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V .G .Vaze College of Arts, Science and Commerce

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Syllabus for S Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 3

Course: Mechanics and Thermodynamics (Physics Paper-I)

Course Code	Paper Title	Credit
SPHT301	Mechanics and Thermodynamics	2

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1. Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHT301
iii) Course Title	:	Mechanics and Thermodynamics
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	02
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	03
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (4 Questions of 15 marks) Internal Assessment 40 marks: (Test 15 marks, Project/ Assignment 15 marks Class Participation: 10 marks)
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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Programme: SYBSc	Semester: III
Course : Mechanics and Thermodynamics	Course Code : SPHT301

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	3		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	**1. Concepts of SHM and simple pendulum** **2. Newton's laws of mechanics** **3. Basic concepts of thermodynamics** **4. Zeroth and first laws of thermodynamics**

Course Objectives	
1.	Introduction to compound pendulums
2.	Understand the complexity associated with system of particles and how to simplify that using the concept of centre of mass
3.	Explore various cases associated with SHM
4.	Acquire in-depth knowledge of laws of thermodynamics and related thermadynamic quantities
5.	Understand how various engines work
6.	Learn about situations in low temperature.
7.	Develop problem-solving skills in all above areas

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1 Mechanics	I	**Chapter 1: Compound pendulum** 1.1 Expression for period, maximum and minimum time period 1.2 Centres of suspension and oscillations, reversible	15

		compound pendulum. 1.3 Kater's reversible pendulum, compound pendulum and simple pendulum- a relative study. **Chapter 2 :System of particles** 2.1 Center of Mass ,Motion of the Center of Mass 2.2 Linear momentum of a Particle, Linear momentum of a System of Particles 2.3 Linear momentum wrt CM coordinate (i.e shift of origin from Lab to CM), Conservation of Linear Momentum 2.4 Some Applications of the Momentum Principle , System of Variable Mass 2.5 Torque Acting on a Particle , Angular Momentum of a Particle, Angular Momentum of System of Particles 2.6 Total angular momentum wrt CM coordinate, Conservation of Angular Momentum **Chapter 3 :Oscillations** 3.1 The Simple Harmonic Oscillator, Relation between Simple Harmonic Motion and Uniform Circular Motion, Two Body Oscillations 3.2 Damped Harmonic Motion 3.3 Forced Oscillations and Resonance	
2 Thermod-ynamics I	II	**Chapter 4: Heat and Work** 4.1 Review of zeroth and first law of thermodynamics 4.2 Conversion of heat into work, heat engine 4.3 Carnot's cycle: its efficiency **Chapter 5: Second law of thermodynamics** 5.1 Statements, Equivalence of Kelvin and Plank statement 5.2 Carnot's theorem, Reversible and irreversible process 5.3 Absolute scale of temperature **Chapter 6: Entropy** 6.1 Clausius theorem, Entropy 6.2 Entropy of a cyclic process, Reversible process, Entropy change, Reversible heat transfer 6.3Principle of increase in entropy, generalized form of first and second law, entropy change of an ideal gas, entropy of steam 6.4 entropy and unavailable energy, entropy and disorder, absolute entropy	15
3 Thermod-ynamics II	III	**Chapter 7 Third Law of Thermodynamics** 7.1 Third law of thermodynamics, Nernst heat theorem, Consequences of the third law 7.2 Maxwell's thermodynamic relations 7.3 Clausius – Clapeyron equation, Thermal Expansion	15

		Chapter 8 : Heat Engines 8.1 Steam engine, Rankine cycle 8.2 Otto engine, Efficiency of Otto cycle 8.3 Diesel cycle, Efficiency of Diesel cycle 8.4 Otto and diesel comparison **Chapter 9: Low temperature Physics** 9.1 Different methods of liquefaction of gases, methods of freezing, Cooling by evaporation, cooling by adiabatic expansion 9.2 Joule - Thompson effect, JT effect of Van der Waal's gas, 9.3 Liquefaction of helium, properties and uses of liquid Helium	

Semester III : Mechanics and Thermodynamics I (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	15 marks
Q.2 (Unit 2)	15 marks
Q.3 (Unit 3)	15 Marks
Q.4 Based on all module	15 Marks

Course Outcomes **Students should be able to...**	
CO1	Understand the various concepts related to compound pendulum
CO2	Derive expressions for linear momentum, angular momentum and torque with and without CM frame
CO3	Solve problems related to variable mass systems
CO4	Solve DE of SHM for various cases
CO5	Understand the various interpretations of the term "Entropy"
CO6	Explain working of various engines through PV diagrams and derive expressions for their efficiency

Recommended Resources	
Reference Books	**Main References:** <u>Unit 1:</u> 1. Resnick and Halliday : Physics – I 2. Mechanics – H. S. Hans and S. P. Puri, Tata McGraw Hill (2nd ED.) <u>Unit 2 and 3</u> 1. Thermal Physics, AB Gupta and H. Roy, Book and Allied (P) Ltd, Reprint 2008, 2009. 2. Heat thermodynamics and Statistical Physics, Brijlal, N.Subramanyam, P.

	S. Hemne, S. Chand, edition 2007. **Additional Reference :** Unit 1: 1. Mechanics by K.R Symon 2. Classical Dynamics of particles and systems by Thornton and Marian, (CENGAGE Learning) 3. Mechanics and Electrodynamics Rev Edn. 2005 by Brijlal and Subramanyan and Jeevan Seshan Unit 2 and 3: 4. Classical mechanics by Kleppener , Kollenkov 5. Basic Thermodynamics : Evelyn Guha (Narosa Publications) 6. A Treatise on heat : Meghanad Saha and BN Srivastava , 1969, India Press 7. Thermal physics by S C Garg, R M Bansal and C K Ghosh, McGraw Hill

This is the Final syllabus which has been approved by the following BOS Members:

1. Dr. Suresh Kadam : Head Department of Physics
2. Prof S Bapat (Vice-Chancellor Nominee)
3. Dr. Sunil Patange : Subject expert from other university (DRBAMU)
4. Dr. Ravi Kawale: Subject expert from other university (DRBAMU)
5. Mr Gangadhar Nair : Industry sector
6. Dr. K.G.Bhole (Faculty Member Ex HOD)
7. Dr. Manoj P. Mahajan: Faculty Member
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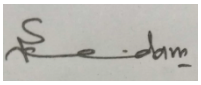
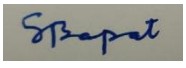


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 3

Course: Vector Calculus & Analog Electronics (Physics Paper-II)

Course Code	Paper Title	Credit
SPHT302	Calculus & Analog Electronics	2

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHT302
iii) Course Title	:	Calculus & Analog Electronics
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	02
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	03
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (4 Questions of 15 marks) Internal Assessment 40 marks: (Test 15 marks, Project/ Assignment 15 marks Class Participation: 10 marks)
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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Programme: SYBSc	Semester: III
Course : Calculus & Analog Electronics	Course Code : SPHT302

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	3		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. Vector algebra 2. Basics electronics devises 3. Simple integration and derivatives

Course Objectives	
1.	Understand the basic concepts of mathematical physics and their applications in physical situations.
2.	Understand the basic laws of electrodynamics and be able to perform calculations using them.
3.	Understand the basics of transistor biasing, operational amplifiers, their applications
4.	Understand the basic concepts of oscillators and be able to perform calculations using them.
5.	Demonstrate quantitative problem-solving skill in all the topics covered.

Course Content			
Unit No.	Module No.	Content	Lectures
1 Vector Calculus	I	**Chapter 1: Vector Calculus** 1.1 Line, Surface and Volume Integrals 1.2 The Fundamental Theorem of Calculus, The Fundamental Theorem of Gradient, The Fundamental Theorem of Divergence , The Fundamental Theorem of Curl (Statement and Geometrical interpretation is included, Proof of these theorems are omitted) 1.3 Problems based on these theorems **Chapter 2: Curvilinear Coordinates**	15

		2.1 Cylindrical Coordinates 2.2 Spherical Coordinates	
2 Analog Electronics I	II	**Chapter 3: Transistor Biasing** 3.1 Transistor Biasing, Inherent Variations of Transistor Parameters, Stabilisation, Essentials of a Transistor Biasing Circuit, Stability Factor 3.2 Methods of Transistor Biasing, Base Resistor Method, Emitter Bias Circuit, Circuit analysis of Emitter Bias 3.3 Biasing with Collector Feedback Resistor, Voltage Divider Bias Method, Stability factor for Potential Divider Bias **Chapter 4: General amplifier characteristics** 4.1 Concept of amplification, amplifier notations 4.2 Current gain, Voltage gain, power gain 4.3 Input resistance, output resistance, general theory of feedback 4.4 Reasons for negative feedback, loop gain **Chapter 5: Transistor Amplifier** 5.1Practical circuit of transistor amplifier, phase reversal 5.2 Frequency response, Decibel gain and Band width	15
3 Analog Electronics II	III	**Chapter 6:Oscillators** 6.1 Introduction, effect of positive feedback. Requirements for oscillations, 6.2 Phase shift oscillator, 6.3 Wien Bridge Oscillator, 6.4 Colpitt's oscillator, 6.5 Hartley oscillator **Chapter 7: Operational Amplifier** 7.1 Introduction, Schematic symbol of OPAMP, Output voltage from OPAMP 7.2 AC analysis, Bandwidth of an OPAMP, Slew rate, Frequency Response of an OPAMP, OPAMP with Negative feedback, 7.3 Inverting Amplifier, Non-Inverting Amplifier, Voltage Follower 7.4 Summing Amplifier, Applications of Summing amplifier, 7.5 OPAMP Integrator and Differentiator, 7.6 Critical frequency of Integrator, Comparator	15
		Total No. of Lectures	45

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Semester III: Vector calculus & analog electronics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	15 marks
Q.2 (Unit 2)	15 marks
Q.3 (Unit 3)	15 Marks
Q.4 Based on all module	15 Marks

Course Outcomes **Students should be able to...**	
CO1	Solve the problems on vector integrations and use the different frame of system for different problem to simplify them.
CO2	Build the circuit using transistor for different type of biasing also use of transistor as amplifier for ac and dc
CO3	Understand the different type of oscillator and application of oscillator
CO4	Use of Op-amp as amplifier, addition, sub, differentiator and integrator.
CO5	Use of electronic devices to control and modify the analog signal.

Recommended Resources	
Reference Books	**Main References:** Unit 1: 1. Introduction to Electrodynamics 3rd Ed by D.J. Griffith Unit 2: 1. Principles of Electronics – V. K. Mehta and Rohit Mehta. (S. Chand – Multicoloured illustrative edition) Unit 3: 1. Electronic devices and circuits – An introduction Allan Mottershead **Additional references:** 1. Electronic principles by Malvino 2. Operational amplifiers by R. Gayakwad

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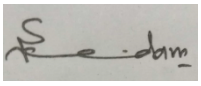
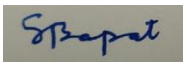


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 3

Course: Applied Physics – I(Physics Paper-III)

Course Code	Paper Title	Credit
SPHT303	Applied Physics – I	2

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V .G .Vaze College of Arts, Science and Commerce

(Autonomous)

1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHT303
iii) Course Title	:	Applied Physics – I
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	02
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	03
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (4 Questions of 15 marks) Internal Assessment 40 marks: (Test 15 marks, Project/ Assignment 15 marks Class Participation: 10 marks)
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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Programme: SYBSc	Semester: III
Course : Applied Physics –I	Course Code : SPHT303

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	3		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. Idea of sound wave, LASER & optical fibre 2. Crystals & its types 3. Idea of nanotechnology

Course Objectives	
1.	Students will be exposed to concept of Acoustics.
2.	Students will appreciate the role of Physics in 'interdisciplinary areas related to materials and Acoustics etc.
3.	Students should familiar with LASER concepts and its principle.
4.	Students should expose to crystal structure so that they can understand the basics of crystallography.
5.	Students should understand the basic concepts of nanotechnology.

Course Content			
Unit No.	Module No.	Content	Lectures
1 Acoustics, LASER and Fibre optics	I	**Chapter 1:Acoustics of Buildings** 1.1 Reverberation, 1.2 Explanation of Sabine's formula,& Importance of Sabine's Formula, 1.3 Absorption Coefficient, 1.4 Acoustics of Buildings, 1.5 Factors Affecting Acoustics of Buildings, 1.6 Sound Distribution in an Auditorium.	15

		Chapter 2 :Laser: 2.1 Introduction, 2.2 Transition between Atomic energy states, 2.3 Principle of Laser, 2.4 Properties of Laser: Coherence Properties of LASER, Spatial Coherence Length, Directionality, Intensity, 2.5 Helium–Neon Laser, 2.6 Application of Laser: Holography	
2 Fibre optics **and crystal physics**	II	**Chapter 3: Fibre Optics:** 3.1 Light propagation through Fibres, 3.2 Fibre Geometry, 3.3 Internal reflection, 3. 4 Numerical Aperture, 3.5 Step-Index and Graded-Index Fibres, 3.6 Applications of Optical Fibres. **Chapter 4: Crystal Physics** 4.1 Lattice points and space lattice, 4.2 The basis and crystal structure, 4.3 Unit Cells and lattice parameters, 4.4 Primitive Cells, Crystal Systems, 4.5 Crystal Symmetry, Bravais space lattices 4.6 Metallic crystal structures, 4.7 Relation between the density of crystal material and lattice constant in a cubic lattice, 4.8 Directions, Planes, Miller Indices, 4.9 Important planes in simple cubic structure, 4.10 separation between lattice planes in a cubic crystal	15
3 **Nanotechnology**	III	**5: Introduction to Nanotechnology** 5.1 Introduction 5.2 Need of Nanotechnology 5.3 Approaches in Nanotechnology 5.4 What are Nonmaterial's 5.5 Physical methods for synthesis of nanoparticles (Qualitative) 5.6 Tools to analyze nanoparticles (SEM, TEM, STM and AFM) 5.7 Applications of Nanotechnology in different fields	15
		Total No. of Lectures	45

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Semester III : Applied Physics –I Paper III (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	15 marks
Q.2 (Unit 2)	15 marks
Q.3 (Unit 3)	15 Marks
Q.4 Based on all module	15 Marks

Course Outcomes Students should be able to...	
CO1	Understand the basic concept of Acoustics of Buildings.
CO2	Understand the basic concept of Fibre Optics:
CO3	Know the properties and importance of LASER.
CO4	Understand the basics of crystallography of elements
CO5	Know the different technique of synthesis of nanomaterial.
CO6	Know the different technique of characterization of nanomaterial.

Recommended Resources	
Reference Books	**Main References:** **Unit I:** **Chapter 1** **RK: 5.9, 5.10, 5.12, 5.13, 5.14 & 5.15** **RK**: Properties of matter and Acoustics – R Murugeshan and K. Shivaprasath, S Chand & Co.Ltd. (2005-Ed) **Chapter 2** **SP:9.1,9.2,9.3,9.4,9.4.1,9.4.2,9.4.3,9.4.4,9.6&9.10** **SP**: Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication **Unit II:** **Chapter 3** SP: 13.3, 13.3.1, 13.3.2, 13.3.3, 13.5 & 13.9 **SP**: Modern Physics Concept and Applications – Sanjeev Puri, Narosa Publication. **Chapter 4** SOP : Chapter 4 : II,III,IV,V, VI, VII, XIV,XV, XVI, XVIII, XX, XXII, XXV,XXVI Solid State Physics – S.O. Pillai, New Age International Publishers **Unit III:** Principles and Practices , Sulabha Kulkarni, Capital Publishing Company (Chapter 3: 3.1,3.2, 3.3,3.4,3.5 and 3.6),Chapter 6 & 10 Solid State Physics by Rita John, McGraw Hill

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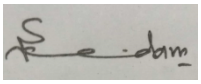
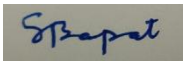


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 3

Course: Practical course –III (Practical's based on three courses)

Course Code	Paper Title	Credit
SPHP03	Practical course –III	3

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V .G .Vaze College of Arts, Science and Commerce

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHP03
iii) Course Title	:	Practical's based on three courses Practical course –III
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	03
vii) No. of lectures per Unit	:	-
viii) No. of Practical per week	:	02
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:150 marks Experiment 1 (group A): 40 Marks Experiment 2(group B): 40 Marks Experiment 3(group C): 40 Marks Journal : 15 Marks Viva : 15 Marks
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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List of Experiments	
Sr. No.	**Description: Experiment from group A**
1	Y by bending.
2	Bar pendulum
3	Searle's experiment: determination of Y
4	Flat spiral spring(Y)
5	Helmholtz resonator- determination of unknown frequency.
6	Moment of Inertia of compound pendulum by method of coincidence.
7	Verification of Stefan's law (electrical method)
8	Temperature coefficient of resistance of conducting material
9	Charging and discharging of capacitor through R
10	LCR parallel resonance.
11	Figure of merit of a mirror galvanometer.
12	Determination of absolute capacitance using BG
13	Measurement of resistance of galvanometer (G by shunting)
	Experiment from group B
1	Passive low pass filter
2	Passive high pass filters.
3	Passive band pass filter.
4	Op-amp: Inverting amplifier with different gains and Difference amplifier
5	Op-amp: Non-inverting amplifier with different gains and voltage follower
6	Op-amp: Integrator and Differentiator
7	CE amplifier: determination of bandwidth
8	CE amplifier: variation of gain with load
9	Lissajous figures using CRO.
10	Phase shift oscillator
11	Colpitt's oscillator
12	Hartley oscillator
	Experiment from group C
1	Laser experiments: straight edge, single slit, ruler grating
2	LASER diffraction using transmission grating
3	Optical fibre: transmission of signal

4	Concept of beats
5	Coupled oscillations and resonance (Resonance Pendulum)
6	Hysteresis using magnetometer
7	Determination of dielectric constant.
8	To study Thermistor characteristic Resistance vs Temperature
9	Comparative study of Surface tension of various fluid.
10	Diode as temperature sensor.
11	Synthesis of materials - mini project - thin film/nano materials/bulkpowders using different routes etc. (equivalent to 2 practical sessions).
12	Visit to research institutes (equivalent to three practical sessions)/Assignment & literature survey (equivalent to 2 practical sessions).
	Skill Experiments
1	Soldering technique
2	Wiring of a simple circuit using breadboard
3	Use of DMM, Component testing, color code of resistors, capacitors.
4	Use of oscilloscope as component tester, phase measurements.
5	Travelling microscope (radius of capillary)
6	Spectrometer: mean μ of yellow doublet of mercury source.
7	Spectrometer: optical leveling and Shuster's method
8	Drawing of graph on semi logarithmic / logarithmic scale.
9	Radius of ball bearings (single pan balance)

For practical examinations, the learner will be examined in three experiments (one from each group) .

Each experiment will be of **three hours'** duration .

A Minimum 7 from each group and in all minimum 21 experiments must be reported in journal.

Minimum 6 skill experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester practical examination only if he /she submit a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester III as per the minimum requirements.

Note: Exemption of two experiments from section A and / or B and / or C may be given if student carries out any one of the following activity.

1) Collect the information of at least five Physicists with their work or any three events on physics, report that in journal.

2) Execute a mini project to the satisfaction of teacher in-charge of practical.

3) Participate in a study tour or visit & submit a study tour report.

Recommended Resources	
Reference Books	1) Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& BSaha. (6th Edition) Book and AlliedPvt.Ltd. 2) B.Sc Practical Physics – Harnam Singh S.Chand& Co. Ld.2001 3) A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh,New Central Book Agency (3rdedition) 4) B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and Co Lt

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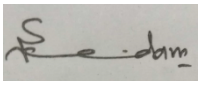
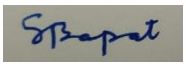


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for S Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 4

Course: Optics and Digital Electronics (Physics Paper-I)

Course Code	Paper Title	Credit
SPHT401	Optics and Digital Electronics	2

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHT401
iii) Course Title	:	Optics and Digital Electronics
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	02
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	03
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (4 Questions of 15 marks) Internal Assessment 40 marks: (Test 15 marks, Project/ Assignment 15 marks Class Participation: 10 marks)
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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Programme: SYBSc	Semester: IV
Course : Optics and Digital Electronics	Course Code : SPHT401

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	3		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite

1. **Basic concepts of interference and diffraction of light**
2. **Understanding of electromagnetic wave nature of light**
3. **Basic concepts of digital electronics and logic gates**

Course Objectives	
1.	Understand the Fresnel and Fraunhoffer type of diffraction and their applications
2.	Acquire in depth knowledge of production, detection, analysis and applications of polarized light
3.	Understand the working of digital circuits
4.	Understand the construction and working of flip-flop, counters and register circuits.
5.	Demonstrate quantitative problem-solving skills in all the topics covered.

Course Content			
Unit No.	Module No.	Content	Lectures
1 Diffraction	I	**Chapter 1: Introduction to Diffraction** 1.1 Introduction, Huygens's - Fresnel theory 1.2 Distinction between interference and diffraction 1.3 Fresnel and Fraunhoffer types of diffraction **Chapter 2: Fresnel Diffraction** 2.1 Fresnel's assumptions, Rectilinear propagation (Half period zones) of light	15

		2.2 Diffraction pattern due to straight edge, Positions of maxima and minima in intensity, Intensity at a point inside the geometrical shadow(straight edge), 2.3 Diffraction due to a narrow slit 2.4 Diffraction due to a narrow wire **Chapter 3:Fraunhoffer Diffraction** 3.1 Introduction, Fraunhoffer diffraction at a single slit Intensity distribution in diffraction pattern due to a single slit 3.2 Fraunhoffer diffraction at a double slit, Distinction between single slit and double slit diffraction pattern and missing orders 3.3 Plane diffraction Grating, Theory of plane transmission grating, Width of principal maxima	
2 Polarization	II	**Chapter 4:Polarization-I** 4.1 Introduction of Polarization, Natural light as Un polarized and Polarized light 4.2 Brewster's law, Polaroid sheets 4.3 Prism and grating spectra 4.4Types of polarization: Plane polarized light, Circularly polarized light, Elliptically polarized light, Partially polarized light, 4.5 Production of Plane polarized light, Polarization by reflection from dielectric surface, Polarization by refraction –pile of plates, Polarization by scattering, Polarization by selective Absorption, Polarization by double refraction **Chapter 5: Polarization-II** 5.1Polarizer and Analyzer, Malus' Law, Anisotropic crystal, Calcite crystal, Optic Axis, Double refraction in calcite crystal 5.2 Huygens' explanation of double refraction, Ordinary and Extra ordinary rays, Positive and Negative crystals **Chapter 6: Wave plates** 6.1 Superposition of waves linearly polarized at right angles, Superposition of e-Ray and o-Ray, Retarders, 6.2 Quarter wave plate, Half wave plate 6.3 Production of linearly polarized light, Production of elliptically polarized light, Production of circularly polarized light 6.4 Analysis of polarized light 6.5 Applications of polarized light	15
3	III	**Chapter 7 Number System**	15

Digital Electronics		7.1 Introduction, Binary number system, Arithmetic building blocks, Types of registers, Digital IC signal levels 7.2 Binary to Decimal, Decimal to binary 7.3 Hexadecimal number, Hexadecimal to decimal Conversion, Decimal to hexadecimal conversion, Hexadecimal to binary conversion, Binary to hexadecimal conversion 7.4 Binary addition, Unsigned binary numbers, Sign magnitude numbers, 1's complement, 2's complement , Converting to and from 2's complement representation , 2's complement arithmetic, The adder-subtractor (ignore IC specific diagrams) **Chapter 8 :Flip Flops and Counters** 8.1RS Flip-Flops (only NOR gate latch, NAND gate latch), Gated Flip-Flops, Edge-Triggered RS Flip-Flop, Edge-Triggered D Flip-Flop, Edge-Triggered J-K Flip-Flop, JK Master- Slave Flip-Flops, Bounce elimination switch 8.2 Asynchronous counter -3 bit (ignore IC specific diagrams), Synchronous counter only mod 8, Decade Counters Mod5 and Mod10	

Semester IV : Optics & Digital electronics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	15 marks
Q.2 (Unit 2)	15 marks
Q.3 (Unit 3)	15 Marks
Q.4 Based on all module	15 Marks

Course Outcomes	
Students should be able to...	
CO1	Derive expressions for positions of maxima and minima due to diffraction at various obstacles and determine the intensity profile
CO2	Understand various ways of producing polarized light
CO3	Explain how to detect and analyse polarised light
CO4	Convert decimal numbers to binary, octa decimal, hexadecimal and vice-versa .
CO5	Perform mathematical operations on binary numbers
CO6	Understand working of various digital electronic-components and explain it through timing diagrams (wherever applicable).

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Recommended Resources	
Reference Books	**Main References:** **Unit 1 and 2:** 1. A Text Book Of Optics By: Dr.N.Subrahmanyam, Brijlal, Dr M.N. Avadhaanulu (S.Chand, 25th Revised edition2012 Reprint 2013) 2. AJOY GHATAK: OPTICS (5th Edition) **Unit 3:** 1. Digital Principles and Aplications By Leach, Malvino, Saha 6th edn. **Additional References:** 1. Digital Fundamentals by Thomas L Floyd 10th edn. (Additional Reading) 2. RPJ – Modern Digital Electronics by R P Jain 4th edn. (Additional Reading)

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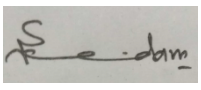
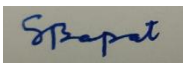


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nomin

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 4

Course: Quantum Physics (Physics Paper-II)

Course Code	Paper Title	Credit
SPHT402	**Quantum Physics**	2

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHT402
iii) Course Title	:	Quantum Physic
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	02
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	03
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (4 Questions of 15 marks) Internal Assessment 40 marks: (Test 15 marks, Project/ Assignment 15 marks Class Participation: 10 marks)
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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Programme: SYBSc	Semester: IV
Course : Quantum Physics	Course Code : SPHT402

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	3		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. calculus 2. linear algebra 3. Ordinary Differential Equation and partial Differential Equation 4. Probability and statistics.

Course Objectives	
1.	Understand the postulates of quantum mechanics and to understand its importance in explaining significant phenomena in Physics.
2.	Demonstrate quantitative problem-solving skills in all the topics covered.

Course Content			
Unit No.	Module No.	Content	Lectures
1 The Schrodinger Wave Equation	I	**Chapter 1 :The Schrodinger wave equation** 1.1. Concept of wave function, Born interpretation of wave function. 1.2 Concepts of operator in quantum mechanics examples – position, momentum and energy operators. 1.3. Eigen value equations, expectation values of operators. 1.4. Schrodinger equation. **Chapter 2 :Formulation** 2.1 Postulates of Quantum Mechanics. 2.2Analogy between Wave equation and Schrodinger	15

		equation. 2.3 Time dependent and time independent (Steady State) Schrodinger equation, Stationary State, Superposition principle. 2.4 Probability current density, Equation of continuity and its physical significance.	
2 Applications of Schrodinger steady state equation - I	II	**Chapter 3:Applications of Schrodinger equation** 3.1 Free particle 3.2Particle in infinitely deep potential well (one - dimension). 3.3. Particle in finitely deep potential well (one - dimension) **Chapter 4: Applications of Schrodinger equation-I** 4.1Step potential. 4.2Particle in three-dimension rigid box, degeneracy of energy state.	15
3 Applications of Schrodinger steady state equation –II	III	**Chapter 5 Applications of Schrodinger equation-II** 5.1 Potential barrier (Finite height and width) penetration and tunnelling effect (derivation of approximate transmission probability) **Chapter 6 : Applications of Schrodinger equation-III** 6.1 Theory of alpha particle decay from radioactive nucleus. 6.2 Harmonic oscillator (one-dimension), correspondence principle	15
		Total No. of Lectures	45

Semester IV: Quantum Physics Paper (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	15 marks
Q.2 (Unit 2)	15 marks
Q.3 (Unit 3)	15 Marks
Q.4 Based on all module	15 Marks

Course Outcomes Students should be able to...	
CO1	Solve problems on different operator, eigenvalues and Eigen function.
CO2	Find out the expectation value of particle for different system
CO3	Understand the nature of particle trapped in some potential or particle in close system also in open system.
CO4	How the transmission of particle occur with different energy. Solve the problems based on that.

CO5	Problems on alpha decay and the expectation value of different energy in HO.

Recommended Resources	
Reference Books	1. Concepts of Modern Physics – A. Beiser (6th Ed.) Tata McGraw Hill. 2. Quantum Mechanics – S P Singh, M K Bagade, Kamal Singh, - S. Chand : 2004 Ed. 3. Quantum Mechanics of Atoms, Molecules, Solids, Nuclei and particles. - By R. Eisberg and R. Resnik Published by Wiley. 5. Introduction to Quantum Mechanics. - By D. Griffiths Published by Prentice Hall. 6. Quantum Mechanics. - By Ghatak and Lokanathan Published by Mc. Millan. 7. Quantum Mechanics. - By L. I. Schiff. 8. Quantum Mechanics. - By Powell and Crasemann, Addison-Wesley Pub. Co.

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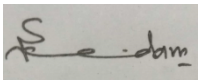
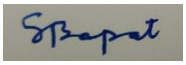


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 3

Course: Applied Physics – II (Physics Paper-III)

Course Code	Paper Title	Credit
SPHT403	**Applied Physics – II**	2

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Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHT403
iii) Course Title	:	Applied Physics – II
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	02
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	03
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (4 Questions of 15 marks) Internal Assessment 40 marks: (Test 15 marks, Project/ Assignment 15 marks Class Participation: 10 marks)
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications
6 Special Ordinances / Resolutions, if any	:	No

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Programme: SYBSc	Semester: IV
Course : Applied Physics – II	Course Code : SPHT403

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA) 40 marks					End Semester Examination	Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Written	
3	-	3		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. Basic idea about matter & its properties 2. Basic idea about gates

Course Objectives	
1.	Understand the importance of peripheral devices in Microprocessor 8085.
2.	Understand the construction and working of basic Microprocessor 8085.
3.	Understand the Internal structure of 8085.
4.	Know the different Instruction sets of 8085.

Course Content			
Unit No.	Module No.	Content	Lectures
1	I	**Chapter 1:Logic devices for interfacing** 1.1Tristate device 1.2 Registors 1.3 Buffer 1.4 Multiplexer and Demultiplexer 1.3Bus organized structure **Chapter 2 : Building Concept of Microprocessor** 2.1 Introduction, 2.2 Study of Memory, 2.3 Input Device, Output Device, Input/output Device Central Processing Unit.	15
2	II	**Microprocessors**	15

		Chapter 3: 8085Microprocessor 3.1 Introduction , 3.2 Features of Inter 8085 , 3.3 Pin Diagram of 8085 , 3.4 8085 CPU Architecture , 3.5 Arithmetic and Logical Group (ALU , Accumulator, Temporary Register , Flag Register (PSW)) , Register Group (Temporary Registers (W and Z) , 3.6 General purpose registers , Special Purpose registers) , 3.7 Interrupt Control , 3.8 Serial I/O Control Group , 3.9 Instruction Register , 3.10 Decoder and Control Group (Instruction Register , Instruction Decoder , Timing and Control)	
3	III	**Chapter 4 : 8085 Instruction Set** 4.1 Introduction , 4.2 Flowchart , 4.3 Classification of Instruction Set (Data Transfer Group , Arithmetic Group , Logical Group , Branching Group , Stack and Machine Control Group) , 4. 4 Notations used in Instructions and Opcode , 4.5 Data Transfer Group , 4.6 Program Examples for Data Transfer Group , Arithmetic Operation Group , Branch Group, Logical Group, 4.7 Addressing Modes, 4.8 8085ProgrammersModel.	15
		Total No. of Lectures	45

Semester IV: Applied Physics II – (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	15 marks
Q.2 (Unit 2)	15 marks
Q.3 (Unit 3)	15 Marks
Q.4 Based on all module	15 Marks

Course Outcomes **Students should be able to...**	
CO1	Understand the concepts of peripheral devices
CO2	Understand the internal structure of 8085 microprocessor
CO3	Understand the instruction set of 8085 microprocessor
CO4	Understand the data transfer group in 8085 microprocessor

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Recommended Resources	
Reference Books	Reference Book: V.J. Vibhute & P.B. Borole, Fifth RevisedEdition **Unit : I** Chapter 3: 3.1, 3.2 , 3.3 (3.3.1 , 3.3.2 , 3,.3.3) , 3.4. , 3.5, 3.6, 3.7 **Unit : II** Chapter 4: 4.1 , 4.2 , 4.3. , 4.4 , 4.5 (4.5.1 , 4.5.2 , 4.5.3 , 4.5.4) , 4.6 (4.6.1 , 4.6.2 , 4.6.3,4.7 , 4.8 , 4.9 (4.9.1 , 4.9.2 , 4.9.3) **Unit : III** Chapter 6 : 6.1 , 6.2 , 6.3 6.4 , 6.5 , 6.6 , 6.7 , 6.8 (6.8.1 , 6.8.2 , 6.8.3, 6.8.8 , 6.8.9, 6.8.10 , 6**.8.11 (A part Block Transfer) , 6.9 (6.9.1 upto 6.9.19) 6.12 ,6.13**

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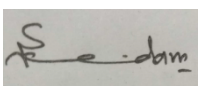
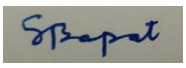


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 4

Course: Practical course –IV (Practical's based on three courses)

Course Code	Paper Title	Credit
SPHP04	Practical course –IV	3

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V .G .Vaze College of Arts, Science and Commerce

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	S.Y.B.Sc
ii) Course Code	:	SPHP04
iii) Course Title	:	Practical's based on three courses Practical course –IV
iv) Semester wise Course Contents	:	Copy of the syllabus Enclosed
v) References and additional references	:	Enclosed in the Syllabus
vi) Credit structure	:	
No. of Credits per Semester	:	03
vii) No. of lectures per Unit	:	-
viii) No. of Practical per week	:	02
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:150 marks Experiment 1 (group A): 40 Marks Experiment 2(group B): 40 Marks Experiment 3(group C): 40 Marks Journal : 15 Marks Viva : 15 Marks
3 Special notes, if any	:	No
4 Eligibility, if any	:	As laid down in the College Admission brochure / website
5 Fee Structure	:	As per College Fee Structure specifications

6 Special Ordinances / Resolutions, if any : No

List of Experiments	
Sr. No.	**Description: Experiment from group A**
1	Optical lever: determination of μ
2	Cylindrical obstacle: determination of λ
3	Single slit diffraction
4	Fresnel's bi-prism: determination of λ
5	Determination of Couchy's constants.
6	R.P. of telescope.
7	Brewster's law: determination of μ
8	Polarimeter
9	Laser beam profile (Divergence and Intensity profile using LDR)
10	Determination of wavelength of sodium using grating
11	Determination of R.I. of liquid by laser
12	Optical lever: determination of μ
	Group B Experiments
1	Square wave oscillator using gates.
2	Half adder and full adder (7486,7408)
3	Study of MS-JK flip flop
4	Study of 3:8 Decoder(74LS138) and 8:3 Priority Encoder(74LS148)
5	4 -bit One's complement using EX-OR gates
6	Counters- mod 2,5 and10
7	Capacitance by series bridge
8	Op-Amp as Astable multivibrator
9	Op-Amp as Schmitt trigger
10	C1/C2 using De-Sauty's method
11	Verification of maximum power transfer theorem
	Experiment from group C
1	Study of 8085 microprocessor kit and commands.
2	8 -bit addition, subtraction, multiplication
3	Two digit Decimal addition, subtraction.
4	Memory blocks transfer from one location to another.

5	Find largest/smallest number in given block.
6	Find number of positive/negative, odd/even elements in given block.
7	Arrange given number in ascending/descending order
8	(**Note**: Use 8085 kit or any 8085 simulator to perform practical)
9	Use of initial magnetization curve to find flux in core
10	Project on a topic (equivalent to three practical sessions)
11	Visit to research institutes (equivalent to three practical sessions)
12	Assignment& literature survey (equivalent to 2 practical sessions).
13	Plotting and analysis of detector data (from University /research institutions)
	Demonstration experiments
1	Error analysis of a given experiment
2	Wave form generator using Op-amp
3	PC simulations: graph, curve fitting etc.
4	Straight edge Fresnel diffraction
5	First order active filter.
6	Use of DAD instruction in 8085.
7	Error analysis of a given experiment

Recommended Resources	
Reference Books	1. Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& BSaha. (6th Edition) Book and AlliedPvt.Ltd. 2. B.Sc PRACTICAL Physics – Harnam Singh S.Chand& Co. Ld.2001 3. A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh,New Central Book Agency (3rdedition) 4. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and CoLtd. 5. PracticalPhysics CL Squires (3rd Edition) CambridgeUniversity 6. University Practical Physics – DC Tayal. HimalayaPublication 7. Advanced Practical Physics –Worsnop&Flint.

For practical examinations, the learner will be examined in three experiments, (one from each group). Each experiment will be of three hours' duration.

A Minimum 7 from each group and in all minimum 21 experiments must be reported in journal.

Miimum 5 Demo experiments are required to be completed compulsorily. Students are required to report all these experiments in the journal. Evaluation in viva voce will be based on regular experiments and skill experiments.

A learner will be allowed to appear for the semester and practical examination only if he submits a certified journal of Physics or a certificate that the learner has completed the practical course of Physics Semester III as per the minimum requirements.

Note: Exemption of two experiments from section A and / or B and / or C may be given if student carries out any one of the following activity.

1) Collect the information of at least three events on physics, report that in journal.

2) Execute a mini project to the satisfaction of teacher in-charge of practical.

3) Participate in a study tour or visit & submit a study tour report.

Recommended Resources	
Reference Books	1. Advanced course in Practical Physics D. Chattopadhya, PC Rakshit& BSaha. (6th Edition) Book and AlliedPvt.Ltd. 2. B.Sc PRACTICAL Physics – Harnam Singh S.Chand& Co. Ld.2001 3. A test book of advanced practical PHYSICS _ SAMIR Kumar Ghosh,New Central Book Agency (3rdedition) 4. B.Sc. Practical Physics – CL Arora (1st Edition) -2001 S.Chand and CoLtd. 5. PracticalPhysics CL Squires (3rd Edition) CambridgeUniversity 6. University Practical Physics – DC Tayal. HimalayaPublication 7. Advanced Practical Physics –Worsnop&Flint.

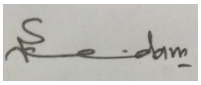
The Kelkar Education Trust's

V .G .Vaze College of Arts, Science and Commerce

(Autonomous)

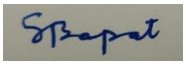
This is the Final syllabus which has been approved by the following BOS Members:

1. Dr. Suresh Kadam : Head Department of Physics
2. Prof S Bapat (Vice-Chancellor Nominee)
3. Dr. Sunil Patange : Subject expert from other university (DRBAMU)
4. Dr. Ravi Kawale: Subject expert from other university (DRBAMU)
5. Mr Gangadhar Nair : Industry sector
6. Dr. K.G.Bhole (Faculty Member Ex HOD)
7. Dr. Manoj P. Mahajan: Faculty Member
8. Mr. Ashitosh Trigune : Faculty Member
9. Mr. Mahesh Kedare : Faculty Member



Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee