JAI HIND COLLEGE

Basantsing Institute of Science & J. T. Lalvani College of Commerce
and Sheila Gopal Raheja College of Management.

Empowered Autonomous

"A" Road, Churchgate, Mumbai - 400 020, India

Affiliated to
University of Mumbai

Bachelor of Science

Program: B. Sc. In Physics

Choice Based Credit System (CBCS) under NEP-2020
with effect from the academic year 2023-2024

Syllabus as approved by Statutory Committees

LOCF Document

JAI HIND COLLEGE ★ AUTONOMOUS ★ "A" Road Churchgate Mumbai-20

PRINCIPAL
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CONTENTS

Preamble

The BSc Physics program, guided by the principles of the National Education Policy (NEP), embarks on a journey to provide students with an enriching educational experience within the realm of physics. Physics, often referred to as the fundamental science, plays a pivotal role in unraveling the mysteries of the universe, advancing technology, and solving complex real-world problems.

Our program is committed to fostering a holistic understanding of physics. It places a strong emphasis on both theoretical foundations and practical skills, encouraging students to engage in critical inquiry, experiments, and research. We aim to equip our students with the tools to become independent thinkers and innovative problem solvers.

In line with the NEP, our BSc Physics course includes an interdisciplinary approach, recognizing the interconnectedness of various scientific fields. It encourages students to explore the synergies between physics, mathematics, chemistry and applied physics.

Practical experience is at the core of our curriculum. We provide state-of-the-art laboratories and opportunities for students to design and conduct experiments, simulations, and projects. This hands-on approach enhances their proficiency in data analysis, modeling, and experimental design.

Research and innovation are at the heart of our program. We expose students to (cutting-edge) research in physics and provide them with the chance to engage in research projects, attend seminars, and collaborate with faculty, fostering a culture of intellectual curiosity and discovery.

Ethical considerations are paramount, and we emphasize the importance of integrity and responsibility in scientific practice. Our program also underscores the societal implications of physics, highlighting the role of physicists in addressing global challenges.

Effective communication skills are cultivated throughout the program. We believe that the ability to articulate ideas, write research papers, and present findings to diverse audiences is crucial in today's scientific landscape.

Inclusivity and diversity are central tenets of our program, aligning with the NEP's commitment to equal access to quality education. We welcome students from diverse backgrounds and strive for gender equity within our academic community.

Recognizing the ever-evolving nature of knowledge, our program equips students with a growth mindset and adaptability for lifelong learning. It prepares them for dynamic career paths in academia, industry, research, and beyond.

The BSc Physics program under the NEP aspires to produce well-rounded physicists who excel academically and contribute positively to society. Our goal is to ignite a passion for exploring the physical world, nurturing curiosity, and shaping the next generation of physicists who will drive groundbreaking discoveries and address the challenges of the future.

The BSc course is a eight semester course.Board of studies members which includes subject expert from parent and other universities, industry expert and an expert alumni along with all faculty members.

Credit Framework

Types of courses

Sr. No.	Types of courses	Learner Category
1	Major	Physics Major
2	Minor	Physics Minor
3	OE	Arts/ Commerce Stream
4	SEC	Physics Major Physics Minor
5	VSC	Physics Major Physics Minor

Number of Courses and credits

Course (Theory &/ Practical)	Number	Credits of each
Major (Theory & Practical)	2	3+1
Minor (Theory & Practical)	2	3+1
VSC (Practical)	1	2
SEC (Practical)	1	2
OE (Theory)	2	2

Semester-wise Courses:

Semester	Course Code	Course title	Type	Credits
I	JUSPHY-DSC101	Mechanics and Thermodynamics I	Major	3
I	JUSPHY-DSCPR101	Physics Practical I	Major Practical	1
I	JUSPHY-MIN101	Mechanics and Thermodynamics I	Minor	3
I	JUSPHY-MINPR101	Physics Practical I	Minor Practical	1
I	JUSPHY-OE101/201	Basic Astronomy	OE	2
I	JUSPHY-OE102/202	Physics in Everyday life	OE	2

I	JUSPHY-VSC101	Python Programming	VSC	2
I	JUSPHY-SEC101	Electronics	SEC	2
II	JUSPHY-DSC201	Optics, Relativity, Particle Physics	Major	3
II	JUSPHY-DSCPR201	Physics Practical II	Major Practical	1
II	JUSPHY-MIN201	Optics, Relativity, Particle Physics	Minor	3
II	JUSPHY-MINPR201	Physics Practical II	Major Practical	1
II	PHY-OE201	Basic Astronomy	OE	2
II	PHY-OE202	Physics in Everyday life	OE	2
II	JUSPHY-VSC201	Python Programming	VSC	2
II	JUSPHY-SEC201	Electronics	SEC	2

Learning Outcomes

1. **Analyze** various scientific and research problems.
2. **Manage** research work
3. **Compare/ differentiate** between the formulation/ applications of the laws of Classical as well as Quantum Physics through scientific reasoning.
4. **Apply** the physics principles to explain natural and physical phenomena.
5. **Exhibit** professional ethics and norms of scientific development.
6. **Communicate** effectively in both verbal and written forms.
7. **Function** individually and in teamwork.
8. **Practice** the use of lifelong learning of physics.
9. **Use** modern ICT tools and softwares/simulators, and programming languages.
10. **Comprehend** and **apply** the physics knowledge in competitive exams at national/international levels.
11. **Apply** their responsibilities in the societal context.
12. **Demonstrate the practical aspect of physics principles**
13. **Acquire different skill sets related to practical and computational physics**
14. **Plan/Design a problem using theoretical framework and experimental data**

15. **Recognize** new cotemporary problems in physics and society and increase awareness among students

Graduate Attributes

The characteristic attributes of a graduate in Physics are:

- **Leadership:** Developing leadership skills throughcollaborative and communication skills developed during the classroom, laboratory, and project work.
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- **Emotional intelligence**: Learning emotional intelligence through sharing responsibilities during practical and other co-curricular group activities.
- **Discipline specific knowledge**: Demonstrating good knowledge and understanding of important concepts and experimental skills from various branches of Physics.
- **Intellectual capacity**: Proficient in analytical, problem solving and explorative skills in both academic and industrial settings.
- **Critical thinking**: Develop critical thinking skills to be applied to all domains of life.
- **Creativity**: Capability to develop novel and original ideas, possibilities and inventions.
- **Professionalism**: Capable of working in a team in diverse settings, and managing resources for completing projects/tasks.

Program Objectives

Students will be able to:

1. To gain knowledge regarding fundamental aspects of physics by learning core courses like, classical and quantum, electronics, optics.
2. Inculcate experimental, observational, decision making and analytical skills.
3. Understand the relationship between nature and matter on a scientific basis.
4. Maintain national standards and international compatibility in learning of physics and academic standards to ensure global competitiveness, and to facilitate student/graduate mobility.
5. Develop competency in designing, constructing and using laboratory instruments and to draw valid conclusions from experimental data.
6. Gain awareness on alternative energy technologies.
7. Inculcate ethics and moral values for professional conduct.
8. Develop interdisciplinary learning approach
9. Learn Communication skills, team learning, soft skills

Teaching Learning Process

1. Chalk and Talk
2. Simulations of Electronic experiments
3. Demonstration of Experiments
4. Problem solving
5. Peer Learning

Assessment Methods / Evaluation Scheme

Assessment pattern of the Major & Minor Courses:

Each Major / Minor Course of 4 credits will be divided into 3 credits for theory and 1 credit for practical. The assessment pattern will be as follows:

- Theory - 75 marks, Practical - 25 marks
- The theory component will comprise of 50 marks as Semester End Examination (SEE) of 2 hours; and 25 marks Continuous Assessment (CA)
- The Practical Component will comprise of 25 marks Semester End Examination (SEE) Practical of 1.5 hour; and 25 marks of continuous assessment (CA). The latter will consist of 20 marks based on continuous assessment of practical conducted during regular turns and 5 marks for VIVA. Completion of Journal is a requirement to appear for Semester-end Practical exam.
- Total of Internal Assessment + SEE for Practical = 50 marks which will be converted to out of 25

Assessment for Open Elective (OE) across all streams will be assessed on Theory Component which will be as follows:

- The theory component will comprise of 25 marks as Semester End Examination (SEE) of 1 hour; and 25 marks Continuous Assessment (CA)

Assessment for Vocational Skill Course (VSC) and Skill Enhancement Course (SEC) across all streams will be assessed as a practical component of 50 marks which will be as follows:

- The practical component will comprise of 25 marks as Semester End Examination (SEE) of 1.5 hour; and 25 marks Continuous assessment (CA); the evaluation pattern to be experiment/task based/ case study or any other similar.

Discipline Specific Core Courses – Major/Minor Core Courses

Course Code JUSPHY-DSC 101/ JUSPHY-MIN101	**Course Title: Mechanics and Thermodynamics I**	**Credits: 3 Lectures/Week: 3**
Course description	This course in Mechanics introduces the concept of different forces that occur in nature. The fundamental forces are discussed. It also includes charged particle dynamics along with a bending of beams and the first law of thermodynamics. The Systematic procedure to solve problems is outlined.	
Learning objectives	• To understand fundamental forces and effect of electric and magnetic fields on a charged particle • To understand the laws of thermodynamics and solve problems involving heat and work interactions • To understand the principles of elasticity and bending of beams	
Course Outcomes	• Students will be able to define and understand the motion of a charged particle in the electric and magnetic fields • Students will be able to understand thermodynamic laws and apply them to real- life problems • Students will be able to understand the elasticity and effect of loading on beams	
	THEORY	**(Total no.) lectures=45)**
Sub Unit	**Unit – I: Forces and Charged Particle Dynamics**	**15 lectures**
1.	Introduction: Realm of Physics, Physical quantities, Measurements-Units of Measurements, Fundamental Forces in nature, Comparison-Range and magnitude Gravitational Force: Motion under gravitational force Newton's laws of motion, Friction force, Problems solving- Atwood machine, mass on inclined plane	6
2.	The Motion of a charged particle under Electro-Magnetic Force: Electrostatic Force: Coulomb's law, effect on - static charge, moving charge, Van-de-Graf Accelerator, Magnetic Force: Lorentz force, Effect on static and moving charges, cyclotron Motion of a charged	9

	particle in under Electro-Magnetic Force– Applications- motion of the charged particles in earth atmosphere- Auroras	
	Unit – II: Thermodynamics	**15 lectures**
	Thermodynamics-Concept of heat, Temperature and Zeroth law of Thermodynamics, Thermodynamic processes, Isothermal and adiabetic processes, and heat is a path function, Internal energy(U) as state function, The first law, Applications of first law to simple processes, heat capacity and specific heat, general relations from the first law: The enthalpy, the case of an ideal gas, –Variation of temperature of the atmosphere with altitude above seal level	
	Unit – III: Elasticity and Bending of beams	**15 lectures**
1.	Elasticity: Stress, Strain, Hook's Law, Constants and their relations, Spring and mass system, Torque in a twisted wire, Determination of elastic constants by Searle's method.	7
2.	Bending of beams: Bending moment, basic assumptions for theory of bending, cantilever, beam supported at its ends and loaded in the middle, I-section girders, determination of y by bending.	8

Evaluation Scheme

CA's - 25 marks comprising CA I + CAII
SEE- 50 marks subjective exam

% Application of Bloom's Taxonomy

Unit	Knowledge	Understanding	Application	Total marks
Unit I	5	10	10	25
Unit II	5	10	10	25
Unit III	5	10	10	25
Total	15	30	30	75

References:	1. H.S. Hans and S.P. Puri, Mechanics, (2nd Edition 2008), Tata Mcgraw Hill. 2. A. B. Gupta, H. Roy, (2009), Thermal Physics, Tata Mc Graw Hill. 3. H. C. Verma, (2002), Concepts of Physics (Part I), Bharati Bhavan Publishers. 4. Brijlal, Subramanyam and Hemne, (Multi-coloured, 2007), Heat Thermodynamics and Statistical Physics, S. Chand publications.

Course Code JUSPHY-DSC PR101/ JUSPHY-MINPR101	**Course Title: Physics Practical**	**Credits: 1**
Course description	This course in Physics practical will consists of experiments based on mechanics and thermodynamics. It will help one to developbasic skills andunderstand principles in physics.	
Learning objectives	• To handle apparatus and instruments properly. • To develop basic experimental skills through conduct of experiments • To be able to measure fundamental constants and material properties • To correlate theory concepts	
Course Outcomes	• Students will be able to extractmeaningful physics principles from the experimental data • Student will be able to handle precision measuring instruments	
	Practical	
	Experiments (ANY 8): 1. Torsional oscillations 2. Bifilar pendulum 3. Y by vibrations 4. Surface tension by capillary rise 5. CVAT 6. Flywheel 7. Flat spiral spring (Determination of Y) 8. Y by bending	
	Evaluation Scheme (a) 25 Marks Continuous Assessment during regular practical turns + Worksheets (b) 25 Marks SEE Practical Exam: Experiment, Identification, Viva. Total of Internal assessment + SEE Practical exam = 50 marks which is to be as 50/2 out of 25 Marks	

Course Code JUSPHY-DSC 201/ JUSPHY-MIN201	**Course Title: Optics, Relativity and Particle Physics**	**Credits: 3 Lectures/Week: 3**
Course description	This course will deal with the study of various areas of Physics. First unit will give detailed study of Interference in thin films, Lasers and their applications and Optical fibres.The second unit will be the introduction of concept of relativity.The third unit will deal with the Particle physics , their interaction will introduce the quark model and recent developments in particle physics.	
Learning objectives	1. To understand the physics behind the optical phenomenon of Interference. 2. To study Principle of working of laser and its applications in various fields and also of the optical fibres 3. To study elementary particles and their interactions 4. To understand quark model and recent developments in accelerators	
Course Outcomes	1. Student will be able to understand the phenomenon of Interference in real life problems 2. The students shall be familiar with the fundamental principles of the general theory of relativity. They shall know the meaning of basic concepts like the equivalence principles, inertial frames and time dilation 3. The student will be able to establish the non-existence of the hypothesized stationary aether through the null result of Michelson-Morley experiments with interferometer. 4. Student will be able to understand the concept of particle and their corresponding antiparticles,and about leptons and baryons.	
	THEORY	**(Total no. of lectures=45)**
Sub Unit	**Unit – I: Interference,lasers and optical fibres**	**15 lectures**
1.	Interference:Interference of Light- conditions, theory of Young's Double slit Expt, Intensity Distribution, Phasor addition of waves, Interference in thin films, multiple reflection:division of amplitude, interference by reflected light in thin films, Interference due to transmitted light, limitation on the width of a thin film,Need of an extended source, wedge shaped film, Newton's rings	5
2.	Laser: Introduction, transition between atomic energy states, principle of Laser, properties of laser, Types of Lasers, Helium Neon laser, Ruby laser, Applications of Laser to holography and other applications	5

3	Optical fibre, Light propogation through fibres, Fibre geometry, Internal reflection, Optical Telecommunication	5
	Unit – II: Relativity	**15 lectures**
	Relative Motion, Law of addition of velocities- Newtonian Mechanics, Galilean transformation, Newtonian relativity, Electromagnetism and Newtonian relativity, Attempts to locate absolute frame: Michelson- Morley experiment, Attempts to preserve the concept of a preferred ether frame: Lorentz Fitzgerald contraction and ether drag hypothesis, Attempts to modify electrodynamics, postulates of the special theory of relativity.	
	Unit – III: Elementary Particles	**15 lectures**
	Structure of an atom, Constituents of nucleus,Nuclear Forces:Introduction to elementary particles, classification of elementary particles, Particle interactions, Particle interactions and Conservation Laws- (, baryon number ,lepton number, parity, Isospin and Stangeness) Particles and antiparticles-, electrons and positrons, protons and antiprotons, neutrons and antineutrons, neutrinos and antineutrinos, photons, mesons, Quark model(Qualitative) Standard Model(Qualitative), Methods of study of Particle Physics- LHC	
	Evaluation Scheme CA's - 25 marks comprising CA I + CAII SEE- 50 marks subjective exam	

% Application of Bloom's Taxonomy

Unit	Knowledge	Understanding	Application	Total marks
Unit I	5	10	10	25
Unit II	5	10	10	25
Unit III	5	10	10	25
Total	15	30	30	75

References:	1. A textbook of Optics-N. Subrahmanyam and Brijlal, S. Chand publications 2. Introduction to particle Physics, Griffith 3. Modern Physics, A. Beiser

Course Code JUSPHY-DSC PR201/ JUSPHY-MINPR201	Course Title: Physics Practical II	Credits: 1
Course description	This course in Physics practical will consists of experiments based on mechanics and thermodynamics. It will help one to develop basic skills and understand principles in physics.	
Learning objectives	• To handle apparatus and instruments properly. • To develop basic experimental skills through conduct of experiments • To be able to measure fundamental constants and material properties • To correlate theory concepts	
Course Outcomes	• Students will be able to extract meaningful physics principles from the experimental data • Student will be able to handle precision measuring instruments	
	Practical	
	Experiments (Any 8) 1. Angle of Prism 2. R.I of prism 3. Diffraction using laser 4. Intensity profile and divergence of laser 5. Newton's rings 6. Lens combination 7. LDR characteristics 8. Stefan's law of Radiation	
	Evaluation Scheme **(a) 25 Marks Continuous Assessment during regular practical turns + Worksheets** **(b) 25 Marks SEE Practical Exam: Experiment, Identification, Viva.** **Total of Internal assessment + SEE Practical exam = 50 marks which is to be as 50/2 out of 25 Marks**	
References:	Experimental physics- Worsnop and Flint	

Open Elective Courses

JUSPHY-OE101/ JUSPHY-OE 201	**Course Title: Basic Astronomy**	**Credits: 02 Lectures/Week: 02**
Course description	Astronomy is an ancient science that mankind is curious about. This course will make students aware of various phenomena happening in nature	
Learning objectives	• Learn about time and scale in astronomy • Basic knowledge of different objects and events happening in the sky such as stars and Galaxies	
Course Outcomes	The students will be able to explain the relation between space and time The students will be able to identify various astronomical objects and recount events	
	THEORY	**(Total no.) lectures = 30)**
Sub Unit	**Unit – I: Observational astronomy**	**15 lectures**
1.	Time and Scale	7
2.	Magnitude	1
3.	Constellations	7
	Unit – II: Astronomical objects and events	**15 lectures**
1.	Stellar evolution	
2.	Galaxies and the large- scale objects	
3.	Supernovae, an explosion of stars, an evolution of Universe	
	Evaluation Scheme Total: 50 marks (a) 25 marks SEE for 1 hr (b) 25 Marks Internal Assessment: 10 marks CA-I (Test with Objective Questions) 15 Marks CA-II (Assignments/ Project, Article writing and power point presentations on related topics, etc.).	

% Application of Bloom's Taxonomy

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	10	10	5	25
II	10	10	5	25
Total marks	20	20	10	50

References:

1. Introduction to Astronomy and Cosmology
2. NASA.gov/contents

Course Code JUSPHY-OE102/ JUSPHY-OE 202	Course Title: Physics in Everyday Life	Credits: 2 Lectures/Week: 02
Course description	Physics unravels the mechanics of our daily existence, from gravity's pull to the behavior of light, influencing our experiences and technological progress. This course imparts insight into everyday phenomena driven by physics principles.	
Learning objectives	• Learn about different concepts in Physics which are applicable in everyday life • Develop critical thinking skills to analyze and solve common problems using physics-based approaches in everyday scenarios. • Enhance scientific literacy by exploring how physics underpins various aspects of our daily lives, fostering a deeper understanding of the world around us. • Apply physics concepts to real-life situations, from household activities to transportation, and appreciate their practical significance.	
Course Outcomes	• Students will be able to demonstrate a practical understanding of key physics principles and their relevance to everyday situations. • Students will be able to effectively analyze and solve everyday problems using physics-based reasoning and critical thinking. • Develop an appreciation for the beauty and significance of physics in shaping the world around us and driving technological advancements. • Communicate complex physics concepts in a clear and accessible manner to both technical and non-technical audiences.	
	THEORY	**(Total no.) lectures = 30)**
Sub Unit	**Unit – I**	**15 lectures**
1.	Fluid dynamics: Introduction to fluids, Pascals principle and application, Basic idea of continuity equation, Archimedes principle, Bernoulli's principle and its applications in everyday life, Surface tension and its applications.	6
2.	Waves and Oscillations: Simple harmonic Motion, Pendulum, Forced oscillations and Resonance, Types of waves, Superposition and interference of waves, Standing waves, Resonance, Sound waves, Properties of Sound waves, Doppler effect, Applications of Doppler effect	6

3.	Gravity: Gravitational force, Free fall, Variation of Gravity on Earth's surface, Critical velocity and Escape velocity, Satellites- Geosynchronous, Geostationary, Low Earth Orbit (LEO), Medium Earth Orbit (MEO), Celestial objects	3
	Unit – II	**15 lectures**
1.	Introduction to electromagnetic spectrum : Radio waves, UV- rays, Microwaves, X-rays, Gamma rays and their applications, LASERs and applications	3
2.	Optics: Nature and properties of light, Basic idea about laws od reflection & refraction, Types of Lenses, Interference, Formation of rainbows, Polarization, Scattering of light.	6
3.	Magnetism: Basics of Magnetism, Working of Compass, Earth's Magnetic field, Right hand thumb rule, Types of Magnetism - Diamagnetism, Para magnetism, Ferromagnetism, Electromagnets, Working of MRI, Generator, Motor, Other applications of Magnetism	6

Evaluation Scheme

Total: 50 marks

(a) 25 marks SEE for 1 hr

(b) 25 Marks Internal Assessment:

10 marks CA-I (Test with Objective Questions)

15 Marks CA-II (Assignments/ Project, Article writing and power point presentations on related topics, etc.).

% Application of Bloom's Taxonomy

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	10	10	05	25
II	10	10	05	25
TOTAL MARKS	20	20	10	50

References:	1. Fundamentals of physics- Halliday & Resnick walker, 10th Edition, Wiley India 2. Physics for Scientists and Engineers with Modern Physics, Serway and Jewett,Cengage India Private Limited

Skill Enhancement Course

Course Code JUSPHY-SEC101/ JUSPHY-SEC201	Course Title: Electronics	Credits: 2
Course description	Physics students are expected to be familiar with basic electronic circuits. This course will enable students to design their circuits.	
Learning objectives	The students should understand how to use transistors for various circuits. To understand types of configurations and dc biasing	
Course Outcomes	The students will be able to design circuit for transistor as an amplifier. They will be able to determine the operating point of the amplifier circuit.	
	Practical	
1.	Electronic components testing Zener diode Use of breadboard Transistor Characteristics Use of DSO Use of CRO Light-dependent resistor LR circuit Diode characteristics, DC load line, Base resistor biasing, collector biasing, emitter biasing, voltage divider biasing simulation	

Evaluation Scheme

25 marks practical as SE practical + Continuous assessment

% Application of Bloom's Taxonomy

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	10	10	5	25
II	10	10	5	25
Total Marks	20	20	10	50

References:

1. Electronic principles by Malvino
2. Principles of Electronics by V. K. Mehta

Vocational Skill Course

Course Code JUSPHY-VSC101/ JUSPHY – VSC 201	Course Title: Python programming	Credits: 2
Course description	The learner of pure physics requires to learn computational and numerical methods. Hence Python fundamentals will aid the students in this process	
Learning objectives	• Demonstrate proficiency in writing Python code with correct syntax and understanding essential language features, such as indentation, comments, and operators. • Define and explain basic programming concepts, including variables, data types, control structures, and functions, with a focus on applications. • Utilize Python to represent, manipulate, and analyze data.	
Course Outcomes	• Apply critical thinking and algorithmic problem-solving skills to develop Python programs that address a variety of computational challenges and tasks. • Develop the ability to write well-structured, efficient, and readable Python code that adheres to established coding conventions and best practices.	
	PRACTICAL	
Sub Unit	**Unit – I: Variables and Expressions**	
1.	Why programming, Overview of Hardware, Python as a language, Installing Python and writing a program, Writing paragraphs of code. Reserved words. Python interpreter and python script.	
2.	Expressions, constants and variables. Variable operations and rules, order of evaluation. User input. Conditional statements: 'if-else-elif', indenting, nesting of 'if' within 'if' statements.	
	Unit – II: Conditional Statement and Loops	
1.	Using 'try-except' structure. Using functions and building functions, parameters, return statements.	
2.	Loops and iterations, indefinite loops (while loop), break and continue statement. Definite loops (for loop), largest number, smallest number, count, filter, search and average of a list, 'in' operator.	

	Unit – III: Python data structures	
1.	Strings, manipulating strings, while and for loops on strings, slicing strings, string functions. Files, opening files, file handle, reading and searching an entire file, processing files.	
2.	Lists, manipulating lists, length and range function, slicing and concatenating lists, lists and strings. Dictionaries, keys and values, counting with dictionaries, get function, loop through dictionary. counting with dictionaries. Tuples, dictionaries to tuples, loops using tuples.	
	Evaluation Scheme Total marks: 50 25 marks practical as SE practical + Continuous assessment **% Application of Bloom's Taxonomy**	

Unit	Knowledge	Understanding	Application	Total marks
Unit I	5	5	10	20
Unit II	5	5	5	15
Unit III	5	5	5	15
Total	15	15	20	50

References:	1. Python for Everybody: Exploring Data using Python 3, Charles R. Severance, Shroff Publishers (2017) 2. Introduction to Python for Science and Engineering, David J. Pine, CRC Press (2019).

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