

BHAVNAGAR UNIVERSITY

BHAVNAGAR

(NACC Accreditation Grade “B”)

CREDIT AND SEMESTER SYSTEM

SYLLABUS

BACHELOR OF SCIENCE (B.Sc.)

PHYSICS

(In Force From Academic Year: 2011-2012)

तमसो मा ज्योतिर्गमय



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: PHYSICS

SEMESTER: 3rd

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	TEACHING HOURS PER WEEK	CREDITS
1	P-301	Classical Mechanics, Statistical Mechanics and Sound	$70 + 30^* = 100$	$28 + 12 = 40$	15 Weeks x 03 Hours = 45	03	03
2	P-302	Mathematical Physics, Electricity and Electrostatics	$70 + 30^* = 100$	$28 + 12 = 40$	15 Weeks x 03 Hours = 45	03	03
3	P-303	Nuclear Physics, Electronics and Solid State Physics	$70 + 30^* = 100$	$28 + 12 = 40$	15 Weeks x 03 Hours = 45	03	03
4	P-304	PRACTICALS	$90 + 00 = 90$ (External Only)	$36 + 00 + 36$	15 Weeks x 09 Hours = 135	09	09

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: **PHYSICS**

SEMESTER: **4th**

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	TEACHING HOURS PER WEEK	CREDITS
1	P-401	Quantum Mechanics, Thermodynamics and Optics	$70 + 30^* = 100$	$28 + 12 = 40$	15 Weeks x 03 Hours = 45	03	03
2	P-402	Mathematical Physics, Magnetism and Electrodynamics	$70 + 30^* = 100$	$28 + 12 = 40$	15 Weeks x 03 Hours = 45	03	03
3	P-403	Molecular Spectra	$70 + 30^* = 100$	$28 + 12 = 40$	15 Weeks x 03 Hours = 45	03	03
4	P-404	PRACTICALS	$90 + 00 = 90$ (External Only)	$36 + 00 + 36$	15 Weeks x 09 Hours = 135	09	09

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10

**B.Sc. (PHYSICS)
SEMESTER – III**

Paper No.P-301: Classical Mechanics, Statistical Mechanics and Sound:

Credit: 03**Total Marks: 100**
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Classical Mechanics:</u> <ul style="list-style-type: none">♣ Equivalent one body problem♣ Motion in a central force field♣ Motion in an inverse – square law♣ Unit vector in polar co-ordinate system♣ Radial and tangential acceleration component in polar co-ordinate system♣ General features of the motion♣ Equation of the orbit♣ Types of the orbit♣ Kapler’s law of motion.♣ Problems	15 lectures	34%
Unit – II	<u>Statistical Mechanic:</u> <ul style="list-style-type: none">♣ Macroscopic States♣ Microscopic States♣ Entropy♣ Fluctuations and their dependence on N molecules♣ Phase space♣ Phase trajectory♣ Density distribution in the phase space♣ Volume in phase space♣ Division of phase space in to cells♣ Problems♣ μ - Space♣ Γ - Space♣ Concept of ensemble♣ Micro canonical ensemble♣ Canonical ensemble♣ Canonical distribution♣ Grand canonical ensemble.♣ examples	15 lectures	33%



Unit – III	Sound: <ul style="list-style-type: none">♣ Doppler effect for different cases.♣ Limitation of doppler's principle♣ Production of ultrasonic wave♣ Magnetostriction generator♣ Piezo-electric generator♣ Detection of Ultrasonic waves♣ Uses of ultrasonic.♣ Effect of wind on pitch of sound♣ Architectural Acoustics.♣ Loudness♣ Reverberation(Sabine's formula)♣ Determination of absorption coefficients♣ Problems	15 lectures	33%
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Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

- | | |
|---|---|
| 1. Introduction to classical mechanics | - R G Takwale & Puranik. |
| 2. Introduction to classical mechanics | - Shrivastava & Gupta |
| 3. Fundamental of statistical Mechanics | - B.B. Laud (New Age International) |
| 4. A Text book of sound | - R.L. Saihgal (S.Chand) |
| 5. A Text book of sound | - M. Ghosh (S.Chand) |
| 6. Elementary statistical mechanics | - Gupta, Kumar, Pragati Prakashan |
| 7. Thermodynamics and statistical physics | - Aggarwal and Satyaprakash (Pragati prakashan) |



Paper No.P-302: Mathematical Physics, Electricity and Electrostatics:

Credit: 03**Total Marks: 100****Marks: Semester End Examination: 70****Continues Internal Evaluation: 30**

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Complex Variables:</u> <ul style="list-style-type: none">♣ Introduction♣ Definition & representation in a plane♣ Function of complex variables and definition♣ Analytic function♣ Cauchy Riemann Condition♣ Cauchy's integral theorem♣ Cauchy's integral formula♣ Introduction of zeroes and singularities of complex function♣ Taylor's and Laurent's series♣ Problems	15 lectures	34%
Unit – II	<u>Electricity:</u> <ul style="list-style-type: none">♣ Types of galvenometer<ol style="list-style-type: none">1. Dead beat Galvenometer2. Ballastic Galvenometer♣ Moving iron Galvenometer♣ Moving Coil Galvenometer♣ Damping♣ Wattmeter, solenoid,♣ Hall effect in conductor♣ Problems	15 lectures	33%
Unit – III	<u>Electrostatics:</u> <p>Concept of gradient, divergence & Curl -- Uniqueness theorem</p> <ul style="list-style-type: none">♣ Poission's and Laplace', equation♣ Solution at lances equation in Cartesian Co ordinate system.♣ Electrical Images♣ Capacitor<ol style="list-style-type: none">1. Type of Capacitor2. Use of Capacitor3. Energy of charged Condenser4. Capacity of cylindrical condenser5. Capacity of spherical condenser♣ Problem	15 lectures	33%



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

- | | |
|---|---|
| 1. Mathematiced Physics | - P.K. Chatopadhyay (Wiley Eastern Limited) |
| 2. Fundamental of Magnetism & Electricity | - D.N. Vasudeva (S. Chand & Comm..) |
| 3. Electrodynamics | - S.L. Gupta & V. Kumar (S.P.Sinsh, Pragati prakshan) |



Paper No.P-303: Nuclear Physics, Electronics and Solid State Physics:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p><u>Nuclear Physics:</u></p> <ul style="list-style-type: none"> ♣ α - Decay, Barrier Penetrate ♣ Gamouse theory of α – Decay ♣ Range of α – particle ♣ Geiger Nuttle law ♣ Determination of velocity and energy of α – particle using magnetic spectrograph ♣ α – particle spectrum ♣ Qualitative explanation of continuous β – particle spectrum ♣ Anomalies of continuous β – particle spectrum ♣ Pauli’s Neutrino hypothesis ♣ Qualitative idea about Nuclear model ♣ Problems 	15 lectures	34%
Unit – II	<p><u>Electronics:</u></p> <ul style="list-style-type: none"> ♣ Introduction to feedback ♣ Types of feedback ♣ Positive and Negative feedback ♣ Oscillators: Introduction classification Barkhausen Criterion <li style="padding-left: 40px;">R C Oscillator <li style="padding-left: 40px;">L C Oscillator <li style="padding-left: 40px;">Colpitt Oscillator <li style="padding-left: 40px;">Hartley Oscillator ♣ Problems on Feedback and Oscillators ♣ UJT ♣ FET ♣ SCR 	15 lectures	33%
Unit – III	<p><u>Solid State Physics:</u></p> <ul style="list-style-type: none"> ♣ Interatomic forces and bonding in solids ♣ Introduction ♣ Force between atoms ♣ Cohesion of atoms and cohesive energy ♣ Madelung constant ♣ Calculation of cohesive energy ♣ Different types of Bonding in solids ♣ Problems on Madelung Constant and Cohesive energy (Primary as well as secondary) 	15 lectures	33%



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

- | | |
|------------------------------------|---------------------|
| 1) Nuclear Physics | - S.B. Patel |
| 2) Nuclear Physics | - Pandya and Yadav |
| 3) Principle of electronics | - V. K. Mehta |
| 4) Elements of solid state physics | - J. P. Shrivastava |
| 5) Solid State Physics | - S. O. Pillai |



Paper No.P-304: Practicals:

Credit: 09

Total Marks: 90 (External Only)

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
SEC.-A	General Physics, Heat, Sound & Light: <ul style="list-style-type: none">♣ Determination of Young's Modulus 'Y' of a bar by bending.♣ Determination of modulus of rigidity 'η' of wire by Maxwell's needle.♣ Determination of surface tension of mercury by Quinck's method.♣ Verification of Stefan's law of radiation.♣ Determination of resolving power of prism.♣ Determination of wave length of sodium source by Biprism.♣ To determine Cauchy's constant.		
SEC.-B	Electricity & Magnetism: <ul style="list-style-type: none">♣ Determination of current sensitivity of Ballistic Galvanometer.♣ Determination of capacity ratio by Desauty's bridge using Ballistic Galvanometer.♣ Determination of High resistance & leakage resistance by Ballistic Galvanometer.♣ Determination of low resistance by Potentiometer.♣ Determination of thermo EMF of thermo couple.♣ To convert a galvanometer in to an ammeter of a given range.♣ Maxwell bridge (Inductance		
SEC.-C	Electronics & Modern Physics: <ul style="list-style-type: none">♣ Determination of value of e/m by Thompson's method.♣ Determination of inductance of coil by Hartley Oscillator and calibration of variable air capacitor.♣ To study voltage – regulation characteristics of Zener diode.♣ To study characteristics of FET .♣ To study frequency response of RC Amplifier .♣ To study Dynamic characteristics of transistor and find quiescent point.		

Reference/Text book/ Additional Reading:

1. Advanced Practical Physics (Vol -1 & 2) - Singh (Pragati Prakashan)
2. Practical Physics - Kumar Gupta (Pragati Prakashan)
3. B.Sc. Practical Physics - C. L. Arora (S. Chand)

**B.Sc. (PHYSICS)****SEMESTER – IV**

Paper No.P-401: Quantum Mechanics, Thermodynamics & Optics:

Credit: 03**Total Marks: 100****Marks: Semester End Examination: 70****Continues Internal Evaluation: 30**

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit-I	<u>Quantum Mechanics:</u> <ul style="list-style-type: none">♣ Schrodinger wave equation for a particle subjected to a force in one dimension and three dimensions.♣ Probabilistic interpretation of the wave function.♣ Normalization of wave function.♣ Conservation of probability.♣ Admissibility condition on the wave function♣ Expectation value♣ Eigen value, Eigen function♣ Particle in a box♣ Finite Potential well♣ Problems	15 lectures	34%
Unit-II	<u>Thermodynamics:</u> <ul style="list-style-type: none">♣ Thermodynamic probability♣ β – Parameters♣ Entropy & probability♣ Law of equipartition of energy♣ Boltzmann Canonical distribution♣ Evaluation of constant A and B♣ Kinetic theory of gases♣ Maxwell-Boltzman distribution law of velocities♣ Evaluation of constants♣ Number of molecules having velocity within c and $c+dc$♣ Problems	15 lectures	33%
Unit-III	<u>Optics:</u> <ul style="list-style-type: none">♣ Fraunhofer and Fresnel diffraction♣ Grating♣ Resolving power of grating♣ Resolving power of Prism♣ Resolving power of Telescope.♣ Comparison of grating spectra & prism spectra♣ Introduction to Eye pieces<ol style="list-style-type: none">1) Kellner eyepiece2) Ramsden eyepiece3) Huygens's eyepiece4) Gauss eyepiece	15 lectures	33%



	<ul style="list-style-type: none">♣ Comparison of Ramsden eyepiece and Huygens's eyepiece♣ Circular polarized light♣ Elliptical polarized light♣ Malus's law♣ Dichroism♣ Birefringence♣ Problems		
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Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Introduction to Quantum mechanics	- Mathews & Venkateshan
2. Quantum Mechanics	- Ahuti Narayan Konark
3. Quantum Mechanics	- Shrivastava
4. Fundamental of Statistical Mechanics	- B.B. Laud (New Age International)
5. Thermodynamics and Statistical Physics	- Aggarwal and Satyaprakash (Pragati prakashan)
6. Principles of Optics	- B.K. Mathur
7. Optics	- Eugene Hecht Pearson Education
8. Elementary Statistical Mechanics	- Gupta, Kumar, Pragati Prakashan



Paper No.P-402: Mathematical Physics, Magnetism and Electrodynamics:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit-I	<u>Fourier series:</u> ♣ Fourier series, definition ♣ Evaluation of coefficient of Fourier series ♣ Cosine & Sine series ♣ Complex representation of Fourier series ♣ Fourier Transform. ♣ Problems	15 lectures	34%
Unit-II	<u>Magnetism:</u> ♣ Introduction ♣ Magnetic Susceptibility & permeability ♣ Measurement of Susceptibility : Rowland method ♣ Hysterisis I & B vs H Curves ♣ Langevin's theory for paramagnetic substances ♣ Weiss theory for ferromagnetic substance ♣ Hysterisis Loss ♣ Magnetic Circuit ♣ Problems	15 lectures	33%
Unit-III	<u>Electrodynamics:</u> ♣ Equation of Continuity ♣ Concept of displacement current ♣ Maxwell equation derivation (in differential form) ♣ Maxwell equation derivation (in integrall form) ♣ Physical Interpretation of maxwell's equation. ♣ Maxwell equation in free space ♣ Poynting theorem ♣ Problems	15 lectures	33%

Break up of Continuous Internal Evaluation:

- | | |
|--------------------|-----------------|
| 1. Assignments | 10 Marks |
| 2. Seminar | 10 Marks |
| 3. Test | <u>10 Marks</u> |
| Total Marks | 30 Marks |

Reference/Text book/ Additional Reading:

- | | |
|---|---|
| 1. Mathematical Physics | - P.K. Chatopadhyay. (Wiley Eastern Limited) |
| 2. Fundamental of Magnetism & Electricity | - D.N. Vasudeva (S. Chand & Comm..) |
| 3. Electrodynamics | - S.L. Gupta & V. Kumar S.P.Singh Pragati Prakashan |

Paper No.P-403: Molecular Spectra and Spectroscopy, Instrumentation and Solid State Physics: **Credit: 03****Total Marks: 100****Marks: Semester End Examination: 70****Continues Internal Evaluation: 30**

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit-I	<u>Molecular Spectra and Spectroscopy</u> <ul style="list-style-type: none">♣ Introduction♣ Raman effect♣ Experimental arrangement to study Raman effect♣ Classical theory and quantum theory of Raman effect♣ SSSRegion of spectrum♣ X-Ray Spectra♣ Zeeman effect and its classification♣ Spectra of alkali and alkaline elements♣ Different series in alkali spectra and Ritz's combination principle♣ Problems	15 lectures	34%
Unit-II	<u>Instrumentation and Number system in digital electronics:</u> Instrumentation: <ul style="list-style-type: none">♣ G M Counter♣ Feby – Perot Interferometer♣ Oscilloscope♣ Function generator Number system in digital electronics <ul style="list-style-type: none">♣ Mutual conversion of decimal, binary and hexadecimal numbers♣ Addition, subtraction , multiplication of binary and hexadecimal number¹	15 lectures	33%
Unit-III	<u>Solid State Physics:</u> <ul style="list-style-type: none">♣ Reciprocal Lattice and determination of crystal structure♣ Reciprocal Lattice♣ Bragg's Law♣ Brilliouin zone♣ Laue's interpretation of X-Ray diffraction by Crystal♣ Construction of reciprocal Lattice♣ Relation between a, b, c and a[*], b[*], c[*]♣ Crystal defects and classification of defects♣ Problems	15 lectures	33%



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Elements of spectroscope - Gupta, Kumar and Sharma
2. Molecular Spectroscope - G. King
3. Electronics - V. K. Mehta
4. Principle of electronics - V. K. Mehta
5. Elements of Solid State Physics - J. P. Shrivastava
6. Solid State Physics - S. O. Pillai



Paper No.P-404: Practicals:

Credit: 09

Total Marks: 90 (External Only)

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
SEC.-A	<p><u>General Physics, Heat, Sound & Light:</u></p> <ul style="list-style-type: none"> ♣ Determination of Young's Modulus 'Y' of a bar by elevation. ♣ Determination of Modulus of rigidity 'η' of rod by Searle's statical method ♣ Determination of Viscosity of liquid by co-axial cylinder. ♣ Determination of Thermal conductivity of rubber tube. ♣ Determination of focal length of an optical system by means of a Goniometer. (Searle's Method) ♣ Determination of resolving power of grating. ♣ Determination of wavelength of Sodium source by cylindrical edge or straight edge diffraction. 		
SEC.-B	<p><u>Electricity and Magnetism:</u></p> <ul style="list-style-type: none"> ♣ Determine Ballistic constant and resistance of Ballistic Galvanometer. ♣ Determination of capacity ratio by method of Mixture. ♣ Determination of resistance of unit length of potentiometer wire and to find specific resistance of coil by Carey-Foster method. ♣ Determination of unknown frequency of audio-frequency oscillator by Wein's bridge. ♣ To convert a galvanometer in to a voltmeter of a given range. ♣ To study a transformer: Determination of Parameters of transformer. ♣ To determine absolute value of capacitor using Ballistic Galvanometer. 		
SEC.-C	<p><u>Electronics & Modern Physics:</u></p> <ul style="list-style-type: none"> ♣ Determination of Plank's constant 'h' by Photo cell. ♣ Determination of inductance of coil by Colpitt's oscillator. ♣ Determination of Q-factor of parallel resonance (LCR). ♣ To study voltage multiplier (Doublet-half wave & full wave, Triplex and Quadruplet) ♣ To study solar cell characteristics ♣ Absorption coefficient of liquid using Photo voltaic cell. 		

Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Advanced Practical Physics (Vol -1 & 2)	- Singh (Pragati Prakashan)
2. Practical Physics	- Kumar Gupta (Pragati Prakashan)
3. B.Sc. Practical Physics	- C. L. Arora (S. Chand)