The Kelkar Education Trust's

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

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V G Vaze College of Arts, Science and Commerce

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Syllabus for TY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 5

Course: Mathematical Physics and Statistical Mechanics (Physics Paper-I)

Course Code	Paper Title	Credit
TPHT501	Mathematical Physics and Statistical Mechanics	2.5

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1. Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	**TPHT501**
iii) Course Title	:	Mathematical Physics and Statistical Mechanics
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: V
Course : Mathematical Physics and Statistical Mechanics	Course Code : TPHT501

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	**1. Understanding and formulae related to permutations and combinations** **2. Properties of complex numbers** **3. Understanding and ability to solve problems of differentiation, integration and ordinary differential equations** **4. Understanding of basic terms and concepts of thermodynamics**

Course Objectives	
1.	Give review of basic concepts of probability theory
2.	Understand the concept of distribution functions and apply it in problem solving
3.	Develop ability to work with functions of complex variables
4.	Introduction to various methods of solving partial D.E.
5.	Comprehend the concept of microstates, Boltzmann distribution and statistical origins of entropy
6.	Understand the difference between different statistics, classical as well as quantum.

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1 Probability And Statistics	I	**Chapter 1: Introduction to Probability** 1.1 Review of basic concepts Sample space, Events, Types of events **Chapter 2: Theory of Probability** 2.1 Probability theorems Methods of counting (Derivation of Formulae not expected) **Chapter 3 : Statistics** 3.1 Random variables continuous distributions (omit joint distributions) **Chapter 4 : Types of Distributions** 4.1 Binomial distribution 4.2 The Normal distribution 4.3 The Poisson distribution	15
2 Complex functions and differential equations	II	**Chapter 1 : Functions of complex variables** 1.1 The exponential and trigonometric functions 1.2 hyperbolic functions, 1.3 logarithms 1.4 complex roots and powers inverse trigonometric and hyperbolic functions **Chapter 2: Applications of Complex Functions** 2.1 Motion of a particle **Chapter 3: Differential Equations** 3.1 Second-order non homogeneous equations with constant coefficients 3.2 Partial differential equations and their solution through direct integration 3.3 Partial differential equations and their solution through method of separation of variables **Chapter 4:Some Important partial differential equations in Physics** 4.1 One-dimensional heat equation 4.2 Two-dimensional Laplace equation One-dimensional wave equation	15
3 Statistical Thermodynamics	III	**Chapter 1: The Boltzmann Distribution** 1.1 Microstates and Configurations 1.2 Derivation of the Boltzmann Distribution 1.3 Dominance of the Boltzmann Distribution	15

		1.4 Physical Meaning of the Boltzmann Distribution Law 1.5 The definition of β **Chapter 2: Ensemble and Molecular Partition Functions** 2.1 The Canonical Ensemble 2.2 Relating Q to q for an ideal gas 2.3 Translational Partition Function 2.4 The Equipartition Theorem **Chapter 3: Statistical Thermodynamics** 3.1 Energy 1.2 Entropy	
4 Statistical Mechanics	IV	**Chapter 1: Classical Statistics** 1.2 Phase Space 1.2 The probability of a distribution 1.3 The Most Probable Distribution 1.4 Maxwell Boltzmann Statistics 1.5 Application of MB statistics (Molecular Speeds) **Chapter 2: Quantum Statistics** 1.1 Bose Einstein Statistics 1.2 The Rayleigh Jeans formula 1.3 The Planck Radiation Formula 1.4 Fermi Dirac Statistics 2.5 Comparison of MB, BE and FD statistics	15

Semester V: Mathematical Physics and Statistical Mechanics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Solve simple problems in probability
CO2	Understand the concept of independent events and work with standard continuous

	distributions.
CO3	Understand the functions of complex variables.
CO4	Solve non homogeneous differential equations and partial differential equations using simple methods
CO5	Derive expressions for MB, FD, BE statistics
CO6	Derive relation between statistical laws and thermodynamic quantities

Recommended Resources	
Reference Books	**Main References:** **Unit 1 and 2** 1. MB: Mathematical Methods in the Physical sciences: Mary L. Boas Wiley India, 3rd ed. 2. Introduction to Mathematical Methods: Charlie Harper (PHI Learning). **Unit 3** 1. Thermodynamics, Statistical Thermodynamics and Kinetics: T. Engeland P. Reid (Pearson). **Unit 4** 1. Perspectives of Modern Physics: Arthur Beiser, (Mc Graw Hill International). **Additional References:** 1. Mathematical Physics: A K Ghatak, Chua – 1995 Macmillian India Ltd. 2. Mathematical Method of Physics: Riley, Hobson and Bence, Cambridge(Indian edition). 3. Mathematical Physics: H. K. Das, S. Chand & Co. 4. Mathematical Methods of Physics: Jon Mathews & R. L. Walker, W A Benjamin inc. 5. A Treatise on heat: Saha and Srivastava (Indian press, Allahabad) 6. Statistical Physics: F. Reif (Berkeley Physics Course, McGraw Hill) 7. Introductory Statistical Mechanics: R. Bowley and M. Sanchez (Oxford Science Publications). 8. An Introduction to Thermal Physics: D. V. Schroeder (Pearson). 9. PROBABILITY: Schaum's Outlines Series by S. Lipschutz and M. L.Lipsonv (Mc Graw Hill International).

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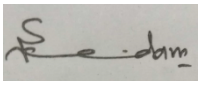
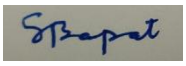
This is the Final syllabus which has been approved by the following BOS Members:

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

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 5

Course: Solid State Physics (Physics Paper-II)

Course Code	Paper Title	Credit
TPHT502	Solid State Physics	2.5

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT502
iii) Course Title	:	Solid State Physics
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: V
Course : Solid State Physics	Course Code : TPHT502

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite

1. **Magnetic properties of materials can be studied.**
2. **Electric property of solids can be studied.**
3. **Semiconductors and their working.**
4. **Central idea about superconductivity.**

Course Objectives	
1.	1. Understand the basics magnetic, electrical properties of metals, Band Theory of solids, demarcation among the types of materials, Semiconductor Physics and Superconductivity.
2.	2. Understand the basic concepts of Fermi probability distribution function, Density of states, conduction in semiconductors and BCS theory of superconductivity.
3.	3. To understand how conduction takes place in semiconductors.
4.	To understand basic concept of superconductivity and their type.
5.	Demonstrate quantitative problem solving skills in all the topics covered.

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1	I	**Chapter 1** Magnetic properties of Materials : 1.1 Introduction 1.2 Magnetization and magnetic field strength 1.3 Diamagnetism 1.4 Classical theory of diamagnetism (Langevin Theory) 1.5 Para magnetism 1.6 Langevin Theory of Para magnetism 1.7 Ferromagnetism and its domain 1.8 Anti ferromagnetism 1.9 Ferrimagnetisms 1.10 Ferrites and their applications	15
2	II	**Chapter 2 : Electrical properties of metals** 2.1 Classical free electron theory of metals 2.2 Drawbacks of classical theory 2.3 Relaxation time, Collision time and mean free path 2.4 Quantum theory of free electrons 2.5 Fermi Dirac statistics and electronic distribution in solids 2.6 Density of energy states and Fermi energy 2.7 The Fermi distribution function 2.8 Heat capacity of the Electron gas, Mean energy of electron gas at 0 K 2.9 Electrical conductivity from quantum mechanical considerations 2.10 Failure of Somerfield's free electron Theory Thermionic Emission	15
3	III	**Chapter 3: Band Theory of Solids** 3.1 Band theory of solids, 3.2 The Kronig- Penney model (Omit eq. 6.184 to 6.188) 3.3 Brillouin zones 3.4 Number of wave functions in a band 3.5 Motion of electrons in a one-dimensional periodic potential 3.6 Distinction between metals, insulators and intrinsic semiconductors. **Chapter 4: Conduction in Semiconductors** 4.1 Electrons and Holes in an Intrinsic Semiconductor 4.2 Conductivity of a Semiconductor 4.3 Carrier concentrations in an intrinsic semiconductor 4.4 Donor and Acceptor impurities 4.5 Charge densities in a semiconductor 4.6 Fermi level in extrinsic semiconductors	15

		4.7 Diffusion, Carrier lifetime 4.8 The continuity equation 4.9 Hall Effect.	
4	IV	**Chapter 5: Diode Theory** 5.1 Semiconductor-diode Characteristics 5.2 Qualitative theory of the p-n junction 5.3 The p-n junction as a diode 5.4 Band structure of an open-circuit p-n junction 5.5 The current components in a p-n junction diode 5.6 Quantitative theory of p-n diode currents 5.7 The Volt-Ampere characteristics 5.8 The temperature dependence of p-n characteristics 5.9 Diode resistance **Chapter 6: Superconductivity** 6.1 Superconductivity: Experimental Survey 6.2 Occurrence of Superconductivity 6.3 destruction of superconductivity by magnetic field 6.4 The Meissner effect 6.5 London equation 6.6 BCS theory of superconductivity 6.7 Type I and Type II Superconductors	15

Semester V: Solid State Physics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Understand the magnetic properties of metals
CO2	Understand the concept electric properties of metals by different models.
CO3	Understand how band structure is form in solids.
CO4	How conduction takes place in the semiconductor.
CO5	Briefly know what is superconductivity and their application.
CO6	Understand the BCS theory of superconductivity .

Recommended Resources

Reference Books

Main References

Unit 1

Solid State Physics : A. J. Dekker, Macmillan India Ltd.
(D : Art 18.1 to 18.4, 19.1 to 19.3, 19.5, 19.9, 19.12.)

Unit 2

Solid State Physics: S. O. Pillai, New Age International. 6th Ed. Chapter 6: II, III, IV, V, XIV, XV, XVI, XVII, XVIII, XX, XXXV, XXXI.

Unit 3

For chapter 3
Solid State Physics: S. O. Pillai, New Age International, 6th Ed. Chapter 6: XXXVI, XXXVII, XXXVIII, XXXIX, XXXX, XXXXI.
For chapter 4
Electronic Devices and Circuits: Millman, Halkias & Satyabrata Jit. (3rd Ed.) Tata McGraw Hill.: 4.1 to 4.10.

Unit 4

For Chapter 5
Ref.: Electronic Devices and Circuits: Millman, Halkias & Satyabrata Jit. (3rd Ed.) Tata McGraw Hill.: 5.1 to 5.8
For Chapter 6
Ref.: Introduction to Solid State Physics-Charles Kittel, 7th Ed. John Wiley & Sons: Topics from Chapter 12.

Modern Physicsand Solid State Physics: Problems and solutions New Age International.

Additional References:

- Solid State Physics by Rita John Mc Graw Hill
- Semiconductor Devices: Physics and Technology, 2nd Ed. John Wiley & Sons.

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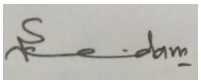
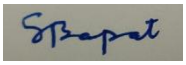


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 5

Course: Atomic and Molecular Physics (Physics Paper-III)

Course Code	Paper Title	Credit
TPHT503	Atomic and Molecular Physics	2.5

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT503
iii) Course Title	:	Atomic and Molecular Physics
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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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V. G .Vaze College of Arts, Science and Commerce

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Programme: TYBSc	Semester: V
Course : Atomic and Molecular Physics	Course Code : TPHT503

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	**1. Basic idea about Spin, Parity & Wave function** **2. Pauli's principle & Hund's rule** **3. Basic idea about spectra & spectrograph** **4. Laws of quantum mechanics**

Course Objectives	
1.	The application of quantum mechanics in atomic physics
2.	The importance of electron spin, symmetric and anti symmetric wave functions and vector atom model
3.	Effect of magnetic field on atoms and its application
4.	Learn Molecular physics and its applications.
5.	This course will be useful to get an insight into spectroscopy.

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1	I	**Chapter I : Hydrogen Atom -I** 1.1 Schrödinger's equation for Hydrogen atom 1.2 Separation of variables 1.3 Quantum Numbers: Total quantum number, Orbital quantum Number, Magnetic quantum number. **Chapter 2: Hydrogen atom – II** 2.1 Introduction 2.2 Angular momentum of electron in H atom 2.3 Orbital magnetic moment	15

		2.4 Quantization of L_z and space quantization 2.5 Atoms in external magnetic field 2.6 Electron probability density (Radial part). **Chapter 3: Electron spin** 3.1 Introduction 3.2 Spin of electron 3.3 Space quantization of electron spin 3.4 Spin magnetic moment and Gyromagnetic ratio of electron spin 3.5 The Stern-Gerlach experiment, 3.6 Pauli's Exclusion Principle 3.7 Symmetric and Anti-symmetric wave functions. 3.8 Hund's rule	
2	II	**Chapter 4: Vector Atom Model** 4.1 Introduction 4.2 Spin orbit coupling, 4.3 Total angular momentum & Vector atom model 4.4 L-S and j-j coupling. **Chapter 5: Atomic spectra and selection rules** 5.1 Introduction 5.2 Quantum theory of Radiative transition 5.3 Selection Rule – Allowed and Forbidden Transitions 5.4 Derivation of selection rule for Magnetic quantum number m **Chapter 6: Atoms in Magnetic Field** 6.1 Introduction 6.2 Experimental observation of Zeeman's experiments 6.3 Classical explanation of Normal Zeeman effect 6.4 Quantum Mechanical explanation of Normal Zeeman effect 6.5 The Lande g –factor 6.6 Anomalous Zeeman effect. **Chapter 7: Atoms in Magnetic Filed** 7.1 Introduction 7.2 Paschen-Back Effect 7.3 Selection rules for Paschen-Back Effect 7.4 Paschen-Back Effect in Principal series doublet	15
3	III	**Chapter 8: Spectra of diatomic Molecule** 8.1 Rotational energy levels 8.2 Rotational spectra of diatomic molecule 8.3 Shortcomings of Rigid Rotator Model of diatomic molecule and Non-rigid rotator. 8.4 Diatomic molecule as Simple Harmonic Oscillator 8.5 Diatomic molecule as an harmonic Oscillator 8.6 Vibrational-Rotational spectra. 8.7 Electronic Spectra of Diatomic molecules: The Born- Oppenheimer approximation, 8.8 Intensity of Vibrational-electronic spectra: The Franck-	15

		Condon principle. 8.9 Infrared spectrometer & Microwave spectrometer	
4	IV	**Chapter 9: Raman effect**. 9.1 Quantum Theory of Raman effect, 9.2 Classical Theory of Raman effect 9.3 Classification of Molecules Based on Rotational Behaviour 9.4 Pure Rotational Raman spectra 9.5 Raman activity of vibrations, 9.6 Vibrational Raman spectra 9.7 Raman Spectrometer 9.10 Applications of Raman effect **Chapter 10 : Magnetic Resonance(NMR and ESR)** **A. Electron spin resonance** 10.1 Introduction, 10.2 Principle of ESR, 10.3 ESR Spectroscopy **B. Nuclear Magnetic Resonance** 10.4 Introduction, 10.5 Nuclear Spin 10.6 Nuclear magnetic moment 10.7 principle of NMR 10.8 NMR instrumentation.	15

Semester V: Atomic Physics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Understand application of quantum mechanics in atomic physics
CO2	Understand importance of electron spin, symmetric and anti symmetric wave functions and vector atom model
CO3	What is the effect of magnetic field on atoms and its application
CO4	What is Molecular physics and its applications.
	Understand spectroscopy.

Recommended Resources	
Reference Books	**Main Reference** **Unit – I –** Perspectives of Modern Physics : Arthur Beiser Page 8 of 18 McGrawHill: 9.1 to 9 .9, and 10.1, 10.3. 2 **Unit – II –** Perspectives of Modern Physics : Arthur Beiser Page 8 of 18 McGrawHill B: 0.2, 10.6, 10.7,10.8,10.9. And 11.1 and 11.2 **Unit – III –** Perspectives of Modern Physics : Arthur Beiser Page 8 of 18 McGrawHill 14.1, 14.3, 14.5, 14.7 **Unit – IV –** **Fundamentals of Molecular Spectroscopy : C. N. Banwell & E. M. McCash (TMH). (4thEd.)** 1. BM: 6.11, 6.1.3. 2. BM: 4.1.1, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.3.1. GA: 8.6.1 2. GA: 11.1,11.2and 11.3 3. GA: 10.1,10.2,10.3 **ADDITIONAL REFRENCES** GA: Molecular structure and Spectroscopy : G Aruldhas (2nd Ed) PHI learning Pvt Ltd. Atomic Physics (Modern Physics):S.N.Ghoshal .S.Chand Publication (for problems on atomic Physics).

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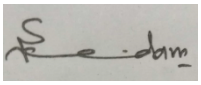
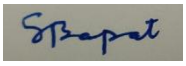


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 5

Course: Electrodynamics (Physics Paper-IV)

Course Code	Paper Title	Credit
TPHT504	Electrodynamics	2.5

1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT504
iii) Course Title	:	Electrodynamics
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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

Programme: TYBSc	Semester: V
Course : Electrodynamics	Course Code : TPHT504

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. The vectors laws and vector calculus and algebra 2. Derivatives, integration and trigonometric functions 3. Basics concept of electrostatics and magnetostatics

Course Objectives	
1.	Understand the laws of electrodynamics and be able to performcalculations using them.
2.	Understand Maxwell's electrodynamics and its relation to relativity
3.	Understand how optical laws can be derived from electromagnetic principles.
4.	Develop quantitative problem-solving skills.

Course Content			
Unit No.	Module No.	Content	Lectures
1 Electrostatics	I	**Chapter 1: Electrostatics** 1.1 Review of Coulomb & Gauss law 1.2 The divergence of **E**, 1.3 Applications of Gauss'law 1.4 The curl of **E** 1.5 Introduction to potential, Comments on potential 1.6 The potential of a localized charge	15

		distribution 1.7 Poisson's equation and Laplace's equation. 1.8 Solution and properties of 1D Laplace equation. Properties of 2D and Laplace equation (without proof). **Chapter 2: Boundary Conditions** 2.1 Boundary conditions and Uniqueness theorems 2.2 Conductors and Second Uniqueness theorem 2.3 The classic image problem- point charge and grounded infinite conducting plane and conducting	
2 Electrostatics in Matter andMagnetostatics	II	**Chapter 7: Poynting's Theorem** 7.1 The continuity equation 7.2 Poynting's theorem **Chapter 8 Electromagnetic waves** 8.1 The wave equation for **E** and **B** 8.2 Monochromatic Plane waves 8.3 Energy and momentum in electromagnetic waves 8.4 Propagation in linear media 8.5 Reflection and transmission of EM waves at normal incidence 8.6 Reflection and transmission of EM waves at oblique incidence.	15
3 Magnetostatics in Matter and Electrodynamics	III	**Chapter 5: Magnetostatics in matter** 5.1 Magnetization, Bound currents and their physical interpretation 5.2 Ampere's law in magnetized materials, A deceptive parallel 5.3 Magnetic susceptibility and permeability. **Chapter 6: Electrodynamics** 6.1 Energy in magnetic fields 6.2 Electrodynamics before Maxwell 6.3 Maxwell's correction to Ampere's law 6.4 Maxwell's equations	15

		6.5 Magnetic charge 6.6 Maxwell's equations in matter, Boundary conditions.	
4 Electromagnetic Waves	IV	**Chapter 7: Poynting's Theorem** 7.1 The continuity equation 7.2 Poynting's theorem **Chapter 8 Electromagnetic waves** 8.1 The wave equation for **E** and **B** 8.2 Monochromatic Plane waves 8.3 Energy and momentum in electromagnetic waves 8.4 Propagation in linear media 8.5 Reflection and transmission of EM waves at normal incidence 8.6 Reflection and transmission of EM waves at oblique incidence.	15

Semester V: Electrodynamics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes	
Students should be able to...	
CO1	Calculation of electric and magnetic potential for different system
CO2	Solve the problems of electrostatics and magnetostatics in matter also
CO3	Understand the Maxwell equation and poyntings theorem to apply on systems
CO4	Explain The basic of electromagnetic wave and light using Maxwell equation

Recommended Resources	
Reference Books	**Main Reference:** 1. DG: Introduction to Electrodynamics, David J. Griffiths (3rd Ed) Prentice Hall of India. **Additional References:**

	1. Introduction to Electrodynamics: A. Z. Capria and P. V. Panat, Narosa Publishing House. 2. Engineering Electrodynamics: William Hayt Jr. & John H. Buck (TMH). 3. Foundations of Electromagnetic Theory: Reitz, Milford and Christy. 4. Solutions to Introduction to Electrodynamics: David J. Griffiths (3rd Ed) Prentice Hall of India.

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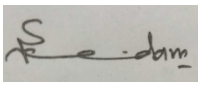
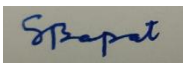


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

The Kelkar Education Trust's

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

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Syllabus for SY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 5

Course: Practical course –V (Course **TPHT501** + Course **TPHT502**)
Course: Practical course –VI (Course **TPHT503** + Course **TPHT504**)

Course Code	Paper Title	Credit
TPHP05	**Practical course –V** **(**Course **TPHT501** + Course **TPHT502**)	**3**
TPHP06	**Practical course –VI** **(**Course **TPHT503** + Course **TPHT504**)	**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	:	T.Y.B.Sc
ii) Course Code	:	TPHP05+ TPHP06
iii) Course Title	:	Practical's based on courses I & IV Practical course V & VI
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	:	3+3 = 6
vii) No. of lectures per Unit	:	-
viii) No. of Practical per week	:	2+2= 4
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:200 marks Experiment 1(group A): 80 Marks Experiment 2(group B): 80 Marks Journal : 20 Marks Viva : 20 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	Determination of 'g' by Kater's pendulum
2	R. P. of prism
3	Surface tension of soap solution
4	Elastic constants of a rubber tube
5	Resistivity by four probe method
6	Logarithmic decrement
7	Searle's Goniometer
8	Determination of Rydberg's constant
9	Edser's 'A' pattern
10	Determination of wavelength by Step slit
11	Determination of e/m by Thomson's method
12	Velocity of sound in air using CRO
	Experiment from group B
1	Mutual inductance by BG.
2	Capacitance by parallel bridge
3	Hysteresis loop by CRO
4	L/C by Maxwell's bridge
5	Band gap energy of Ge diode
6	Solar cell characteristics and determination of V_{oc}, I_{sc} and P_{max}
7	Design and study of Wien bridge oscillator
8	Design and study of first order active low pass filter circuit (BB)
9	Design and study of first order active high pass filter circuit (BB)
10	Hall effect
11	Application of Op-Amp as a Log amplifier
12	Characteristic of photo diode and photo transistor
	Skill Experiments
1	Estimation of errors from actual experimental data
2	Soldering and testing of an astable multivibrator (Tr./IC555) circuit on PCB
3	Optical Leveling of Spectrometer
4	Schuster's method
5	Laser beam profile
6	Use of electronic balance: Find the density of a solid cylinder
7	Dual trace CRO: Phase shift measurement, component testing
8	C1/C2 by B G

9	Internal resistance of voltage and current source

Scheme of Practical Examination:

1. The University (external) examination for Practical shall be conducted at the end of each Semester

2. The candidate should appear for Two Practical sessions of three hours each as part of his/her Practical course examination.

3. The candidates shall appear for external examination of 2 practical courses each carrying 100 marks at the end of each semester.

5. The candidate shall prepare and submit for practical examination a certified Journal based on the practical course with minimum 8 experiments from each groups.

6. The certified journal must contain a minimum of 16 regular experiments (8 from each group), with minimum 5 skill experiments in semester V. A separate index and certificate in journal is must for each semester course.

7. A candidate will be allowed to appear for the practical examination only if the candidate submits a certified journal of TYBSc Physics

Recommended Resources	
Reference Books	Advanced course in Practical Physics: D. Chattopadhya, PC. Rakshit & B. Saha (8th Edition) Book & Allied Pvt. Ltd. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition). B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co. Ltd. Practical Physics: C. L. Squires – (3rd Edition) Cambridge University Press. University Practical Physics: D C Tayal. Himalaya Publication. Advanced Practical Physics: Worsnop & Flint.

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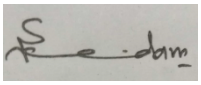
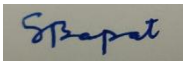


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

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Syllabus for TYBSc

(June 2020 Onwards)

Program: BSc

Semester 5

Course: Applied Component - Computer Science

Course Code	Paper Title	Credit
TACCST501	Advanced Microprocessor, Microcontrollers & Python Programing	02

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc.Physics
ii) Course Code	:	TACCST501
iii) Course Title	:	Semester V - (Applied Component)Advanced Microprocessor, Microcontrollers & Python(Version 3.x) Programing
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	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: V
Course : Advanced Microprocessor, Microcontrollers & PythonPrograming	Course Code :

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. Basic idea about Microprocessor 8085 and its programming 2. Basic idea about Microcontroller 8051 and its programming 3. Basic idea about Python and its programming

Course Objectives	
1.	Microprocessor Advance instruction and programming
2.	Basics of microcontroller MCS 51 family
3.	Hardware and software of MCS 51
4.	Learn higher level programming language
5.	Develop logical and programming skills

Course Content			
Unit No.	Module No.	Content	Lectures
1 Advanced 8085 Programming and 8255 (PPI)	I	Introduction to advanced instructions and applications Stack and Subroutines: Stack, Subroutine The 8255 Programmable Peripheral Interface: Block Diagram of the 8255, Mode 0 – Simple Input or Output mode, BSR (Bit Set/Reset Mode)	15
2 Introduction to Microcontrollers, Instruction Set & Programing	I	**Introduction:** Microcontrollers and Microprocessors, History of Microcontrollers and Microprocessors, Block diagram of 8051 Microcontroller*, Embedded Versus External Memory Devices, 8-bit & 16-bit Microcontrollers, CISC and RISC Processors, Harvard and Von Neumann Architectures, Commercial Microcontrollers.	15

	II III	**8051 Microcontrollers :** Introduction, MCS-Architecture, Registers in MCS-51,8051 Pin Description, 8051 Connections, 8051 Parallel I/O Ports, Memory Organization. **8051 Instruction Set and Programming:** MCS-51 Addressing Modes and Instructions: 8051 Addressing modes, MCS-51 Instruction Set, 8051 Instructions and Simple Programs, Using Stack Pointer	
3 Basics of Python Conditional statements:	I II III IV	**Introduction:** What is a Program**,** The Python Programming Language, History, features, Installing Python, Running a Python program, the first program, Arithmetic operators , Values and types, Formal and Natural Languages **Variables , Expressions and Statements :** Assignment statements **,** Variable Names and Keywords, Expressions and statements , Script mode , Order of Operations , String operations , Comments , Debugging : Syntax Errors, Runtime Errors, Semantic Errors. **Conditionals and recursion :** Floor division and modulus, Boolean expression , Logical operators, Conditional expression, Alternative execution , chained conditionals , Nested conditionals, Recursion , Stack diagrams for recursive functions , infinite recursion , keyboard input. Programs on recursion **Iterations :** Reassignment , updating variables , while statement, break statement	15
4 Functions, Strings & Lists in Python	I II III	**Functions:** Function basics**,** Function Calls, Math Functions, Composition, Adding New Functions, Definitions and Uses, Flow of Execution, Parameters and Arguments, Local variables and parameters, Stack Diagrams, Fruitful Functions and void Functions , return values , composition , incremental development , Boolean functions **Strings:** A String is a Sequence, len built in function , for Loop traversal , String Slices, Strings Are Immutable, Searching, Looping and Counting, String Methods, The in Operator, String Comparisons. **Lists:** A list is a sequence, Lists are mutable, Traversing a	

		List, List operations , List slices, List methods , Deleting elements , Lists & Strings , Objects & Values , Aliasing , List arguments.	
		Total No. of Lectures	45

Semester V : Applied Component – I (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q. 5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Use advance instruction and programme the microprocessor 8085 and also Use of peripheral devices of 8085 microprocessor to interact 8085.
CO2	Understand the basics behind the microcontroller (MCS 51 family) , learn simple programming of MCS 51
CO3	Write and run basic programs in Python
CO4	Understand procedural way of programming using functions

Recommended Resources	
Reference Books	Main Reference: Unit 1: 1. "Microprocessor Architecture Programming and Applications with the 8085" by Ramesh Gaonkar, 5th edition PenramPublishers Pvt. Ltd Unit 2: 1. Microcontrollers (Theory and Applications) by Ajay V Deshmukh, The Tata-McGraw-Hill Companies. Unit 3 amd 4: 1. Think Python by Allen Downey , 2nd Edition 2. Core Python Programming by Dr. R. Nageswara Rao

	3. Additional Reference: 1. Intel's 8031/8051 Data sheet 2. The 8051 Microcontroller & Embedded Systems-Dr. Rajiv Kapadia (Jaico Pub. House) 3. 8051 Micro-controller by K.J.Ayala, Penram International. 4. Programming & customizing the 8051 microcontroller By MykePredko, TMH. 5. The 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidi and R.D.Mckinlay, Second Edition, Pearson. 6. Paul Gries, et al., Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014. 7. Official Python Web site : https://www.python.org/

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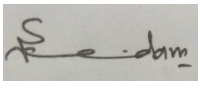

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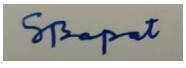

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Vice-Chancellor Nominee

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Syllabus for TYBSc

(June 2020 Onwards)

Program: B.Sc

Semester 5

Course: Applied Component - Practical course

Course Code	Paper Title	Credit
TACCS5P1	**Applied Component - Practical course**	2

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TACCS5P1
iii) Course Title	:	Applied Component - Practical course
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	:	2
vii) No. of lectures per Unit	:	-
viii) No. of Practical per week	:	1
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:100 marks Experiment 1: 40 Marks Experiment 2: 40 Marks Journal : 10 Marks Viva : 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

List of Experiments	
Group A: Advanced 8085 microprocessor & Microcontrollers	
Sr. No.	**A1: Experiments for 8085 and 8255** Any one experiment from 1 & 2 and 3 & 4
1	16-bit Data manipulation (Addition, subtraction) Display result on Address field
2	Write ALP for Addition, Subtraction of two, 8-bit hex numbers. Note: Use Read Keyboard Utility for inputting the hex numbers and display for the result on the Address field.
3	Interfacing 8 LEDs to 8255 i. Write ALP to alternately flash 8 LEDs ii. Write ALP to display binary count in UP sequence on the 8 LEDs
4	Interfacing 8 switches and 8 LEDs to 8255 i. Write ALP read the status of the switches and display on the LEDs. ii. Write ALP so that when the first switch is made ON all the LEDs should glow and when the second switch is made OFF all the LEDs should become off.
	A2:Experiments for 8031/8051/89C51 Any two experiments from 1, 2 and 3
1	8031/51/89C51 assembly language programming: Simple data manipulation programs. (8/16-bit addition, subtraction, multiplication, 8/16-bit data transfer, cubes of nos., to rotate a 32- bit number, finding greatest/smallest number from a block of data, decimal / hexadecimal counter)
2	Study of IN and OUT port of 8031/51/89C51 by Interfacing switches, and LEDs: Interface 4 LEDs to one of the microcontrollers PORT. Write ALP to display bit pattern on LED's. (i) 1000 (ii) 1100 0100 0110 0010 0011 continuously 0001 continuously
3	Interface 4 switches and 4 LEDs to one of the microcontrollers PORT. Develop various types of logic to control LEDs depending on the status/states/conditions of the 4 switches. For example: Write ALP such that when all four switches are ON all four LEDs should glow. But when

	any two switches become OFF then all four LEDs should become OFF. And so on……
Group B: Python Programming Exercises	
Sr. No.	**B1: Perform minimum two experiment**
1	Write a program to generate the Fibonacci series.
2	Write a program to generate if a three digit number entered is an Armstrong number or not
3	Write a function that reverses the user defined value.
4	Write a recursive function to print the factorial for a given number.
	B2: Perform minimum one experiment
1	Write a function that takes a character (i.e. a string of length 1) and returns True if it is a vowel, False otherwise.
2	Define a function that computes the length of a given list or string.
	B3 :Perform minimum two experiments
1	Write a program that takes two lists and returns True if they have at least one common member.
2	Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.
3	Write a Python program to clone or copy a list

Scheme of Practical Examination:

1. The examination for Practical shall be conducted at the end of each Semester

2. The candidate should appear for Two Practical sessions of three hours each as part of his/her Practical course examination.

3. The candidates shall appear for external examination of 2 practical courses each carrying 50 marks at the end of each semester.

5. The candidate shall prepare and submit for practical examination a certified Journal based on the practical course which he/she performed during the practicals.

6. The certified journal must contain a minimum of 90% regular experiments (As per experiment taken) A separate index and certificate in journal is must for each semester course.

7. A candidate will be allowed to appear for the practical examination only if the candidate submits a certified journal of Applied Physics.

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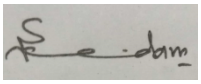

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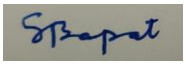

Prof S.G Bapat

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The Kelkar Education Trust's

V G Vaze College of Arts, Science and Commerce

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 6

Course: Classical Mechanics (Physics Paper-I)

Course Code	Paper Title	Credit
TPHT601	Classical Mechanics	2.5

1.Syllabus as per Choice Based Credit System

The Kelkar Education Trust's

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

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i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT601
iii) Course Title	:	Classical Mechanics
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: VI
Course : Classical Mechanics	Course Code : TPHT601

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. Newtonian mechanics, the basics concept and formulas 2. Vectors calculus and algebra.

Course Objectives	
1.	Understand the kinds of motions that can occur under a central potential and their applications to planetary orbits
2.	Appreciate the effect of moving coordinate system, rectilinear as well as rotating
3.	Understand the concepts needed for the important formalism of Lagrange's equations and derive the equations using D'Alembert's principle
4.	Solve simple examples using this formalism
5.	Understand the concepts of fluid mechanics and dynamics of rigid bodies
6.	Understand the irregularity we observe around us in nature as a result of adding nonlinear corrections to usual problems of mechanics i.e. due to non-linear mechanics.

Course Content			
Unit No.	Module No.	Content	Lectures
1 Central Force	I	**Chapter 1:** 1.1 Motion under a central force 1.2 The central force inversely proportional to the square of the distance 1.3 Elliptic orbits, The Kepler problem **Chapter 2:** 2.1 Moving origin of coordinates 2.2 Rotating coordinate systems	15

		2.3Laws of motion on the rotating earth 2.4The Foucault pendulum 2.5Larmor's theorem.	
2 Lagrange's Equations	II	**Chapter 3:** 3.1Constraints, Examples of holonomic constraints,examples of nonholonomic constraints 3.2degrees of freedom and generalizedcoordinates 3.3virtual displacement, virtual work,D'Alembert's principle, 3.4illustrative problems. **Chapter 4:** 4.1 Lagrange's equations (using D'Alembert's principle), 4.2properties of Lagrange's equations 4.3 Illustrative problems 4.4 Canonical momentum, cyclic or ignorable coordinates.	15
3 Fluid Motion and Rigid body rotation	III	**Chapter 5** 5.1 Kinematics of moving fluids 5.2 Equation of motion for an ideal fluid, 5.3Conservation laws for fluid motion, Steady flow. **Chapter 6 :** 6.1 Rigid dynamics: introduction, degrees of freedom 6.2 Rotation about an axis: orthogonal matrix, Euler's theorem, Eulerian angles, inertia tensor 6.3 Angular momentum of rigid body, Euler's equation of motion of rigid body, free motion of rigid body 6.4 Motion of symmetric top (without notation).	15
4 Non-linear Mechanics	IV	**Chapter 7:** 7.1 Nonlinear mechanics: Qualitative approach to chaos 7.2 The anharmonic oscillator 7.3 Numerical solution of Duffing's equation. **Chapter 8** 8.1 Transition to chaos: Bifurcations and strange attractors, 8.2 Aspects of chaotic behaviour (Logistic map).	15

Semester VI: Classical Mechanics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Solve the problem based of central force system and understand the transformation for inertial and non-inertial frame
CO2	Use the lagrangian to solve the classical problem (which we were use the Newtonian mechanics to solve) and understand the difference between them.
CO3	Apply the kinematics of fluids to other system and solve the problems accordingly
CO4	Understand the chaotic behaviour of system and how to simplify.

Recommended Resources	
Reference Books	**Main References:** 1. Classical Mechanics, P. V. Panat (Narosa). 2. Mechanics: Keith R. Symon, (Addision Wesely) 3rd Ed. 3. Classical Mechanics- a Modern Perspective: V. D. Barger and M. G. Olsson. (Mc Graw Hill International 1995 Ed.) **Additional References:** 1. Classical Mechanics: Herbert Goldstein (Narosa 2nd Ed.). 2. An Introduction to Mechanics: Daniel Kleppner & Robert Kolenkow Tata Mc Graw Hill (Indian Ed. 2007). 3. Chaotic Dynamics- an introduction: Baker and Gollub (Cambridge Univ. Press). 4. Classical Mechanics: J. C. Upadhyaya (Himalaya Publishing House).

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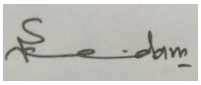
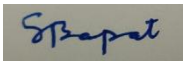


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 6

Course: Electronics (Physics Paper-II)

Course Code	Paper Title	Credit
TPHT602	Electronics	2.5

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Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT602
iii) Course Title	:	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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: VI
Course : Electronics	Course Code : TPHT602

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite

1. **To learn power devices**
2. **To know the Op-amp Application**
3. **To learn logic families**
4. **To understand different types of communication systems**

Course Objectives	
1.	Understand the basics of semiconductor devices and their applications.
2.	Understand the basic concepts of operational amplifier: its prototype and applications as instrumentation amplifier, active filters, comparators and waveform generation.
3.	Understand the basic concepts of timing circuits and regulated power supplies
4.	Brief understanding of monolithic (IC) regulated power supply.
5.	Building blocks and basic concepts of digital communication.
6.	Develop quantitative problem solving skills in all the topics covered..

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1	I	**Chapter 1: Field effect transistors:** 1.1 Introduction to JFET: 1.2 Basic ideas, 1.3 Drain curve, The transconductance curve, 1.4 Biasing in the ohmic region and the active region, 1.5 Transconductance, 1.6 JFET common source amplifier, 1.7 JFET analog switch, multiplexer, voltage controlled resistor, Current sourcing **Chapter 2: MOSFET** 2.1 Introduction to MOSFET: 2.2 Types of MOSFET Depletion and enhancement mode, 2.3 MOSFET operation and characteristics, digital switching. **Chapter 3: Silicon Controlled Rectifier** 3.1 Introduction to SCR – construction, static characteristics, 3.2 Analysis of the operation of SCR, 3.3 Gate Triggering Characteristics, 3.4 Variable half wave rectifier and Variable full wave rectifier, Current ratings of SCR. 3.5 UJT: Construction, Operation and characteristics, its application as a relaxation oscillator.	15
2	II	**Chapter 4: Differential Amplifier using transistor:** 4.1 The Differential Amplifier, 4.2 DC and AC analysis of a differential amplifier, 4.3 Input characteristic-effect of input bias, offset current and input offset voltage on output, 4.4 Common mode gain, CMRR. **Chapter 5: Applications of Op-Amp** 5.1 Log amplifier, 5.2 Instrumentation amplifiers, 5.3 Voltage controlled current sources (grounded load), 5.4 First order Active filters, 5.5 Astable using OP AMP, 5.6 Square wave and triangular wave generator using OP AMP, 5.7 Wein-bridge oscillator using OP AMP, 5.8 Comparators with Hysteresis, Window Comparator	15
3	III	**Chapter 6: Transistor Multivibrators:** 6.1 Astable Multivibrator. 6.2 Monostable Multivibrator.	15

		6.3 Bistable Multivibrator, 6.4 Schmitt trigger. **Chapter 7: 555 Timer** 7.1 Review Block diagram, 7.2 Monostable and Astable operation 7.3 Voltage Controlled Oscillator, 7.4 Pulse Width modulator and Pulse Position Modulator, 7.5 Triggered linear ramp generator. **Chapter 8: Regulated DC power supply** 8.1 Supply characteristics 8.2 series voltage regulator, 8.3 Short circuit protection (current limit and fold back) 8.4 Monolithic linear IC 8.5 Voltage Regulators. (LM 78XX, LM 79XX, LM 317, LM337).	
4	IV	**Chapter 9: Analog communication** 9.1Block diagram of communication system, 9.2 types of communication system: simplex, duplex, analog and digital communication, 9.3Electromagnetic spectrum, 9.4 Base band and broad band communication. 9.5Noise concept and types, signal to noise ratio, noise figure, noise temperature. 9.5 Need of modulation 9.7Amplitude Modulation 9.8Modulation factor, demodulation. 9.9Frequency modulation **Chapter 10: Digital Communication Techniques** 10.1Digital Transmission of Data, 10.2Benefits of Digital Communication, 10.3Disadvantages of Digital Communication, 10.4Parallel and Serial Transmission, 10.5Pulse Modulation, 10.6Comparing Pulse-Modulation Methods (PAM, PWM, PPM), 10.7Pulse-Code Modulation.	15

Semester VI: Electronics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes Students should be able to...	
CO1	Working of FET and its application in various fields.
CO2	Understand the construction and working of power devices such as SCR.
CO3	Understand how Op amps can be use in various electronics circuits.
CO4	Understand the construction and working of multivibrator circuits using different components.
CO5	Understanding the concept and importance of regulated power supply.
CO6	Understand various types of communication and its applications.

Recommended Resources	
Reference Books	Main References: Unit 1 1. MB: 13.1 to 13.9 2. MB: 14.1, 14.2, 14.4, 14.6. 3. AM: 28.1, 28.5 Unit 2 1. MB: 17.1 to 17.5 2. MB: 20.5, 20.8, 21.4, 22.2, 22.3, 22.7, 22.8, 23. Unit 3 1. AM: 18.11 2. KVR: 14.5.2.1, 14.5.2.5, 14.5.2.6, 14.5.4.1 3. MB: 23.8, 23.9 4. MB: 24.1, 24.3, 24.4 Unit 4 1. ML: 6.2, 6.4, 6.6, 6.7, 7.2 to 7.4. 2. LF: 7.1, 7.2, 7.4 MB: Electronic Principles, Malvino & Bates -7th Ed TMH Publication AM: Electronic Devices and Circuits, Allen Mottershead -PHI Publication. ML: Digital Principles and Applications, Malvino and Leach (4th Ed)(TMH). LF: Communication Electronics: Principles and applications, Louis E Frenzel 4th edition TMH Publications. Electronic Communication System by Kennedy Electronic Communication System by Denis Roody and John Coolen, PHY Publication

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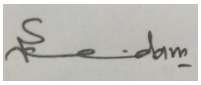

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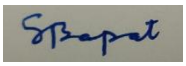

Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 6

Course: Nuclear Physics(Physics Paper-III)

Course Code	Paper Title	Credit
TPHT603	**Nuclear Physics**	2.5

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT603
iii) Course Title	:	Nuclear Physics
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: VI
Course : Nuclear Physics	Course Code : TPHT603

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite	1. Nucleus & its properties 2. Laws of radioactive decay 3. What is fission & fusion

Course Objectives	
1.	The course is built on exploring the fundamentals of nuclear matter as well as considering some of the important applications of nuclear physics.
2.	Upon successful completion of this course, the student will be able to understand the fundamental principles and concepts governing classical nuclear and particle physics.
3.	It includes Applications of Nuclear Physics in the field of particle accelerators and energy generation, nuclear forces and elementary particles.

Course Content			
Unit No.	Module No.	Content	Lectures
1	I	**Chapter 1: Alpha Decay** 1.1 Introduction 1.2 Velocity, energy, and Absorption of alpha particles: 1.3 Range, Ionization and stopping power, Nuclear energy levels. 1.4 Range of alpha particles, 1.5 alpha particle spectrum, Fine structure, long range alpha particles, 1.6 Alpha decay paradox: Barrier penetration (Gamow's theory of alpha decay and Geiger-Nuttal law). **Chapter 2: Beta decay:**	15

		2.1 Introduction, 2.2 Velocity and energy of beta particles, 2.3 Energy levels and decay schemes, 2.4 Continuous beta ray spectrum 2.5 Difficulties encountered to understand it, 2.6 Pauli's neutrino hypothesis, 2.7 Detection of neutrino, 2.8 Energ etics of beta decay	
2	II	**Chapter 3: Gamma decay:** 3.1 Introduction, 3.2 selection rules, 3.3 Internal conversion, 3.4 nuclear isomerism, 3.5 Mossbauer effect. **Chapter 4: Nuclear Models** 4.1 Liquid drop model, 4.2 Weizsacker's semi-empirical mass formula, 4.3 Mass parabolas - Prediction of stability against beta decay for members of an isobaric family, 4.4 Stability limits against spontaneous fission. 4.5 Shell model (Qualitative), 4.6 Magic numbers in the nucleus.	15
3	III	**Chapter 5: Nuclear Energy** 5.1 Introduction 5.2 Asymmetric fission - Mass yield, 5.3 Emission of delayed neutrons, 5.4 Nuclear release in fission, Nature of fission fragments, 5.5 Energy released in the fission of U235, 5.6 Fission of lighter nuclei, 5.7 Fission chain reaction, 5.8 Neutron cycle in a thermal nuclear reactor (Four Factor Formula), 5.9 Nuclear power and breeder reactors, 5.10 Natural fusion Possibility of controlled fusion. **Chapter 6: Particle Detectors** 6.1 Ionization Chambers 6.2 Proportional Counters 6.3 G.M Counter 6.4 Principle and working of Advanced detectors **Chapter 7: Particle Accelerators** 7.1 Vande Graaff Generator, 7.2 Cyclotron 7.3 Synchrotron, 7.4 Betatron and Idea of Large Hadron Collider.	15
4	IV	**Chapter 8: Nuclear Force** 8.1 Introduction,	15

		8.2 Deuteron problem, 8.3 Meson theory of Nuclear Force- A qualitative discussion. **Chapter 9: Elementary particles** 9.1 Introduction 9.2 Classification of elementary particles, 9.3 Particle interactions, 9.4 Conservation laws (linear &angular momentum, energy, charge, baryon number & lepton number), 9.5 particles and antiparticles (Electrons and positrons, Protons and anti- protons, Neutrons and anti-neutrons, Neutrinos and anti-neutrinos), 9.6 Photons, Mesons, Quark model (Qualitative).	

Semester VI: Nuclear Physics (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Find important applications of nuclearphysics.
CO2	Understand the fundamental principles and concepts governing classical nuclear and particle physics.
CO3	Look different Applications of Nuclear Physics in the field of particle accelerators and energy generation, nuclear forces and elementary particles.

Recommended Resources	
Reference Books	Main References: Unit 1 1. IK: 13. 1, 13.2, 13.5, SBP: 4. II. 1, 4. II. 2, 4. II. 3, 1.II.3 2. IK: 14.1, 14.7, SBP: 4. III. 1, 4. III. 2, 4. III. 3, 4. III. 5, SNG : 5.5. Unit 2 1. SBP: 4. IV. 1, 4. IV.2, 4. IV. 3, 4. IV. 4, 9.4 2. SBP: 5.1, 5.3, 5.4,5.5. AB: 11.6-pages(460,461). Unit 3

	1.SBP: 6.1, 6.3 to 6.9, 9.6, 9.7, 8.1,8.2,8.3 2. SBP: 1.I.4 (i), 1.I.4 (ii), 1.I.4 (iii), 1.I.4 (iv), 6.9, AB:13.3 Unit 4 1. SBP: 8.6 2. DCT: 18.1, 18.2,18.3, 18.4 , 18.5to18.9 AB:13.5 **AB**: Concepts of Modern Physics: Arthur Beiser, Shobhit Mahajan, SRai Choudhury (6th Ed.)(TMH). **SBP**: Nuclear Physics, S.B. Patel (Wiley EasternLtd.). **IK**: Nuclear Physics, Irving Kaplan (2nd Ed.) (AddisonWesley). **SNG**: Nuclear Physics, S. N. Ghoshal (S. Chand & Co.) **DCT**: Nuclear Physics, D. C. Tayal (Himalayan Publishing House) 5thed **Additional References:** Modern Physics: Kenneth Krane (2nd Ed.), John Wiley & Sons. Atomic & Nuclear Physics: N Subrahmanyam, Brij Lal. (Revised by Jivan Seshan.) S. Chand. Atomic & Nuclear Physics: A B Gupta & Dipak Ghosh Books & Allied (P)Ltd Introduction to Elementary Particles: David Griffith, Second Revised Edition,Wiley- VCH

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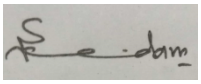

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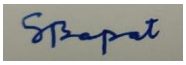
Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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Syllabus for T Y B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 6

Course: Special Theory of Relativity (Physics Paper-IV)

Course Code	Paper Title	Credit
TPHT604	Special Theory of Relativity	2.5

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHT604
iii) Course Title	:	Special Theory of Relativity
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	:	2.5
vii) No. of lectures per Unit	:	15
viii) No. of lectures per week	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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

Programme: TYBSc	Semester: VI
Course : Special Theory of Relativity	Course Code : TPHT604

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite

1. **Basic geometry**
2. **Basic calculus**
3. **Fundamental concepts in mechanics**
4. **Fundamental concepts of electrodynamics**

Course Objectives	
1.	Understand the significance of Michelson Morley experiment and failure of the existing theories to explain the null result
2.	Understand the importance of postulates of special relativity, Lorentz transformation equations and how it changed the way we look at space and time, absolutism and relativity, Common sense versus Einstein concept of Space and time.
3.	Understand the transformation equations for: Space and time, velocity, frequency, mass, momentum, force, Energy, Charge and current density, electric and magnetic fields.
4.	Solve problems based on length contraction, time dilation, velocity addition, Doppler effect, mass energy relation and resolve paradoxes in relativity like twin paradox etc.

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1 Introduction	I	**Chapter 1: Introduction to Special theory of relativity** 1.1Inertial and Non-inertial frames of reference, Galilean transformations 1.2 Newtonian relativity, Electromagnetism and Newtonian relativity. 1.3 Attempts tolocate absolute frame: Michelson- Morley experiment 1.4 Attempts to preserve the concept of a preferred ether frame: Lorentz Fitzgeraldcontraction and Ether drag hypothesis 1.5 Stellar aberration, Attempts to modify electrodynamics. **Chapter 2: Relativistic Kinematics - I** 2.1Postulates of the special theory of relativity,Simultaneity2.2Derivation of Lorentz transformation equations 2.3 Someconsequences of the Lorentz transformationequations: length contraction, timedilation and meson experiment 2.4 The observer in relativity	15
2 Relativistic Kinematics	II	**Chapter 3: Relativistic Kinematics - II** 3.1The relativistic addition of velocities 3.2 Acceleration transformation equations 3.3 Aberration and Doppler effect inrelativity 3.4 The common sense of special relativity. **Chapter 4: The Geometric Representation of Space-Time** 4.1 Space-Time Diagrams: Simultaneity, Length contraction and Time dilation 4.2 The time order and space separation of events 4.3 The twin paradox.	15
3 Relativistic Dynamics	III	**Chapter 5: Relativistic Dynamics** 5.1 Mechanics and Relativity 5.2 The need to redefinemomentum, Relativistic momentum, Alternative views of mass in relativity 5.3 The relativistic force law and the dynamics of a single particle **Chapter 6: Mass and Energy** 6.1 The equivalenceof mass and energy 6.2 The transformation properties of momentum, energy andmass.	15
4 Relativity	**IV**	**Chapter 7: Relativity and Electromagnetism**: 7.1 Introduction, The interdependence ofElectric and	15

and Electro-magnetism		Magnetic fields 7.2 The Transformation for E and B 7.3 The field of auniformly moving point charge 7.4 Force and fields near a current-carrying wire 7.5 Force between moving charges 7.6The invariance of Maxwell's equations. **Chapter 8: Introduction to general relativity:** 8.1The principle of equivalence and general relativity 8.2Gravitational red shift.	

Semester VI: Special Theory of Relativity (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q.5 Based on all module	12 Marks

Course Outcomes **Students should be able to...**	
CO1	Derive expected fringe shift in Michelson Morley experiment and understand limitations of various theories in explaining the "null result" obtained in this experiment
CO2	State postulates of special relativity and derive Lorentz transformations using that
CO3	Derive expressions for length contraction and time dilation and solve related problems
CO4	Derive transformations for velocities & acceleration and formulae for aberration and relativistic doppler effect
CO5	Explain relativistic effects and twin paradox using space-time diagrams
CO6	Prove equivalence of mass and energy
CO7	Prove invariance of Maxwell's equations
CO8	Understand the principle of equivalence and concept of gravitational red shift

Recommended Resources	
Reference Books	**Main Reference:** 1. Introduction to Special Relativity: Robert Resnick (Wiley Student Edition) **Additional References:** 1. Special theory of Relativity: A. P. French 2. Very Special Relativity – An illustrated guide: by Sander Bais – Amsterdam University Press 3. Concepts of Modern Physics by Arthur Beiser 4. Modern Physics by Kenneth Krane

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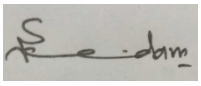
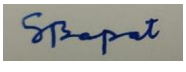


Dr.S N Kadam

Chairmen BOS Physics



Prof S.G Bapat

Vice-Chancellor Nominee

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

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Syllabus for TY B.Sc

(June 2020 Onwards)

Program: B.Sc

Semester 6

Course: Practical course –VII (Course **TPHT601** + Course **TPHT602**)
Course: Practical course –VIII (Course **TPHT603** + Course **TPHT604**)

Course Code	Paper Title	Credit
TPHP07	**Practical course –V** **(**Course **TPHT601** + Course **TPHT602**)	**3**
TPHP08	**Practical course –VI** **(**Course **TPHT603** + Course **TPHT604**)	**3**

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1.Syllabus as per Choice Based Credit System

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TPHP07+ TPHP08
iii) Course Title	:	Practical's based on courses I & IV Practical course –VII & VIII
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	:	3+3=6
vii) No. of lectures per Unit	:	-
viii) No. of Practical per week	:	2+2=4
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:200 marks Experiment 1(group A): 80 Marks Experiment 2(group B): 80 Marks Journal : 20 Marks Viva : 20 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	Surface tension of mercury by Quincke's method
2	Thermal conductivity by Lee's method
3	Study of JFET characteristics
4	JFET as a common source amplifier
5	JFET as switch (series and shunt)
6	UJT characteristics and relaxation oscillator
7	Study of Pulse width modulation (BB)/ Study of Pulse position modulation (BB)
8	Young's modulus by Koenig'smethod
9	Determination of h/e by photocell
10	R. P. of Prism
11	Double refraction
12	Lloyd's single mirror: determination of wavelength
	Experiment from group B
1	Determination of M/C by using BG
2	Self-inductance by Anderson's bridge
3	Hall effect
4	Solar cell characteristics and determination of Voc, Isc andPmax
5	Design and study of transistorized monostable multivibrator (BB)
6	Design and study of transistorized bistable multivibrator (BB)
7	Application of Op-Amp as a window comparator
8	Application of Op-Amp as a Log amplifier
9	Application of IC 555 as a voltage to frequency converter (BB)
10	Application of IC 555 as a voltage to time converter (BB)
11	LM-317 as variable voltage source
12	Shift register
	Demonstration Experiments
1	Open CRO, Power Supply, and Signal Generator: block diagrams
2	Data sheets: Diodes, Transistor, Op-amp & Optoelectronic devices
3	Zeeman Effect
4	Michelson's interferometer
5	Constant deviation spectrometer (CDS)

6	Digital storage oscilloscope (DSO)
7	Determination of Op-Amp parameters (offset voltage, slew rate,
8	Input impedance, output impedance, ACM)
9	Transformer (theory, construction and working), types of transformers and energy losses associated with them.
10	Use of LCR meter
11	Lux meter / Flux meter

Scheme of Practical Examination:

1. The University (external) examination for Practical shall be conducted at the end of each Semester

2. The candidate should appear for Two Practical sessions of three hours each as part of his/her Practical course examination.

3. The candidates shall appear for external examination of 2 practical courses each carrying 100 marks at the end of each semester.

5. The candidate shall prepare and submit for practical examination a certified Journal based on the practical course with minimum 8 experiments from each groups.

6. The certified journal must contain a minimum of 16 regular experiments (8 from each group), with minimum **5 demo** experiments in semester V. A separate index and certificate in journal is must for each semester course.

7. A candidate will be allowed to appear for the practical examination only if the candidate submits a certified journal of TYBSc Physics

Recommended Resources	
Reference Books	Advanced course in Practical Physics: D. Chattopadhya, PC. Rakshit & B. Saha (8th Edition) Book & Allied (P) Ltd. BSc Practical Physics: Harnam Singh. S. Chand & Co. Ltd. – 2001. A Text book of Practical Physics: Samir Kumar Ghosh New Central Book Agency (4th edition). B Sc. Practical Physics: C. L. Arora (1st Edition) – 2001 S. Chand & Co. Practical Physics: C. L. Squires – (3rd Edition) Cambridge Univ. Press. University Practical Physics: D C Tayal, Himalaya Publication. Advanced Practical Physics: Worsnop & Flint.

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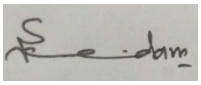

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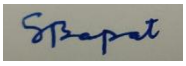

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Syllabus for TYBSc

(June 2020 Onwards)

Program: BSc

Semester 6

Course: Applied Component - Computer Science

Course Code	Paper Title	Credit
TACCST601	Advanced Microprocessor, Microcontrollers & Python Programing	02

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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	:	T.Y.B.Sc.Physics
ii) Course Code	:	TACCST601
iii) Course Title	:	Semester VI - (Applied Component) Advanced Microprocessor, Microcontrollers & Python Programing
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	:	04
ix) No. of Tutorial per week	:	---
2 Scheme of Examination	:	Semester End Exam:60 marks (5 Questions of 12 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: TYBSc	Semester: VI
Course : Advanced Microprocessor, Microcontrollers & PythonPrograming	Course Code : TACCST601

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	
4	-	4		15	15	10		-	60	100
Max. Time, End Semester Exam (Theory) -2Hrs.										

Prerequisite **1. . MCS 51 hardware and software basic knowledge**
2. Basic programming skills in Python

Course Objectives	
1.	The serial communication and advance instruction in 8051
2.	Introduction to timer, counter and interrupt of MSC 51
3.	Understand the concepts of Object Oriented Programming
4.	Develop High level programming skills
5.	Learn data handling and analysis through programming

Course Content			
Unit No.	**Module No.**	**Content**	**Lectures**
1 8051 microcontroller: Timer/Counters, Serial Communication, Interrupts	I	Programming 8051 Timers, Counter Programming, Basics of Serial Communication, 8051 Connection to RS232, 8051 Serial Port Programming in assembly, 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts	15
2 Tuples, Dictionaries, File	I	**Tuples:** Tuples, Accessing values in Tuples, Tuple Assignment, Tuples as return values, Variable-length argument tuples, Basic tuples operations, Concatenation,	15

& Exception Handling in Python	II III IV	Repetition, in Operator, Iteration, Built-in Tuple Functions **Dictionaries:** Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Deleting Elements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods, in operator. **Files:** Text Files, The File Object Attributes, Directories **Exceptions:** Built-in Exceptions, Handling Exceptions, Exception with Arguments, User-defined Exceptions.	
3 Object Oriented Programming , Modules & Multithreading in Python	I II III	**Classes and Objects:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding **Multithreaded Programming:** Thread Module, creating a thread, synchronizing threads, multithreaded priority queue **Modules:** Importing module, Creating and exploring modules, Math module, Random module, Time module	15
4 GUI & Database in Python Creating the GUI Form and Adding Widgets:	I II III IV	**Widgets: Tkinter module ,** Label **,** Buttons , Checkbutton, Radiobuttons, Text box, Canvas , Entry, Frame, Text, Menu, LabelFrame, Scrolled Text Widgets , Message boxes , Spinbox . Handling Standard attributes and Properties of Widgets. **Layout Management:** Designing GUI applications with proper Layout Management features. **Look and Feel Customization**: Enhancing Look and Feel of GUI using different appearances of widgets. **Storing Data in Our MySQL Database via Our GUI:** Connecting to a MySQL database from Python, Configuring the MySQL connection, Designing the Python GUI database, Using the INSERT command, Using the UPDATE command, Using the DELETE command, Storing and retrieving data from MySQL database.	
		Total No. of Lectures	45

Semester V : Applied Component – II (Paper Pattern)	
Duration: 2 hours	**Marks: 60**
Q.1 (Unit 1)	12 marks
Q.2 (Unit 2)	12 marks
Q.3 (Unit 3)	12 Marks
Q.4 (Unit 4)	12 Marks
Q. 5 Based on all module	12 Marks

Course Outcome Students should be able to	
CO1	Understand the concept of timer, counter and interrupt and programme the 8051 (MCS 51) for interrupt.
CO2	The basic concept of serial communication and programme the controller accordingly.
CO3	Understand the importance of Object Oriented Programming
CO4	Write programs dealing with objects and related concepts
CO5	Design GUI interface for data handling and analysis through MySQL database

Recommended Resources	
Reference Books	Main Reference: Unit 1: 1. **MMM** - The 8051 Microcontroller & Embedded Systems by M.A. Mazidi, J.G. Mazidi and R.D.Mckinlay, Second Edition, Pearson Unit 2 and 3: 1. Think Python by Allen Downey , 2nd Edition 2. Core Python Programming by Dr. R. Nageswara Rao Unit 4: 1. Python GUI Programming Cookbook by Burkhard Meier, Packt Publishing Additional Reference: 1. Intel's 8031/8051 Data sheet 2. Paul Gries, et al., Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014. 3. Michael H. Goldwasser, David Letscher ,Object-oriented Programming in Python , Michael H. Goldwasser 4. Official Python Web site : https://www.python.org/

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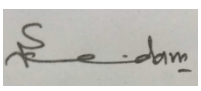

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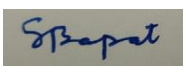

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Syllabus for TYBSc

(June 2020 Onwards)

Program: B.Sc

Semester 6

Course: Applied Component - Practical course

Course Code	Paper Title	Credit
TACCS6P1	Applied Component - Practical course (Microcontrollers & Python (Version 3.x) Programming)	2

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1.Syllabus as per Choice Based Credit Syste

i) Name of the Programme	:	T.Y.B.Sc
ii) Course Code	:	TACCS6P1
iii) Course Title	:	Applied Component - Practical course (Microcontrollers & Python (Version 3.x) Programming)
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	:	2
vii) No. of lectures per Unit	:	-
viii) No. of Practical per week	:	1
ix) No. of Tutorial per week	:	---
2 Scheme of Examination		Semester End Exam:100 marks Experiment 1: 40 Marks Experiment 2: 40 Marks Journal : 10 Marks
	:	Viva : 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

List of Experiments	
Group A: Microcontrollers	
Sr. No.	**A1: Any two experiments from the following**
1	Study of TIMER0/1 in Mode 0.
2	Study of TIMER0/1 in Mode 1.
3	Study of TIMER0/1 in Mode 2.
4	Study of External Interrupts INT0 / INT1.
Group B: Python Programming Exercises	
Sr. No.	**B1: Perform minimum two experiments (one from Dictionary & the other from file handling).**
1	Write a Python script to sort (ascending and descending) a dictionary by va
2	Write a Python script to concatenate following dictionaries to create a new one.
3	Write a Python program to sum all the items in a dictionary.
4	Write a Python program to read an entire text file.
5	Write a Python program to append text to a file and display the text.
6	Write a Python program to read last n lines of a file.
	B2: Perform minimum one experiment
1	Design a class that store the information of student and display the same
2	Implement the concept of inheritance using python
3	Write a program to implement exception handling.
	B3: Perform minimum two experiments (one from GUI and the other from Database).
1	Try to configure the widget with various options like: bg="red", family="times", size=18
2	Try to change the widget type and configuration options to experiment with other widget types like Message, Button, Entry, Checkbutton, Radiobutton, Scale etc.
3	Design a simple database application that stores the records and retrieve the same.
4	Design a database application to search the specified record from the database.
5	Design a database application to that allows the user to add, delete and modify the records.

Scheme of Practical Examination:

1. The examination for Practical shall be conducted at the end of each Semester

2. The candidate should appear for Two Practical sessions of three hours each as part of his/her Practical course examination.

3. The candidates shall appear for external examination of 2 practical courses each carrying 50 marks at the end of each semester.

5. The candidate shall prepare and submit for practical examination a certified Journal based on the practical course which he/she performed during the practical's.

6. The certified journal must contain a minimum of 90% regular experiments (As per experiment taken) A separate index and certificate in journal is must for each semester course.

7. A candidate will be allowed to appear for the practical examination only if the candidate submits a certified journal of Applied Physics.

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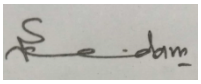

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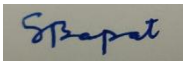

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