Education of the students begins while enrolling their names in the B. Sc. Classes. The Board of study thought authentically that some sort of Job oriented syllabi is to be included and accordingly, some principles of cooling and liquefaction of gasses, some part of thermodynamics, theoretical physics, AC current, part of industrial electronics, digital electronics, communication system, TV, Lasers, detectors, nuclear energy, solar energy and various aspects of physics related to the industries and research field has been covered. The lab work also includes theory based practical to develop the skill and create interest of the students in the subject physics.

Curriculum Designing Committee	
Dr. G. N. Shinde Dean, Faculty of Science SRTMU Nanded	Principal, Indira Gandhi College CIDCO, Nanded
Dr. L. S. Ravangave (Chairman BOS)	Shri Sant Gadge Maharaj Mahavidyalaya, Loha, Dist. Nanded
Prof. R. S. Khairnar	Director, School of Physical Sciences , SRTM University Nanded
Dr. Dharmkare Ram M.	Adarsha Mahavidyalaya, **Hingoli**
Dr. Gore Krashnakant Umajirao	Neataji Subhash Chandra Bose College, **Nanded**
Dr. Shahane Subhash Vaijnathrao	Dnyanopasak Shikshan Mandals College Of Acs, **Jintur** Dist. Parbhani
Dr. Kendre D. K.	Gramin Mahavidyalaya,Kotgyal Vasantnagar, Mukhed, Dist. Nanded.
Dr. Devshette Pandit Mallikarjun	Shri Hawagiswami Mahavidyalaya, **Udgir** Dist. Latur
Dr. Choudhari Milind Madhukarrao	Maharashtra College Nilanga
Dr. Jadhav Kamlakar M.	Professor & Former Head Dept. of Physics Dr. Babasaheb Ambedkar Marathwada University, **Aurangabad**
Dr. R.L. Raibagkar	Associate Professor, Dept. of Material Science, Gulbarga University, **Gulbarga**
Dr. Kasture Mahesh W.,	Dy. Manager, R & D Center, Bharat Petrolium Corporation Ltd. Plot 2 A, Udyog Kendra, **Grater Noida-201306**

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

B. Sc. III Year Physics

Course Title	Paper No.	SEM.	Periods	Marks Ext.	Int..
Phy 301 Quantum Mechanics (Compulsory paper)	XII	V	45	40	10
PHY302: Solid state Physics (Elective paper)	XIII-A	V	45	40	10
PHY303: Astrophysics (Elective paper)	XIII-B	V	45	40	10
PHY304: Atomic, Molecular and Nuclear physics (Compulsory paper)	XIV	VI	45	40	10
PHY305: Digital and communication Electronics (Elective paper)	XV-A	VI	45	40	10
PHY306: Solar Energy (Elective paper)	XV-B	VI	45	40	10
Phy307 Practical Course(Comp. Paper)	XVI	Annual	80	50	
Practical Course (Elective) For Papers(XIII-A& XV-A)		Annual	80	50	
Practical Course (Elective) For Papers(XIII-B & XV-B)		Annual	80	50	

B. Sc. III Year PHYSICS

Semester - V	**Paper –XII**
Periods: 45	**Marks: 40 External + 10 Internal**

PHY301: Quantum Mechanics (Compulsory paper)

UnitI I: Particle Properties of Waves: (12 Periods)

Introduction, Photoelectric Effect, Quantum Theory of Light, The Compton Effect, de Broglie waves, Wave function, de Broglie Wave Velocity, Wave and Group velocities, G. P. Thomsons experiment, The Uncertainty principle and its applications, The Wave Particle Duality.

Unit II: Schrödinger's Equation: (12 Periods)

Introduction, Schrödinger's Equation: Time dependent form, Probability current, Expectation Values, Operators, Schrödinger's Equation: Steady-state form, Eigen values and Eigen functions, Problems.

Unit III: Applications of Quantum Mechanics: (09 Periods)

Introduction, The particle in a box :energy quantization, The particle in a box :wave functions, The particle in a box : Momentum Quantization, The Harmonic Oscillator, The Harmonic Oscillator-Energy level, The particle in a three dimensional box

Unit IV: Quantum Theory Of Hydrogen Atom: (12 Periods)

Schrödinger's equation for the Hydrogen Atom in spherical polar co- ordinates, separation of Variables, Quantum numbers –Total quantum number, Orbital quantum number, Magnetic quantum number (introduction only), spin quantum number.

Books Recommended:

1. Perspectives of Modern Physics-Arthur Beiser (McGraw-Hill Int.Edition)

2. Modern physics – R. Murugeshan.(S.Chand & Co.XIth Revised edition)

3. Text Book of Quantum mechanics – Kakani & Chandaliya ((S.Chand & sons)

4. Quantum Mechanics – Chatwal and Anand (Himalaya Publishing)

5. Quantum Mechanics- Ghatak and Loknatha

B.Sc. III Year PHYSICS
Semester – V   Paper –XIII-A
Periods: 45   Marks: 40 External + 10 Internal

PHY302: Solid state Physics (Elective paper)

Unit I: Crystal structure: Book1,2   **(10 Periods)**

Introduction, Crystal Lattices and bases and Translation vectors, Unit cell, Symmetry operations, Point groups, space group, Types of lattices, Bragg's Law, Simple crystal structure (FCC, BCC), Structure of Diamond, ZnS, NaCl, Problems.

Unit II: Bonding in Solids: Book1,2   **(10 periods)**

Crystalline solids, Amorphous solids, covalent bond, ionic bond, metallic bond, hydrogen bond, vander-waal's bond.

Unit III : Thermal properties of Solids: Book1,2   **(12Periods)**

Specific heat of solids, Classical theory of Lattice heat Capacity, Einstein's theory of heat Capacity , Limitations, Debye's theory of specific heat of solids.

Unit IV: Free Electron Theory of Metals: Book1,2   **(13 Periods)**

Drude-Lorentz theory, Thermal conductivity, Electrical conductivity, Widemann- Franz relation, Sommerfeld Model, Quantum theory of free electron in a box.

Books Recommended:

1. Solid State Physics and Electronics – R. K.Puri & V. K. Babar (S.chand & Co.)

2. Solid State Physics – Saxena,Gupta, Saxena (Pragati Prakashan Meerut)

3. Solid State Physics – Puri & Babar (S.chand & Co.)

4. Introduction to Solid State Physics -by Kittel, Wiley and Sons, 7th Edition.

5. Material Science by M. Arumguarn, Anuradha Publishers.

6. Solid state Physics – R.L.Singhal (Kedar Nath Ram Nath Co., Meerut)

7. Modern physics – R. Murugeshan.(S.Chand & Co.XIth Revised edition)

8. Solid state physics- A.J.Dekkar(Macmillan India Ltd.2000)

B.Sc. III Year PHYSICS
Semester - V   Paper –XIII-B
Periods: 45   Marks: 40 External + 10 Internal

PHY303: Astrophysics (Elective paper)

-
Unit I: Stellar physics: **(15 Periods)**

Electromagnetic spectrum, Transmission of radiations through atmosphere, Black body radiation and Wien's law, Physical properties of astronomical objects, Spectral classification of stars, H-R diagram, luminosity classification of stars, distance measurement by Parallax method.

Units–II: Milky Way Galaxy and Sun: (Book 6 and 7)   **(12 Periods)**

The Milky Way galaxy, inter –stellar medium, inter-stellar molecules, origin of solar system, condensation theory, arguments for and against the theory.

Unit–III: Solar System   **(10 Periods)**

The Solar system, Surface of Sun, Sunspot, Sunspot cycle, **The Sun:** Photosphere, chromospheres and corona. Kepler's laws of Planetary motion, Early history of planets, Structure, Composition and Atmosphere of our Solar system (all nine planets), Comets, Asteroids, Meteors, Meteoroids, prospectus for life on Mars.

Unit–IV: Cosmology   **(08 Periods)**

The Big-Bang universe, the steady state cosmology, the oscillating cosmology, the Hubble law and cosmological test.

Books Recommended:

1. Astrophysics(Stars and Galaxies) – K.D. Abhyankar (University Press Hyderabad)

2. Observational Astrophysics – Robert C. Smith (Cambridge University Press)

3. Astrophysics- A Modern Perspective- K.S. Krishna Swamy (New Age International)

4. Stars- Life, Death and Beyond – A.K.kimbhavi, J.V.Narlikar (IUCAA-Pune)

5. Expanding Universe- Jayant Naralikar

6. An Introduction to astrophysics- Baidynath Basu (PHI)

7. Astronomy – Fundamentals and Frontiers – Robert jastrow and M. H. Thompson

B.Sc. III Year PHYSICS

Semester – VI	**Paper –XIV**
Periods: 45	**Marks: 40 External + 10 Internal**

PHY304: Atomic, Molecular and Nuclear physics (Compulsory paper)

Unit I: Atomic Physics. (15 Periods)

The Vector Atom Model, Quantum numbers associated with the vector atom model, LS and J-J coupling, The Pauli's exclusion Principle, Selection rules, Intensity rules, Interval rule, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.

Unit II: Molecular Spectra: (08 Periods)

Regions of Electromagnetic Spectra, Theory of pure rotational spectra, Theory of rotation-vibration spectra, Raman Effect, Experimental study,

Unit III: Nuclear Fission and Nuclear Reactions (10 Periods)

Discovary of Nuclear Fission, The fission products, The mass energy distribution of fission products, Energy release in fission, Kinds of nuclear reactions, Conservation laws Nuclear reaction kinematics,

Unit IV: Nuclear Energy Sources (10 Periods)

Nuclear fission as source of energy, Chain reacting system, Thermal nuclear reactor, Energy production in stars, controlled thermonuclear reactions.

Books Recommended:

1. Modern physics- R. Murugeshan, Kruthigaprasath. (S.Chand & Co.)

2. Atomic physics – J.B.Rajam. (S.Chand & Co.) .

3. Fundamentals of spectroscopy- C. N. Banwell

4. Nuclear Physics – D.C.Tayal (Himalaya Publishing House)

5. Nuclear Physics – Irving Kaplan

6. Introduction to Atomic Spectra: H E White, McGraw Book Company, Inc.

7. Basic Nuclear Physics- B. N. Shrivastav.

B.Sc. III Year PHYSICS

Periods : 45   **Mark : 40 External + 10 Internal PHY305: Digital and communication Electronics (Elective paper)**

-- Unit I: Number Systems and Logic Gates   book 1,4
     (12 Periods)

Number System:- Decimal numbers, Binary numbers, Binary arithmetic, Octal Numbers, Hexadecimal numbers, Inter-conversions of number systems, Binary coded decimal (BCD), Gray code, Excess-3 code.

Unit II: Logic Gates: book 1,4   **(09 Periods)**

AND gate, OR gate, NOT gate, NAND gate, NOR gate, EX-OR and EX-NOR gates, Universal properties of NAND gates.

Boolean operations, logic expressions for 2,3 & 4 inputs, laws of Boolean algebra, De-Morgen's theorems, SOP form of Boolean expressions, simplification of Boolean expressions using K-maps   (upto 4 variables)

Unit III: Modulation and Demodulation: book 5   **(12 Periods)**

Introduction, Types of Modulation, Expression for A. M. voltage, AM waves, Frequency spectrum of AM wave, Power Output in AM, Expression for frequency modulated voltage, Principle of demodulation, linear diode AM detector or demodulator.

Unit IV: Communication Electronics: book 6   **(13Periods)**

 Introduction, Block diagram of basic communication system, classification based on the technique of signal transmission: Base band signal, base band transmission, communication system using modulation, need of modulation in communication system, A.M. receiver: Turned Radio Frequency(TRF)Receiver, Super heterodyne receiver, Characteristics of radio receivers: sensitivity, selectivity, fidelity & their measurements.

Books Recommended:
1. Modern Digital Electronics- R.P. Jain, Tata McGraw Hill Pub. Company (Third edition)
2. Digital Fundamentals-Thomas L. Floyd, Universal Book Stall
3. Digital Principles and Applications- A. P. Malvino, (McGraw Hill International Editions(Fourth Edition)
4. Digital Electronics with Practical Approach- G. N. Shinde, Shivani Pub., Nanded
5. Electronics and Radio Engineering – M. L. Gupta
6. Communication Engineering – J.S. Katre (Tech Max Pub – Second revi. edition)

Semester - VI Paper –XV-B
Periods: 45   Marks: 40 External + 10 Internal

PHY306: Solar Energy (Elective paper)

Unit I: Solar Energy: **(12 Periods)**

Solar constant, solar radiation at the Earth's surface, solar energy collectors: physical principle of the conversion of solar radiation in to heat. Types of collectors: Parabolic collectors, Mirror strip reflector, Fresnel lens collector, Compound parabolic concentrators (CPC).

Unit II: Application of Solar Energy   **(11Periods)**

Solar Water Heating, Heating and Cooling of Buildings, Thermo electric conversion, Power generation, PV cells, Solar distillation, Pumping, Cooking, Hydrogen production, Green Houses.

Unit III: Energy Scenario   **(12 Periods)**

 Various forms of energy, Types of energy reservoirs, photo thermal and photovoltaic systems, geothermal systems, wind energy, Classification of biogas, plants, Advantages and disadvantages of different types of plants, Problems.

Unit IV: Fuel Cells   **(10 Periods)**

Design and Principle of operation, Classification, Types, Advantages and disadvantages, Conversion efficiency, Types of electrodes, Work output and EMF of Fuel Cells, Applications of Fuel Cells. .

Books Recommended:

1. Non-Conventional Energy Sources – G.D. Rai (Khanna Publishers, Delhi)

2. Solar energy utilization - G.D.Rai ,(Ed,V.1995)

3. Solar Energy – S.P.Sukhatme (II nd edition Tata McGraw-Hill).

4. Fundamentals of Renewable Energy Systems - D. Mukherjee and S. Chakrabarti, (New Age International Publishers.)

B.Sc. III Year PHYSICS

Semester – V   Paper –XVI
Periods: 80   Marks: 50

PHY307: Practical Course(Compulsory Paper)
----

1. Coefficient of viscosity by oscillating disc method

2. Determination of Rydberg's constant

3. Hartmann's dispersion formula

4. Temperature of flame

5. Cauchy's constant by using spectrometer

6. Conductivity by Forbe's method

8. Planck's constant (h) by LED

9. Determination of Planck's constant using solar cell.

10. e / m by Thomson's method

11. Determination of resolving power of prism

12. **Diffraction at Cylindrical Object: Determination of Wave length**

13. To study Hysteresis curve of transformer core.

14. Thermal conductivity of an insulator by Lee's disc method.

15. Resolving power of grating

16. Y By Konings Method

17. To Study the Spectral Characteristics of a photovoltaic solar cell

The students can have their own choice to perform any two experiments in place of any two experiment in the list above available in their laboratory.

Each student appearing for examination must produce a journal showing that he has completed not less than **12** experiments during the year.

PHY308: Practical Course in Solid state physics & Digital electronics
(Elective Paper)

----

1. Calibration of bridge wire using Carrey – Foster's bridge

2. Efficiency of a transformer

3. Variation of thermo e.m.f. with temperature

4. Study of CRO: Measurement of frequency and voltage sensitivity

5. Determination of electrical conductivity of graphite rod

6. Temperature coefficient of a thermister or a resistor

7. Study of energy bad gap of a semiconductor

8. Comparison of capacity by Method of mixture

9. To study characteristics of thermisters

10. Verification of truth table of basic gates (AND, OR, NOT) using ICs.

11. Construction of basic gates (AND, OR, NOT) using NAND gates.

12. Construction and study of half adder using NAND gates.

13. Construction and study of full adder using NAND gates.

14. Implementation of Boolean expression from the given truth table using K-map.

15. Study of Colpits oscillator

16. Study of low pass and high pass filter using resistance and capacitance

17. Clipper and Clamper circuits

NOTE: The students can have their own choice to perform any two experiments in place of any two experiment in the list above available in their laboratory. Each student appearing for examination must produce a journal showing that he has completed not less than **12** experiments during the academic year.

B.Sc. III Year PHYSICS

Semester – V & VI   **Paper –XVII-B**

PHY309: Practical Course in Astrophysics & Solar Energy
(Elective Paper)

Periods: 80   **Marks: 50**

---

1. Estimation of mass of the Jupiter

2. Astronomical photometry

3. Distance of star cluster by main sequence fit

4. Solar spectrum

5. Observing the Sun: Sun spots

6. Sun spectrum: Fraunhofer lines

7. Locating objects in the sky

8. Studying features of the moon surface

9. Observing Jovinan planet: Jupiter and its satellites

10. Characteristics of solar cell

11. Characteristics of solar cooker

12. Study of Power versus load characteristics of Solar Photovoltaic panel.

13. Study of Series combination of Solar Photovoltaic panels

14. Study of Parallel combination of Solar Photovoltaic panels

15. Determination of Calorific value of Coal/Cow dung

16. Study of Solar Hot water system.

NOTE: The students can have their own choice to perform any two experiments in place of any two experiment in the list above available in their laboratory.

Each student appearing for examination must produce a journal showing that he has completed not less than **12** experiments during the year.