Structure for B. Sc. Syllabus

Inforce from June 2020

B. Sc. (PHYSICS)

Semester IV

Sr. No.	Course Code	Course Title	Credits
1	PH – 403	Physics Paper III	02
2	PH – 404	Physics Paper IV	02
3	PH – 405	Physics Paper V	02
4	PH – 406	Practicals	02

Faculty code: Science **Subject code: PH**

Name of the Program: B. Sc. **Subject: PHYSICS**

External Examination Time Duration: 2 hrs.

Name of Exam	Semester	Paper No.	Course Group	Credit	Internal Marks	External Marks	Total Marks
B. Sc.	IV	PH – 403	Theory	02	20	50	70
		PH – 404	Theory	02	20	50	70
		PH – 405	Theory	02	20	50	70
		PH – 406	Practical	02	20	60	80

Veer Narmad South Gujarat University, Surat

Proposed Syllabus for S. Y. B. Sc. Sem IV

Physics Paper III (PH – 403)

Unit 1	**Thermodynamic relations, free energies and Thermodynamic equilibrium (Thermal Physics by Garg, Bansal and Ghosh, 2nd Ed., McGraw Hill Education (India) Pvt Ltd. Chennai, 2012)**
	The Maxwell relations (8.2), Thermodynamic relations involving heat capacities (8.3), The TdS equations (8.4), The energy equations (8.5), Heat of reaction: Gibbs-Helmholtz equation (8.6) General condition for a natural change (9.2), An adiabatic process (9.2.1), An isothermal process (9.2.2), Free energies and Maxwell relations (9.3), Thermodynamic mnemonic diagrams (9.4), General conditions for thermodynamic equilibrium (9.5), An adiabatic process (9.5.1), An isothermal process (9.5.2), equilibrium between phases (9.6), One component system (9.6.1), Multi-component systems: Gibbs phase rule (9.6.2)
Unit 2	**Production of low temperatures (Thermal Physics by Garg, Bansal and Ghosh, 2nd Ed., McGraw Hill Education (India) Pvt Ltd. Chennai, 2012)**
	Ordinary methods of cooling (10.2), Adiabatic cooling (10.3), Joule-Thomson effect (10.4), Joule-Kelvin effect: An isenthalpic process (10.4.1), Adiabatic demagnetisation (10.5), The third law of thermodynamics (10.9), consequences of the third law (10.9.1)
Unit 3	**Crystal Structure (Introduction to Solid State Physics by Charles Kittel, 8th Ed., John Wiley and Sons, 2005)**
	Chapter 1 (includes subtopics) Periodic array of atoms, Fundamental types of lattices, index systems for crystal planes, simple crystal structures, direct imagining of atomic structure, Non ideal crystal structures Chapter 2 (includes subtopics) Diffraction of waves by crystals, Brillouin zones
Unit 4	**Crystal Vibrations (Introduction to Solid State Physics by Charles Kittel, 8th Ed., John Wiley and Sons, 2005)**
	Chapter 4 (includes subtopics) Vibrations of crystals with monoatomic bases, two atoms per primitive bases

Suggested books:

1. Heat and Thermodynamics by Zemansky and Dittman, Wiley India
2. Solid State Physics by A Dekker

Veer Narmad South Gujarat University, Surat

Proposed Syllabus for S. Y. B. Sc. Sem IV

Physics Paper IV (PH – 404)

Unit 1	**Quantum Mechanics ((Concepts of Modern Physics by Arthur Beiser, 6th Ed., TataMcBraw-Hill Publishing Co. Ltd. New Delhi, 2003)**
	Quantum Mechanics (5.1),Wave Equation (5.2),Schrodinger's Equation:Time Dependent Form (5.3),Linearity and Superposition (5.4),Expectation Values (5.5),Operators (5.6).
Unit 2	**Quantum Mechanics ((Concepts of Modern Physics by Arthur Beiser, 6th Ed., TataMcBraw-Hill Publishing Co. Ltd. New Delhi, 2003)**
	Schrodinger's Equation: Steady- State Form (5.7),Particle in Box (5.8),Finite Potential (5.9), Tunnel Effect (5.10), Harmonic Oscillator (5.11)
Unit 3	**Polarization and Double Refraction (Optics by Ajoy Ghatak 6th Ed., McGrawHill Education (India) Pvt. Ltd. New Delhi, 2017)**
	Introduction (22.1), Malus' Law (22.2), The Wire Grid Polarizer and the Polaroid (22.3.1), Polarization by Reflection (22.3.2), Polarization by Double Refraction (22.3.3), Polarization by Reflection (22.3.4), Analysis of Polarized Light (22.7), Optical Activity (22.8), Theory of Optical Activity (22.16)
Unit 4	**Lasers: An Introduction and Optical Fiber Basics (Optics by Ajoy Ghatak 6th Ed., McGrawHill Education (India) Pvt. Ltd. New Delhi, 2017)**
	Introduction (27.1),Spontaneous and Stimulated Emission(27.1.1), Main Components of the Lasers (27.1.2), Understanding Optical Amplification: The EDFA(27.1.3), The Resonator(27.1.4), The Lasing Action(27.1.5), The Fiber Laser(27.2), The Ruby Laser (27.3), The He-Ne Laser(27.4), Introduction(28.1), Total Internal Reflection(28.3), The Optical Fiber(28.4).

Suggested books:

1. Modern Physics by Kenneth S. Krane
2. Optics by Eugene Hecht
3. Fundamentals of Optics by Jenkins & White
4. An Introduction to Laser Theory and Applications by M. N. Avadhanulu

Veer Narmad South Gujarat University, Surat

Proposed Syllabus for S. Y. B. Sc. Sem IV

Physics Paper V (PH – 405)

Unit 1	**Fourier Series (Mathematical Physics by B. S. Rajput, Pragati Prakashan, India, 2013)**
	Definition (7.1), Dirichlet's condition (7.2), Graphical representation of a function (7.3), Extension of the interval (7.4), Complex form of Fourier series (7.5), Advantages of Fourier series (7.6), Properties of Fourier series (7.7)
Unit 2	**AC bridges (Electricity and Magnetism by D C Tayal, 4th Revised Ed., Himalaya Publishing House, India, 2019)**
	Impedance Bridge(17.18), Measurement of Inductance(17.19) (a) Maxwell's Impedance Bridge (b) Maxwell's LC bridge (c) Owen's Bridge: (d) Anderson's Bridge, Measurement of Capacitance (17.21) (a) De Sauty's Bridge (b) Wien's Bridge (c) Schering Bridge, Measurement of frequency (low) (17.22).
Unit 3	**Emiter Follower (Electronics Principles by Malvino, 6th Ed., Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1999)**
	CC amplifier (12.1) Output impedance (12.2), Maximum peak to peak output (12.3), Darlington connections (12.4), Class B push-pull emitter follower (12.5), Biasing Class B amplifiers (12.6), Class B driver (12.7), Voltage regulation (12.8)
Unit 4	**JFETs (Electronics Principles by Malvino, 6th Ed., Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1999)**
	Basic Ideas(13.1), Drain curves(13.2), The Transcoductance curve(13.3), Biasing inthe Ohmic region (13.4), Biasing in the active region (13.5), Transconductance (13.6), JFET amplifiers (13.7), The JFET analog switch (13.8), other JFET applications (13.9)

Suggested books:

1. Elements of Electromagnetics by M N O Sadiku, Oxford University Press, 2001
2. Electricity and Magnetism by A S Mahajan and A R Rangwala 7thEd. Tata McGraw-Hill, 2003.
3. Electronic Devices and Circuit Theory by Boylestad

Veer Narmad South Gujarat University, Surat

Proposed Practicals for S. Y. B. Sc. Sem IV

PH - 406

LIST OF EXPERIMENTS

	GROUP A
1	To study characteristics of Solar cell
2	To study divergence of LASER beam
3	To determine lattice parameters of a cubic single crystals structure.(From XRD pattern)
4	To find stopping potential using photocell
5	Y by bending
	GROUP B
1	Verification of Malus's Law
2	Verification of Brewster's Law
3	To determine wavelength of LASER beam using plane transmission grating.
4	To determine wavelength of spectral lines by plane transmission grating (Normal Incident Method)
5	To determine the specific rotation of a cane sugar by Laurent's half shade polarimeter
	GROUP C
1	To determine k_B/e using Transistor
2	To studyFET characteristics
3	To determine figure of merit of Ballistic galvanometer
4	To determine the self-inductance of a coil by Owen's bridge.
5	To determine the dielectric constant of a given liquid by Schering bridge.

Suggested books:

1. D C Tayal,University Practical Physics,Edited by Ila Agarwal ,Himalaya Publishing House
2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
3. P. Khandelwal, A Laboratory Manual of Physics for Undergraduate Classes, Vani Publication House, New Delhi.
4. Geeta Sanon, BSc Practical Physics, 1st Edn. (2007), S. Chand & Co.

Note:

1. The duration of each experiment is of 2 hours. Three such experiments are to be performed by each student per week.
2. In the external exam, a student will have to perform three experiments, one from each group. Each experiment will be of 2 hours duration.
3. There shall not be more than 20 students per batch in the external exam.