

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
CLASS: B. Sc. Physics SECOND YEAR
Semester III& IV
(W. e. f. June 2017)

Semester	Paper No.	Name of the Course	Instruction Hrs/ week	Total periods	CA	ESE	Total Marks	Credits
III	CCPIII (Section A)	Waves and Oscillations Theory paper (P-VI)	03	45	10	40	50	2
	CCP III (Section B)	Statistical physics, Electromagnetic Theory and Relativity Theory paper (P-VII)	03	45	10	40	50	2
	CCPP II (Annual Pattern Section A)]	P-X: Practical's based on P-VI	03	24	05	20	25	1
		Practical's based on P-VIII	03	24	05	20	25	1
	CCP S I (Section A)	SEC I (One SEC from any optional)	03	45	25	25	50	2
IV	CCP IV (Section A)	Optics and Lasers Theory Paper (P-VIII)	03	45	10	40	50	2
	CCPIV (Section B)	Basic Electronics Theory Paper (P-IX)	03	45	10	40	50	2
	CCPP III (Annual Pattern Section B)	P-XI: Practical's based on P-VII	03	24	05	20	25	1
		Practical's based on P-IX	03	24	05	20	25	1
	CCPSII (Section B)	SEC II (One SEC from any optional)	3	45	25	25	50	2
Total credits semester III and IV								16

CCP: Core course Physics SEC: Skill Enhancement Course ESE: End Semester Examination C. A.: Continuous Assessment (Internal)

(Note: ESE of CCPII, CCPIII and SEC I, SEC II should be evaluated at annual)

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Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. Second Year (Semester – III)

Semester Pattern effective from June -2017

Physics

CCP III (Section A)

Waves and Oscillations (P-VI)

Credits: 02 (Marks: 50)

Periods: 45

Unit –I: Waves:

(10 Periods)

Wave velocity and particle velocity, Differential equation of wave motion, Energy of a plane progressive wave, Equation of motion of a vibrating string, Velocity of transverse waves along a string, Frequency and period of vibration of a string,

Unit—II: Stationary waves:

(11 Periods)

Analytical treatment of stationary waves (closed end & open end pipe at the other end), Investigation of pressure and density changes at displacement Nodes and Antinodes, Distribution of Energy in a stationary wave, Energy is not transferred in a stationary waves.

Unit - III: Free and Forced Vibrations:

(12 Periods)

Free Vibrations, Forced Vibrations, Resonance, Oscillatory Motion of a particle from energy considerations, Damped simple harmonic motion, Aperiodic, Critically Damped Oscillatory Motions, Effect of damping on Frequency, Forced Vibrations, resonance and sharpness of resonance.

Unit –IV: Acoustics and Ultrasonics:

(12 Periods)

Reverberation, Reverberation time, Derivation of Reverberation Time (Sabine's formula), Absorption coefficient, Determination of absorption coefficient (reverberation Chamber Method), Conditions for good acoustical designs of auditorium, Ultrasonics, Piezo-electric & magnetostriction effect, Piezoelectric Oscillator, magnetostriction oscillator, Detection of ultrasonic waves: Acoustic grating

Books Recommended:

1. Waves and Oscillations – Brijlal and Subrahmanyam. (Vikas Publishing House)
2. Text Book of Sound with Theory of Oscillations and waves – D. R. Khanna and R. S. Bedi.(Atma Ram & Sons Delhi)
3. A text book of Sound - N. Subrahmanyam, Brijlal
4. Sound - M. Ghosh
5. Text Book of Sound - Sharma & Saxena (New Age international publishers)
6. Physics of Vibrations & Waves - H.J.Pain (John Wiley & So

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Physics

CCP III (Section B)

Statistical Physics, Electromagnetic Theory & Relativity (P-VII)

Credits: 02 (Marks: 50)

Periods: 45

Unit -I: Statistical Basis and Thermodynamics (12 Periods)

Statistical Basis, probability, probability and frequency, permutation and combinations, Micro and Macro states, Thermodynamic probability, Entropy & probability, (Book 1)

Unit S-II: Classical Statistics and Quantum Statistics (12 Periods)

Phase space, Maxwell-Boltzmann Distribution law, Quantum Statistics- Bose- Einstein Distribution law, Fermi- Dirac Distribution law, comparison of M. B., B.E. and F. D. statistics, Application of Quantum statistics to Photon gas and Electron gas. (Book 1 and 4)

UNIT –III: Electromagnetic Theory and Maxwell’s Equations (11 Periods)

Ampere’s Law and Steady State current, Generalization of Ampere’s Law and displacement current, Maxwell’s Equations, Derivation of Maxwell’s Equations, The electromagnetic Energy, and Poynting Vector, The wave Equation. (Books 4,5,6)

Unit IV: Relativity (10 Periods)

Introduction, frame of reference, Postulates of Special Theory of Relativity, Galilean Transformations, Lorentz Transformations, Length Contraction, Time dilation, Velocity addition, relativity of mass, Mass energy relation.

(Book 7 and 8)

Books Recommended:

1. Heat Thermodynamics and statistical Physics – Brij Lal, Dr. N.Subrahmanyam, P. S. Hemne (Sultan Chand &Company Ltd).
2. Thermodynamics and Statistical Physics- S.L.Kakani(Sultan Chand &Sons)
3. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics – Sears and Salinger, (Narosa Publishing House, New Delhi)
4. Foundatin of Electromagnetic Theory – John R Reitz Frederic J. Milford ,(Narosa Publishing House, New Delhi
5. Classical Electrodynamics- Gupta Singh, Kumar , Pragati Prakashan Meerut.
6. Introduction to Electrodynamics- David J. Griffiths, Prentices Hall, India.
7. Perspectives of Modern physics – Arthur Beiser

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B. Sc. Second Year (Semester – IV)
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Physics
CCP IV (Section A)
Optics and Lasers (P-VIII)

Credits: 02 (Marks: 50)

Periods: 45

Unit–I: Geometrical Optics

(09 Periods)

Cardinal Points of an Optical System(six points), Coaxial Lens System (equivalent focal length and cardinal points), Huygens Eyepiece, Ramsden Eyepiece and their cardinal points,
(Book 1)

Unit–II: Interference and Diffraction:

(14 Periods)

Newton’s Rings, Determination of wavelength of Sodium light, Michelson Interferometer,
Determination of wavelength of monochromatic light, Difference in wavelength between two neighboring spectral lines.

Diffraction:

Fresnel and Fraunhofer diffraction, Fraunhofer’s diffraction due to single and double slit, Plane diffraction grating, Determination of wavelength of Sodium light, Rayleigh criterion, Resolving power of grating, Resolving power of Prism.

(Book 1)

Unit–III: Polarization

(12 Periods)

Polarization by Reflection, Brewster’s law, Malus law, Double refraction, Nicol prism, Nicol prism as an analyzer, Huygen’s explanation of double Refraction in Uniaxial crystals , Quarter wave plate, Half wave plate, Optical Activity , Specific rotation, Laurent’s half shade polarimeter.

(Books 1 and 2)

Units–IV: Lasers

(10 Periods)

Spontaneous & stimulated emission, absorption, Einstein coefficients (definitions),
Population inversion, Optical & electrical pumping, Properties of lasers, He-Ne laser and diode laser,

(Book 3)

Books Recommended:

1. A Text Book of Optics - Brijlal and Subrahmanyam. (S. Chand & Co.)
2. B.Sc.Physics Volume –I-- C.L.Arora (S.Chand)
3. Lasers and Nonlinear Optics – B.B.Laud (Wiley .Eastern limited)
4. Optics and Atomic Physics – D.P. Khandelwal. (Himalaya Publishing House)
5. Optics (Second edition) – A.K.Ghatak
6. Geometrical & Physical optics by D. S. Mathur.

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Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. Second Year (Semester – IV)

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Physics

CCP IV (Section B)

Basic Electronics (P-IX)

Credits: 02 (Marks: 50)

Periods: 45

Unit I: Regulated Power supply : (10 Periods)

Introduction, ordinary D. C. power supply, Voltage regulation, , Need of regulated power supply, Types of regulators, for low voltage, for high voltage, Zener diode voltage regulator,, Transistor series voltage regulator Series feedback voltage regulator short circuit protection, Transistor shunt voltage regulator, Definition of Line and Load regulation, Problems.

(Book 1, 2)

Unit–II: Bipolar Junction Transistors (BJT): (13Periods)

Transistor Connections: Common base, common emitter, common collector, Characteristics of common base, common emitter, common collector connections, transistor Load line Analysis, Operating point. Hybrid parameters (or h parameters) Determination of h-parameters, Analysis of common emitter amplifier and common using h-parameters (current gain, voltage gain, power gain, input resistance and output resistance) **(Book 1,2,3)**

Unit–III: Operational Amplifier: (12Periods)

Operational Amplifier, Basic circuit of differential amplifier, common Mode and differential mode signals, block diagram of Op-Amp, schematic symbol, ideal Characteristics, input offset voltage; input offset current, input bias current, input impedance, Output impedance, open loop gain, Slew rate, Inverting amplifier. **(Book 2, 6)**

Unit IV: Sinusoidal Oscillators: (10 Periods)

Sinusoidal Oscillator, Types of sinusoidal Oscillators, Oscillatory circuit, Positive feedback Amplifier- Oscillator, Barkhausen Criterion,Hartley oscillator, Colpitt's oscillator, R-C Network, Phase shift oscillator, **(Book 1, 2, 9)**

Books Recommended:

1. Principles of Electronics – V. K. Mehta Rohit Mehta (S.Chand & Co.)
2. Principles of Electronics – V. K. Mehta Rohit Mehta (multicolour Illustrative Edition 2000 and 2013) (S.Chand & Co.)
3. Electronic Principles-Malvino
4. Basic Electronics(Solid State) – B.L.Thereja (S.Chand & Co.)
5. Basic Electronics & Linear Circuits—N.N.Bhargava,D.C.Kulshreshtha(TMh)
6. Op-Amps and Linear Integrated Circuits-Ramakant Gayakwad, (PHI Delhi)
7. Electronic fundamentals and Applications – J. D. Ryder.(TMh publications).
8. Digital & Analogue Techniques—Navneet , Gokhale & Kale (Kitab Mahal)
9. Introduction to Electronics-K.J.M.Rao, (Oxford and IBH Publishing Co.).
10. Solid State Pulse Circuits-David A Bell, Fourth edition, (PHI)
11. Electronics and Radio Engineering-M.L.Gupta, (Dhanpat Rai and sons).
12. Linear Integrated circuits-K.C. Botkar

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Physics

Practical Paper P-X: *Practical's based on P-VI & P-VIII*
(Annual practicals Based on [CCPIII& IV (Section A & B)])

Credits: 02 (Marks: 50)

Periods : 45

Practicals based on paper -VI

1. Moment of Inertia of a flywheel
2. Kater's pendulum
3. Y by Cantilever (Oscillation method)
4. η by torsional pendulum
5. Y and η by Searle's method
6. Surface tension by Fergusson method
7. Frequency of A.C. by Sonometer
8. Helmholtz's resonator
9. Study of Lissajous figures using CRO

Practicals based on paper-VIII

10. Calibration of Spectrometer
11. Determination of ' μ ' by i - δ curve using spectrometer
12. Determination of λ of Sodium light by Newton's ring
13. Diffraction grating normal incidence
14. Resolving power of Telescope
15. Resolving power of grating
16. Specific rotation by Laurent's half shade polarimeter
17. To Estimation the concentration of sugar in the solution.
18. Wave Length of Laser source by Diffraction Grating
19. To study the Spectral Characteristics of a Photovoltaic
20. To study the Characteristics of solar cell.

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Physics

Practical Paper P-XI: *Practical's based on P-VII & P-IX*

(Annual practical Based on [CCPIII & IV (Section A & B)])

Credits: 02 (Marks: 50)

Periods: 45

Practicals based on paper-VII

1. Potentiometer- measurement of Low resistance
2. C_1/C_2 by Proportional kick method
3. C_1/C_2 by Method of Mixture
4. Maximum velocity of electron using photocell
5. To determine the capacitance of a capacitor by discharging it through a sensitive galvanometer.
6. Determination of self inductance by Owen's bridge.
7. To determine resistance of a thermister.
8. Calibration of ammeter using potentiometer.
9. Stefn's Constants

Practicals based on paper-IX

10. To Study the Zener Diode as voltage regulator
11. Photo diode characteristics
12. Transistor characteristics (C-B mode)
13. Transistor characteristics (C-E mode)
14. Characteristics of photo transistor
15. Power supply using π -filter (Full Wave rectifier)
16. Transistorized regulated power supply.
17. Load regulation using bridge rectifier.
18. Study of transistorized CE amplifier (Frequency response, gain & 3db band width.)
19. Op-Amp as adder
20. Op-amp as subtractor.
21. Phase shift oscillator. Measurement of frequency and amplitude of waveforms.

Note: 1. Each student appearing for Annual practical examination must produce a journal showing that he has completed minimum **12** experiments in each practical course during the year.

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B. Sc. Second Year (Semester – III)

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Physics

CCPSI (Section A)

Skill Enhancement Course SEC I

Credits: 02 (Marks: 50)

Periods: 45

Skill Enhancement Course-I (Credit:2) B. Sc. III SEM

Computational Physics Credit: 02 45 Lectures (Theory + Lab)	Maximum Marks: 50 C. A. (Internal): 25 ESE OR Skill Exam:25
Maintain project file or Dissertation to check Analytic skills/ problem solving in skill exam	

UNIT-I: Algorithms and Flowcharts: Algorithm- definition and development, Flowchart- Concept, Symbols, Algorithm and Flowcharts for roots of quadratic equation, sum of two matrices, sum and product of finite series, calculation of $\sin(x)$ as series. **(10 Lectures)**

UNIT-II: Scientific Programming: Fortran: character set, Constants, Variables, Arithmetic expressions, Library functions, Arithmetic statements, Structure of program, FORMAT specification, READ, WRITE, Terminating a program, programming style, Unformatted I/O statements. **(10 Lectures)**

UNIT-III: Control Statements: Unconditional GOTO, Computed GOTO, Arithmetic IF, Logical if, IF-THEN-ELSE, Nested IF-THEN-ELSE, ELSE-IF-THEN, Rules for DO loops, CONTINUE, Nested Do loops, DATA Statement, Double precision, Logical data, COMPLEX data, String manipulation, WHILE structure, Array declarative statements, Implied Do loops, One & multidimensional array, Function subprograms, Subroutine subprograms, COMMON, EQUIVALENCE, Data file organization, OPEN a file, READ from a file, WRITE in a file, Closing a file, File creation programs, File processing programs. **(10 lectures)**

Hands on Exercises: Write programs for the following and get the results
(15 Lectures)

1. Centigrade to Fahrenheit conversion.
2. Area of a triangle.
3. Velocity and acceleration.
4. Fibonacci Numbers
5. Quadratic equation.
6. Sum of series.
7. Sum of sine series.
8. Greatest common divisor.
9. Matrix addition.
10. Matrix multiplication.

Reference Books:

1. Introduction to Numerical Analysis, S S Sastry, 5th edition, 2012, PHI Learning Pvt. Ltd.
2. Computer programming in Fortran 77, V. Rajaraman, PHI Publisher
3. Computational Physics: An Introduction, R. C. Verma, New Age International Publisher, New Delhi.

OR

Skill Enhancement Course-I (Credit: 02) B. Sc. III SEM

Electrical Measurements Credit: 02 45 Lectures (Theory + Lab)	Maximum Marks: 50 C. A. (Internal): 25 ESE OR Skill Exam:25
Maintain project file or Dissertation to check Analytic skills/ problem solving in skill exam	

UNIT-I: Basic of Measurement: Instruments accuracy, Precision, Sensitivity, Resolution range, Errors in measurements, Loading effect. **(3 Lectures)**

UNIT-II: Multimeter: Principle of measurement of dc voltage and dc current, ac voltage, ac current, Resistance, Specifications of a Multimeter and their significance. **(4 Lectures)**

UNIT-III: Voltmeter: Principles of voltage measurement (block diagram only), Sensitivity, Specifications of an electronic voltmeter and its significance, Ac millivoltmeter, Types of ac millivoltmeter. **(5 Lectures)**

UNIT-IV: Milliammeters: Principle of current measurement, Measurements of dc current, Ac current, Micro ammeters **(5 Lectures)**

UNIT-V: Impedance Bridges: Block diagram of bridge, Working principles of basic (balancing type) RLC bridge, Specifications of RLC bridge. **(6 Lectures)**

UNIT-VI: Digital Instruments: Principle and working of digital meters, Comparison of analogue and digital instruments, Characteristics of digital meter, Working principle of digital voltmeter, Block diagram and working of digital Multimeter. **(7 Lectures)**

Hands on Exercises: (15 Lectures)

1. Measurement of ac and dc voltages by using analogue multimeter.
2. Measurement of resistance using colour code and analogue multimeter.
3. Measurement of ac and dc currents by using multimeter.
4. Measurement of ac and dc voltages by using AC/DC Voltmeters.
5. Measurement of ac and dc currents by using AC/DC Milliammeters.
6. Determination of value of L and C using bridge circuit.
7. Measurement of ac and dc voltages by using digital multimeter.
8. Measurement of resistance using digital multimeter.
9. To study testing of diode and transistor with multimeter.

Reference Books:

1. A Text book in Electrical technology, B L Theraja, S Chand & Co
2. Digital Circuits & Systems, Venugopal, 2011, Tata McGraw Hill
3. Electronic Circuits: Handbook of design and applications, U. Tietze, Ch. Schenk, 2008, Springer
4. Electronic Devices & Circuits, S. Salivahanan & N S Kumar, 3rd edition, 2012, Tata McGraw Hill

Swami Ramanand Teerth Marathwada University Nanded**Choice Based Credit System (CBCS) Course Structure (New scheme)****B. Sc. Second Year (Semester – IV)**

Semester Pattern effective from June -2017

Physics**CCPS II (Section B)*****Skill Enhancement Course SEC II*****Credits: 02 (Marks: 50)****Periods: 45****Skill Enhancement Course-II (Credit: 02) B. Sc. IV SEM**

Applied Optics Credit: 02 45 Lectures (Theory + Lab)	Maximum Marks: 50 C. A. (Internal): 25 ESE OR Skill Exam:25
Maintain project file or Dissertation to check Analytic skills/ problem solving in skill exam	

UNIT-I: Refraction Through Lenses: Types of lenses, The sign convention, principal foci, Deviation produced by a thin lens, Power of a lens, Principal planes and focal planes, Dispersion by prism, Dispersive power, Huygens eyepiece, Ramsden eyepiece.

(10 Lectures)

UNIT-II: Semiconductor Sources and Detectors: Construction of LED, Working principle of LED, Types of LED, Construction of LDR, Working principle of LDR, Construction of photovoltaic cell & its working principle. **Polarization of Light:** Polarization of transverse wave, Plane of polarization, Brewster law, Malus law, specific rotation, Laurent's half shade polarimeter.

(10 Lectures)

UNIT-III: Laser: Lasers, spontaneous and stimulated emission, Theory of laser action, Einstein's coefficients, Light amplification, Characterization of laser beam, He-Ne laser, Semiconductor lasers.

(10 Lectures)**Hands on Exercises: (15 Lectures)**

1. Determination of focal length of a biconvex lens.
2. Determination of radius of curvature of a lens using a spherometer.
3. Determination of power of a lens.
4. Determination of the grating radial spacing of a compact disc (CD) by reflection using a laser source.

5. To find the width of the slit using diffraction pattern obtained by a laser.
6. To find angle of polarization using Brewster law.
7. To study V-I characteristics of LED.
8. Study the characteristics of solid state laser.
9. Study the characteristics of LDR.
10. Study characteristics of a photovoltaic cell.

Reference Books:

1. Fundamentals of optics, F. A. Jenkins & H. E. White, 1981, Tata McGraw Hill.
2. LASERS: Fundamentals & applications, K. Thyagrajan & A. K. Ghatak, 2010, Tata McGraw Hill.
3. A Text Book of Optics, Brij Lal & Subramanyam, 1989, S Chand & Co
4. Laser & Non- linear optics, B. B. Laud, New Age International Publisher

OR

Skill Enhancement Course-II (Credit: 02) B. Sc. IV SEM

Electronic devices and equipments Credit: 02 45 Lectures (Theory + Lab)	Maximum Marks: 50 C. A. (Internal): 25 ESE OR Skill Exam:25
Maintain project file or Dissertation to check Analytic skills/ problem solving in skill exam	

UNIT-I: Basic Electricity Principles: Resistance, Inductance, Capacitor, Colour code, Voltage, Current, Power, Ohm's law, Kirchhoff's law, Junction diode, Transistor
(6 Lectures)

UNIT-II: Understanding Electronic circuits: Ac and Dc sources, Rules to analyse DC sourced electronic circuits, Current and voltage drops across the DC circuit elements, Rectifiers (half wave, full wave & bridge), Voltage regulator using Zener diode.
(6 Lectures)

UNIT-III: Transistor applications: CE amplifier, its analysis and performance, CB amplifier, its analysis and performance, Hartley oscillator, Colpitt oscillator and their performance, Wien bridge oscillator and its performance (6 Lectures)

UNIT-IV: Signal Generators: Block diagram, explanation and specification of low frequency signal generators, Pulse generator, Function generator.
(6 Lectures)

UNIT-V: Cathode Ray Oscilloscope: Block diagram of basic CRO, construction of CRT, electron gun, electrostatic focusing and acceleration (only explanation), Use of CRO for measurement of ac and dc voltages, time period, frequency, special features of dual trace CRO, study of Lissajous figures.
(6 Lectures)

Hands on Exercises: (15 Lectures)

1. Measurement of voltage, time period and frequency using CRO.
2. Measurements of rise and fall time using CRO.
3. To study dual trace CRO.
4. Study of full wave rectifier.
5. Study of Lisajous figures.
6. Study of Zener diode voltage regulator.
7. To study of performance of single stage CE amplifier.
8. Determination of resistance and capacitor values using colour code.
9. To study wave forms generated by a function generator.

Reference Books:

1. A Text Book in Electrical Technology, B. L. Theraja, S Chand & Co.
2. Electronic Circuits: Handbook of design and applications, U. Tietze, Ch. Schenk, 2008, Springer.
3. Electronic devices, 7/e Thomas L. Floyd, 2008, Pearson India.
4. Electronic Devices & Circuits, S. Salivahanan & N S Kumar, 3rd edition, 2012, Tata McGraw Hill

Note: SEC I & II Continuous Assessments (CA) includes test on theory 15 + seminar 10 = 25; 25 Marks for Seminar on SEC or conducting of the practical work on SEC (Annually). SEC is examined by External Examiner at the time of their Practical examination for 25 Marks.

Students can have choice of SEC from any one of their optional subjects: Physics, Mathematics, Chemistry or Physics, Mathematics, Electronics or Physics Mathematics, Computer Science as per their Group. Students can have choice of SEC from other department also and their credits are transferred to parent department.

Submitted by Dr. L. S. Ravangave
Member of Coordination Committee
Swami Ramanand Teerth Marathwada University Nanded.

Dr. B. S. MUNDE
Member of syllabus committee

Prof. M .P. SARWADE
Member of syllabus committee

Paper setting Pattern
B. Sc. II Year for SEM III &IV

All Questions are compulsory

Question NO. 1 Multiple Choice Questions

10 Marks.

- I) .
- II) .
- III) .
- IV) .
- V) .
- VI) .
- VII) .
- VIII) .
- IX) .
- X) .

Question NO. 2 Attempt Any five from following.

10 Marks

- a)
- b).
- C).
- d).
- e)
- f).
- g).

Question NO.3 Attempt any Two of the following

10 Marks

- a).
- b).
- c).
- d).

Question NO. 4 Attempt any one from following

10 Marks

- a)
- b)

Proforma for B. Sc. S. Y. Physics (CBCS Pattern) Practical Examination Marks Distribution

B. Sc. S. Y.		CBCS pattern	
Minimum Practicals completed		12	
		Mark Distribution	
Annual = 40		Total = 40	
Experimental performance	40		
Total Marks	40		

Note: The Continuous Assessment (C. A.) marks of practical papers includes viva voce = 05 marks + Journal (Record Book) = 05 Marks. Total 10 marks and should be submitted along with internal examination marks (C. A.) to the university.