Department of Science & Computer Science

B. Sc. I Year

S. No.	Course Title	Course Type
1.	Computer System Architecture	Major
2.	Programming Methodologies and Data Structures	Major
3.	Mechanics and General Properties of Matter	Minor
4.	Calculus and Differential Equations	Elective
5.	Computational Mathematics	Elective
6.	Environmental Education	Foundation
7.	Basics of Mathematics	Bridge Course
8.	Artificial Intelligence	Value Added Course
9.	Cyber Security	Value Added Course

12/08/2025

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Phone No. 0731-2499911, 49661355, 4961356
E-mail: info@spipsindore.ac.in, Website: www.spipsindore.com

Part A-Introduction

Programme: Certificate/Diploma/Degree	Class: B.Sc. I Year- Semester I	Session 2025-2026
Subject: Computer Science		
Course Code	**BS-101T-S**	
Course Title	**Computer System Architecture**	
Course Type	Core Course	
Pre-requisite	To study this course, a student must have had the subject Physics/Maths in XII standard.	
Course Learning Outcomes	On completion of this course, learners will be able to: • Understand the basic structure, operation and characteristics of digital computer. • Be able to design simple combinational digital circuits based • on given parameters. • Familiarity with working of arithmetic and logic unit as well as the concept of pipelining. • Know about hierarchical memory system including cache memories and virtual memory. • Understand concept and advantages of parallelism, threading, multiprocessors and mulcore processors. • Know the contributions of Indians in the field of computer • Understand architecture and related technologies	
Credit Value	**Theory 4 Credits**	**Practical 2 Credits**
Total Marks	**Max marks: 30 +70 = 100**	**Minimum Passing Marks 35**

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Part B: Content of the Course

No. of Lectures (in hours per week): **4 Hrs. per week** Total No. of Lectures: **60 Hrs.**		
Unit	Topic	No. of lectures
1	**Fundamentals of Digital Electronics**: Data Types, Complements, Fixed-Point Representation, Floating-Point Representation, Binary & other Codes, Error Detection Codes. Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Sequential Circuits, simple combinational circuit design. Circuits: Adder, Subtractor, Multiplexer, Demultiplexer, Decoders, Encoders, Flip - Flops, Registers, Counters. **Basic Computer Organization:** Instruction codes, Computer Registers, Computer Instructions, Timing & Control, Instruction Cycles, Memory Reference Instruction, Input - Output & Interrupts, Complete Computer Description & Design of Basic Computer.	12
2	**Instructions:** Instruction formats, Addressing modes, Instruction codes, Machine language, Assembly language. **Register Transfer and Micro operations:** Register Transfer Language, Register Transfer, Bus & Memory Transfer, Arithmetic Micro- operations, Logic Micro-operations, Shift Micro-operations.	12
3	**Processor and Control Unit:** Hardwired vs. Micro programmed Control Unit, General Register Organization, Stack Organization, Instruction Format, Data Transfer & Manipulation, Program Control, Introductory concept of RISC, CISC, advantages and disadvantages of both. **Pipelining:** Concept of pipelining, introduction to Pipelined data path and control, Handling Data hazards & Control hazards. **Memory and I/O Systems:** Peripheral Devices, I/O Interface. **Data Transfer Schemes:** Program Control, Interrupt, DMA Transfer. I/O Processor	12

4	**Memory Hierarchy:** Processor vs. Memory Speed, High-Speed Memories, Main Memory, Auxiliary Memory, Cache Memory, Associative Memory, Interleaving, Virtual Memory, Memory Management. **Parallelism:** Meaning, types of parallelism, introduction to Instruction-level-parallelism, Parallel processing challenges, Applications. **Flynn's classification:** Introduction to SISD, SIMD,MISD, MIMD **Hardware multithreading:** Introduction, types, advantages and applications. **Multicore processors:** Introduction, advantages, differences from multiprocessor.	12
5.	**Application Software :** Types, Database, Graphics, Education, Entertainment Software, Mobile App Software **Social Media Software:** Instant messaging, Email, Chatbot, Web Blogs. Free Open Source Software (FOSS). **Application Software uses:** Word Processing, Spreadsheet, Presentation, Database designing, Recording sound and video, Newsletter, Posters, Websites, Multimedia presentation, Audio, Video, Media Steaming and E-publications, Blog, Forum, Wiki, Social networking. **Using Office Tools:** MS Office Tools	12
Keywords/Tags: Digital Electronics, Logic Gates, Circuits, Instruction formats, Addressing Modes, Parallelism, Pipelining, Memory Hierarchy, Multicore, Multithreading, SISD, SIMD, MISD, MIMD, Graphics, Chatbot		

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Part C-Learning Resources
Textbooks, Reference Books, Other Resources **Suggested Readings:** • M.Morris Mano, "Computer System Architecture", PHI. • Heuring Jordan , "Computer System Design & Architecture" (A.W.L.) • William Stalling, "Computer Organization & Architecture", Pearson Education Asia. • V. Carl Hamacher , "Computer Organization", TMH Tannenbaum, "Structured Computer Organization", PHI
Suggestive digital platform web links : https://www.youtube.com/watch?v=4TzMyXmzL8M https://npte Lac. in/courses/106/106/106106166/ https://npteLac. in/courses/106/106/106106134/
Suggested equivalent online courses https://npteLac.in/courses/ I 06/105/106105 I **63/**

Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE) :70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation E-quiz	30
External Assessment: University Exam Section: 70 Time : 03.00 Hours	**Section(A) : Six Very Short Questions**	06 x 01 = 06
	Section (B) : Five Short Questions	05 x 08 = 40
	Section (C) : Two Long Questions	02 x 12 = 24 Total 70

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Lab : Part A-Introduction

Programme : Certificate/Diploma/Degree	**Class: B.Sc. I Year- I Semester**	**Session 2025-2026**
Subject: Computer Science		
	Course Code	**BS-101P-S**
2	Course Title	**Computer Architecture Lab**
3	Course Type	Core Course
4	Pre-requisite	To study this course, a student must have had the subject Physics/Maths in 12th class.
5	Course Learning Outcomes	**On completion of this course, learners will be able to:** • Realization of the basic logic and universal gates. • Verify the behavior of logic gates using truth tables. • Implement Binary-to -Gray, Gray-to -Binary code conversions • Design half and full adder circuit using basic gates. • Design and construct flip flops and verify the excitation tables. • Architecture and related technologies
6	Credit Value	**Practical 2 Credits**
7	Total Marks	Max marks: **30 +70 = 100** Minimum Passing Marks **35**

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Part B: Content of the course
No. of Lab. Practical (in hours per week): 2 Hrs. per week
Total No. of Labs: 30 Hours

Suggestive list of Practical

a) System Architecture

1. To study basic gates (AND, OR, NOT) and verify their truth tables.
2. To convert a given binary number to Gray code using IC 7486.
3. To study and verify NAND as Universal gate using IC 7400.
4. To study half adder using basic gates and verify its truth table.
5. To study Full Adder using basic gates and verify its truth table.
6. To realize basic gates (AND, OR, NOT) from Universal gates (NAND and NOR).
7. To verify truth table of 4-bit adder using IC 7483.
8. To design and construct RS flip Flop using gates and verify the truth table.
9. To design and construct JK flip Flop using gates and verify the truth table.
10. To verify DeMorgan's Theorem.

b) MS Office Tools

Text Editor Tool

1. Create a document and apply different Editing options.
2. Create Banner for your college.
3. Design a Greeting Card using Word Art for different festivals.
4. Design your Bio data and use page borders and shading.

Spreadsheet Tool

1. Design your class Time Table.
2. Prepare a Mark Sheet of your class result.
3. Prepare a Salary Slip of an employee of an organization.
4. Prepare a bar chart & pie chart for analysis of Election Results.

Presentation Tools

1. Design a presentation of your institute using auto content wizard, design template and blank presentation.
2. Design a presentation illustrating insertion of pictures, Word Art and ClipArt.
3. Design a presentation, learn how to save it in different formats, copying and opening an existing presentation.

Keywords/Tags: Digital Electronics, Logic Gates, AND, OR, NOT, IC 7486, IC 7400, NAND, NOR, IC 7483, Circuits, Flip Flop, DeMorgan's Theorem

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

Suggested Readings:

- M.Morris Mano, "Computer System Architecture", **PHI.**
- Heuring Jordan , "Computer System Design & Architecture" (A.W.L.)
- William Stalling, "Computer Organization & Architecture", Pearson Education
- V. Carl Hamacher , "Computer Organization", TMH
- Tannenbaum, "Structured Computer Organization", **PHI .**

Suggestive digital platform web links :

https://www.youtube.com/watch?v=4TzMyXrnzL8M
https://nptel.ac. in/courses/106/106/106106 166/
https://nptel.ac.in/courses/106/106/106106134/

Suggested equivalent online courses

https://nptel.ac.in/courses/106/105/106105163/

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PART D: Assessment and Evaluation			
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 30 **Marks**		**External Assessment:** University Exam (UE) – **70 Marks** Time: **02.00 Hours**	
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Hands-on Lab Practice	10 Marks	Practical record file	10 Marks
Mock Viva	5 Marks	Viva voce practical	20 Marks
Lab Test from practical list	7 Marks	Table works/ Exercise Assigned (02) in practical exam	30 Marks
Assignments (Charts/ Models) Technology Dissemination/ Excursion/ Lab visit/ Industrial Training	8 Marks	Reports of excursion/ Lab visits/ Industrial training/ Survey/ Collection/ Models	10 Marks
Total ***Excursion/ Lab visits/ Industrial Training is compulsory**	**30 Marks**	Total	**70 Marks**

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Lab : Part A-Introduction

Programme : Certificate/Diploma/Degree	**Class: B.Sc. I Year- I Semester**	**Session 2025-2026**
Subject: Computer Science		
	Course Code	**BS-101P-S**
2	Course Title	**Computer Architecture Lab**
3	Course Type	Core Course
4	Pre-requisite	To study this course, a student must have had the subject Physics/Maths in 12th class.
5	Course Learning Outcomes	**On completion of this course, learners will be able to:** • Realization of the basic logic and universal gates. • Verify the behavior of logic gates using truth tables. • Implement Binary-to -Gray, Gray-to -Binary code • conversions • Design half and full adder circuit using basic gates. • Design and construct flip flops and verify the excitation • tables. • Architecture and related technologies
6	Credit Value	**Practical 2 Credits**
7	Total Marks	Max marks: **30 +70 = 100** Minimum Passing Marks **35**

Part B: Content of the course
No. of Lab. Practical (in hours per week): 2 Hrs. per week
Total No. of Labs: 30 Hours

Suggestive list of Practical

a) System Architecture

1. To study basic gates (AND, OR, NOT) and verify their truth tables.
2. To convert a given binary number to Gray code using IC 7486.
3. To study and verify NAND as Universal gate using IC 7400.
4. To study half adder using basic gates and verify its truth table.
5. To study Full Adder using basic gates and verify its truth table.
6. To realize basic gates (AND, OR, NOT) from Universal gates (NAND and NOR).
7. To verify truth table of 4-bit adder using IC 7483.
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9. To design and construct JK flip Flop using gates and verify the truth table.
10. To verify DeMorgan's Theorem.

b) MS Office Tools

Text Editor Tool

1. Create a document and apply different Editing options.
2. Create Banner for your college.
3. Design a Greeting Card using Word Art for different festivals.
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2. Design a presentation illustrating insertion of pictures, Word Art and ClipArt.
3. Design a presentation, learn how to save it in different formats, copying and opening an existing presentation.

Keywords/Tags: Digital Electronics, Logic Gates, AND, OR, NOT, IC 7486, IC 7400, NAND, NOR, IC 7483, Circuits, Flip Flop, DeMorgan's Theorem

PART C: Learning Resources

Textbooks, Reference Books, Other Resources

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- William Stalling, "Computer Organization & Architecture", Pearson Education
- V. Carl Hamacher , "Computer Organization", TMH
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Suggestive digital platform web links :

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https://nptel.ac. in/courses/106/106/106106 166/
https://nptel.ac.in/courses/106/106/106106134/

Suggested equivalent online courses

https://nptel.ac.in/courses/106/105/106105163/

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PART D: Assessment and Evaluation			
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 30 **Marks**		**External Assessment:** University Exam (UE) – **70 Marks** Time: **02.00 Hours**	
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Hands-on Lab Practice	10 Marks	Practical record file	10 Marks
Mock Viva	5 Marks	Viva voce practical	20 Marks
Lab Test from practical list	7 Marks	Table works/ Exercise Assigned (02) in practical exam	30 Marks
Assignments (Charts/ Models) Technology Dissemination/ Excursion/ Lab visit/ Industrial Training	8 Marks	Reports of excursion/ Lab visits/ Industrial training/ Survey/ Collection/ Models	10 Marks
Total ***Excursion/ Lab visits/ Industrial Training is compulsory**	**30 Marks**	Total	**70 Marks**

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PART A- Introduction

Program: Certificate/Diploma/Certificate **Class: B.Sc. I Year- Semester II** **Session:2025-2026**		
Subject: Computer Science		
1	Course Code	**BS-102T-S**
2	Course Title	**Programming Methodologies & Data Structures**
3	Course Type	Core Course
4	Pre-Requisite	To study this course, a student must have had the subject Physics/Maths in 12 class.
5	Course Learning Outcomes	On completion of this course, learners will be able to: 1. Develop simple algorithms and flow charts to solve a problem with programming using top-down design principles. 2. Writing efficient and well-structured computer algorithms/programs. 3. Learn to formulate iterative solutions and array processing algorithms for problems. 4. Use recursive techniques, pointers and searching methods in programming. 5. Will be familiar with fundamental data structures, their implementation; become accustomed to the description of algorithms in both functional and procedural styles 6. Have knowledge of complexity of basic operations like insert, delete, search on these data structures. 7. Possess ability to choose a data structure to suitably model any data used in computer applications. 8. Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc. 9. Assess efficiency trade-offs among different data structure implementations. 10. Implement and know the applications of algorithms for searching and sorting etc. 11. Know the contribution of Indians in the field of programming and data structures.
7	Credit value	**Theory 4 Credits** **Practical 2 Credits**
8	Total Marks	Max marks: **30 +70** Minimum Passing Marks **35**

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PART B- Content of the Course

Total no. of Lectures (in hours per week): - 4 hrs per week Total Lectures: - 60 hrs

Unit	Topic	No. of Lectures
I	**Introduction to Programming** - Program Concept, Characteristics of Programming, Stages in Program Development, Algorithms, Flowcharts, Types of Programming Methodologies. **Introduction to C++ Programming** - Basic Program Structure In C++, Data Types, Variables, Constants, Operators and Basic I/O. **Variables & Expressions** - Declaring, Defining and Initializing Variables, Scope of Variables, Using Named Constants, Keywords, Casting of Data Types, Operators (Arithmetic, Logical and Bitwise), Using Comments in programs, Character I/O (getc, getchar, putc, putchar etc.), Formatted and Console i/o (printf(), scanf(), cin, cout), Using Basic Header Files (stdio.h, iostream.h, conio.h etc.) Simple Expressions in C++ (including Unary Operator Expressions, Binary Operator Expressions), Understanding Operators Precedence in Expressions **Control Statements:** Conditional Statements if construct, switch-case construct. Iterative Statements while, do-while, and for loops, Use of break and continue in Loops, Using Nested Statements (Conditional as well as Iterative)	14
II	**Functions:** Top-Down Design, Pre-defined Functions, Programmer — defined Functions, Local Variables and Global variables, Functions with Default Arguments, Call-By-Value and Call-By-Reference, Parameters, Recursion. **Structures and Unions:** Declaration and Initialization. Pointers: Introduction, Referencing, Dereferencing and operations. **File Handling** - Use of files for data input and output, merging and copying files.	10

III	**Data Structures** - Basic concepts, Linear and Non-Linear data Structures, Algorithm Specification-Introduction. **Arrays:** Introduction to Arrays - Declaration and Referring Arrays, Arrays in Memory, Initializing Arrays. single, two-dimensional arrays, Multi-dimensional Arrays, Arrays in function. Sparse Matrices. **Strings** - Reading and Writing Strings, Arrays of Strings, String Function, Strings and Structure, Standard String Library Functions. **Linked Lists**: Singly Linked Lists, Operations, Concatenating, circularly linked lists-Operations for Circularly linked lists, Doubly Linked Lists- Operations.	12
IV	**Stacks**- Operations, Array and Linked Applications, Infix to Postfix Conversion, Postfix Expression Evaluation, Recursion & Implementation. **Queues**- Definition, Operations, Array and Linked Implementations. Circular Queue-Insertion and Deletion Operations, Dequeue (Double Ended Queue), Priority Queue- Implementation. **Trees & Graphs**- Representation of Trees, Binary tree, Properties, Binary Tree Representations-Array and Linked Representations, Binary Tree Traversals, Threaded Binary Trees, Binary Search Trees, AVL Trees, Heap. **Graphs** - Graph ADT, Graph Representations, Graph Traversals	14
V	**Sorting & Searching** : Sorting Methods: Bubble Sort, Insertion Sort, Selection Sort, Quick Sort, Merge Sort, Comparison of Sorting Methods **Searching Algorithms** - Linear Search, Binary Search. **Hashing**- Introduction, Hash tables, Hash functions. **Indian Contribution to the field** : Innovations in India, origin of Julia Programming Language, Indian Engineers who designed new programming languages, open source languages, Dr. Sartaj Sahni — computer scientist - pioneer of data structures, Other relevant contributors and contributions.	10
Keywords/ Tags	Programming, C++, Data Structures, Expressions, Control, File Handling, Arrays, Stack, Queue, Linked List, Tree, Graph, Structure, Union, Hash, Search, Sort, Algorithm	

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PART C- Learning Resources

Textbooks/ Reference Books:

Suggested Readings:

1. Problem Solving and Program Design in C, J. R. Hanly and E. B. Koffman, Pearson, 2015
2. E. Balguruswamy, "C++ "TMH Publication ISBN 0-07-462038-X
3. Herbertz Shield, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7
4. R. Lafore, 'Object Oriented Programming C++"
5. N. Dale and C. Weems, Programming and problem solving with C++: brief edition, Jones & Bartlett Learning.
6. Adam Drozdek, "Data Structures and algorithm in C++", Third Edition, Cengage Learning.
7. Sartaj Sahani, Data Structures, Algorithms and Applications with C++, McGraw Hill.
8. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
9. D.S. Malik, Data Structure using C++, Second edition, Cengage Learning.
10. M. A. Weiss, Data structures and Algorithm Analysis in C, 2nd edition, Pearson.
11. Lipschutz: Schaum's outline series Data structures, Tata McGraw-Hill

Suggested Digital Platforms, Web Links:

1. https://www.youtube.com/watch?v=BCIS40yzssA
2. https://www.youtube.com/watch?v=vLnPwxZdW4Y&v1=en
3. https://www.youtube.com/watch?v=Umm1Z051tZw
4. https://npteLac. in/courses/106/106/106106127/

Suggested equivalent online courses

1. https://npteLac.in/courses/106/105/106105151/
2. https://nptel.ac.in/courses/106/105/106105171/
3. https://onlinecourses.swayam2.ac.in/cec19 m g35/prev iew

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Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE) :70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation E-quiz	30
External Assessment: University Exam Section: 70 Time : 03.00 Hours	**Section(A) : Six Very Short Questions**	06 x 01 = 06
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Part A - Introduction		
Program: Certificate/Diploma/Degree	**Class: B.Sc. I Year – Semester I**	**Session: 2025-2026**
Subject: Physics		
1.	**Course Code**	**BS-103P-S**
2.	**Course Title**	**Mechanics and General Properties of Matter Lab**
3.	**Course Type (Core/Elective/Generic Elective/Vocational/...)**	**Minor**
4.	**Pre- requisite (If any)**	To study this course, a student must have had the subject Physics in 12th class.
5.	**Course Learning Outcomes (C LO)**	1. The students would acquire basic practical knowledge related to mechanics through the experiments. 2. Students will be familiar with various measurement devices by which they can measure various physical quantities with accuracy. 3. The students will develop the concept related to the mechanics and properties of matter.
6.	**Credit Value**	**2**
7.	**Total Marks**	Max. Marks: 30+70 Min. Passing Marks: 35

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Part B - Content of the Course		
Sr. No.	Total numbers of Practical (in hours): 30 List of experiments	Number of Practical (in hours)
1.	Determination of Young's modulus, modulus of rigidity and Poisson's ratio of material of a wire using Searle's method.	30
2.	Determination of Young's modulus of material of a metallic bar by bending of beam method.	
3.	Determination of acceleration due to gravity (g) using Bar pendulum.	
4.	Determination of acceleration due to gravity (g) using Kater's reversible pendulum.	
5.	Determination of modulus of rigidity of a rod with the help of Barton's apparatus.	
6.	Determination of coefficient of viscosity of liquid using	
7.	Determination of the moment of inertia of a flywheel about its axis of rotation.	
8.	Determination of the moment of inertia of a given body (irregular body) with the help of inertia table.	
9.	Verification of laws of the parallel/perpendicular axes of moment of inertia.	
10.	Determination of modulus of rigidity of material of a wire with the help of Maxwell's needle.	
11.	Determination of Young's Modulus of a material of a rod using Cantilever method.	
12.	Determination of modulus of rigidity of material of a wire with the help of torsional pendulum.	
13.	Determination of force constant of a spring.	
14.	Determination of Poisson's ratio of rubber.	
15.	Determination of surface tension of a liquid by Jaeger's method.	

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Part C-Learning Resources
Text Books, Reference Books, Other resources
Suggested Readings: 1. Prakash I. & Ramakrishna, "A Text Book of Practical Physics", Kitab Mahal, 2011,11/e. 2. Squires G. L., "Practical Physics", Cambridge University Press, 2015, 4/e. 3. Flint B. L. and Worsnop H. T., "Advanced Practical Physics for students", Publishing House, 197. 4. Chattopadhyay D. & Rakshit P. C., "An Advanced Course in Practical Physics", Central Book Agency. **Suggestive digital platforms web links** 1. https://www.vlab.co.in/broad-area-physical-sciences
2. https://storage.cpleapis.com/uniquecourses/online.hrni

Part D-Assessment and Evaluation			
Suggested Continuous Evaluation Methods:			
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Class Interaction /Quiz	10	Viva Voce on Practical	10
Attendance	10	Practical Record File	10
Assignments (Charts/ Model Seminar / Rural Service/ Technology Dissemination/ Report of Excursion/ Lab Visits/ Survey / Industrial visit)	10	Table work / Experiments	50
TOTAL	**30**		**70**

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Part A: Introduction			
Program: Certificate Course		**Class: I Year- Semester II**	**Session: 2025-2026**
Subject: Mathematics			
1	Course Code	**EL-110-S**	
2	Course Title	**Calculus and Differential Equations**	
3	Course Type	**Elective**	
4	Pre-requisite (if any)	To study this course, a student must have had the subject Mathematics in class 12th.	
5	Course Learning Outcomes (CLO)	The course will enable the students to: 1. Sketch curves in a plane using its Mathematical properties in the different coordinate systems of reference. 2. Using the derivatives in Optimization. Social sciences, Physics and Life sciences etc. 3. Formulate the Differential equations for various Mathematical models. 4. Using techniques to solve and analyze various Mathematical models.	
6	Credit Value	6	
7	Total Marks	Max.Marks:30+70	Min. Passing Marks: 35

Part B: Content of the Course		
Total No. of Lectures (in hours per week): 6 hours per week		Total Lectures: 90hours
Unit	Topics	No. of Lectures
1	I.I Historical background: 1.1.I Development of Indian Mathematics: Ancient and Early Classical Period (till 500CE) I.1.2Abrief biography of Bhaskaracharya (with special reference to Lilavati) and Madhava Successive differentiation Leibnitz theorem Maclaurin's series expansion Taylor's series expansion Partial Differentiation Partial derivatives of higher order Euler's theorem on homogeneous functions Asymptotes Asymptotes or algebraic curves Condition for Existence of Asymptotes Parallel Asymptotes I.4.4 Asymptotes of Curves	18

II	2.1 Curvature' 2.I.IFormula for radius of Curvature: Curvature at origin, Centre of Curvature Coocavity and Convexity: Concavity and Convexity of curves Point of lnflexion, Singular point, Multiple points Tracing of curves Curves represented by Cartesian equation Curves represented bv Polar equation	18
Ill	3.1 Integration of transcendental functions Introduction to Double and Triple Integral. Reduction formulae Quadrature 3.4.I For Cartesian coordinates 3.4.2 For Polar coordinates Rectification: For Cartesian coordinates, For Polar coordinates	18
IV	4.1 Linear differential equations 4.1.1 Linear equation: Equations reducible to the linear form Change of variables, Exact differential equations First order and higher degree differential equations Equations solvable for x, y and p Equations homogenous in x and y Clairaut's equation, Singular solutions, Geometrical meaning of differential equations, Orthogonal trajectories	18
V	5.1 Linear differential equation with constant coefficients Homogeneous linear ordinary differential equations Linear differential equations of second order Transformation of equations by changing the dependent/ Independent variable 5.5 Method of variation of parameters	18

Keywords/Tags
Indian Mathematics, Successive differentiation, Partial Differentiation, Asymptotes, Curvature, Tracing of curves. Rectification, Linear differential equations, Method of variation or parameters.

Part C: **Learning** Resources Text Books. Reference Books, Other Resources
Suggested Readings: Text Books: 1. Gorakh Prasad: Differential Calculus, Pothishala PrivateLtd., Allahabad, 2016. 2. Corakh Prasad: integral Calculus, Pothishala Private Ltd. .Allahabad, 2015. 3. M.D. Raisinghania: Ordinary and Partial Differential Equations. S Chand A Co Ltd, 2017. 4. Gerard G. Emch, R.Sridharanand M.D. Srinivas: Contributions to the History of IndianMathematics.HindustanBookAgency,Vol.3,2005. Reference Books: 1. N. Piskunov: Differential and Integral Calculus, CBS Publishers, 1996. 2. G.F.Simmons: Differential Equations, TataMcGraw Hill.1972. 3. E.A.Codington:An Introduction to ordinary differential Equation,Prentice Hall of India, 1961. 4. D.A.Murray: introductory Course in Differential Equations, Orient Longman(India) 1967. 5. H.T. H Piaggio: Elementary Treatise on Differential Equations and their Application, C.B.S.Publisher&Distributors,Delhi.1985. 6.Bibhuti bhusan Datta and Avadhesh Narayan Singh: History of Hindu Mathematics, Asia Publishing House,1962. Suggested Digital PlatforzzssWeb.links: hltps://epgp.inflibnet.ac.in https://freevideolectures.com./university/iit-roorkes https://www.higfiereducation.mp.gov.in/?page=xhzfQmpZwkyI\fo2b%2Fy5G7w%3D°/«3D https://www.bhojvirtualuniversity.com Suggested Equivalent online courses: hxps://npteI.ac.in/courses/I11106100/ https://nptel.ac.in/courses/III/101/l 1110l080/

Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE) :70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation E-quiz	30
External Assessment: University Exam Section: 70 Time : 03.00 Hours	**Section(A) : Six Very Short Questions**	06 x 01 = 06
	Section (B) : Five Short Questions	05 x 08 = 40
	Section (C) : Two Long Questions	02 x 12 = 24 Total 70

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Part A: Introduction			
Program: Certificate/ Diploma/ Degree		**Class: I Year- Semester II**	**Session: 2025-2026**
Subject: Mathematics			
I	Course Code	**EL-109-S**	
2	Course Title	**Computational Mathematics**	
3	Course Type	**Elective**	
4	Pre-requisite (if any)	**Student must have basic analytic aptitude.**	
5	Course Learning Outcomes CLO)	On successful completion of the course the students shall be able to • Implement trigonometric solutions for measurements in real world scenarios • Implement matrices and simultaneous equations to solve complex problems • Use statistical tools efficiently • Use Mathematical Logic and predicate calculus for solving problems • Apply the concepts of set theory for finding solutions to set related problems	
6	Credit Value	6	
7	Total Marks	Max.Marks:30+70	Min. Passing Marks: 35

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Part B: Content of the Course		
Total No. of Lectures (in hours per week):6 hours per week		Total Lectures: 90 hours
Unit	Topic	No. of Lecture
I	Trigonometry: Angles & their Measurement, Values of Trigonometry Ratios, Height and Distance. Elementary Matrices and types of matrices.	18
II	Equations: Simultaneous linear equations, Methods of Solving Simultaneous equations, Quadratic equations.	18
III	Statistics: Frequency Distribution, Measure of Central Tendency; Mean, Median, Mode. Measures of variation: Mean deviation, Standard deviation.	18
IV	Mathematical Logic: Statements and notation, Connectives: Negation, Conjunction, and Disjunction. Statement formula and truth tables. Tautologies, Tautological implication, contradiction contingency.	18
V	Set Theory: Basic concept of set theory, notation, inclusion and equality of sets, the power sets, operations on set, Venn diagrams.	18

Part C: **Learning** Resources
Text Books. Reference Books, Other Resources
Suggested Readings: Text Books: • Business mathematics SM Shukla sahitya bhavan publication • Business mathematics DC Agarwal Sri Sai Prakasha • Text book of discrete mathematics S K Sarkar s Chand • Reference books • Fundamental of statistics Taj Mahal publications • Mathematical statistics Ray and Sharma Ramprasad and sons • Business mathematics Sancheti and Kapoor s Chand and sons • Business mathematics structure with applications to computer science. Indian edition JP Tremblay are Manohar Mcgra Hill Publication

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Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods:		
Maximum Marks: 100		
Continuous Comprehensive Evaluation (CCE) : 30 marks University Exam (UE) :70 marks		
Internal Assessment :	Class Test	30
Continuous Comprehensive	Assignment/Presentation	
Evaluation (CCE):30	E-quiz	
External Assessment :	Section(A) : Six Very Short Questions	06 x 01 = 06
University Exam Section: 70	Section (B) : Five Short Questions	05 x 08 = 40
Time : 03.00 Hours	Section (C) : Two Long Questions	02 x 12 = 24 Total 70

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PART A: Introduction

Program: Certificate/Diploma/Degree		**Class: I Year - Semester II**	**Session: 2025-26**
Subject: Environmental Education			
1.	Course Code	**FC-104-S**	
2.	Course Title	**Environmental Education**	
3.	Course Type (Core Course/Elective/Generic Elective/ Vocational	**Foundation Course**	
4.	Pre-Requisite (if any)	A course intended to create awareness about the life of human beings which is an integral part of environment; and to inculcate the skills required to protect the environment from all sides. To study this course, the student must have a knowledge about the environmental components, pollution, biodiversity, and ecosystem at senior secondary, class 12th level:	
5.	Course Learning Outcomes (CLO)	1. To understand various aspects of life form's, ecological processes, and the impacts on them by the human during anthropogenic era. 2. To build capabilities to identify relevant environmental issues, analyze the various underlying causes, evaluate the practices and policies, and develop framework to make inform decisions. 3. To develop empathy for all life forms, awareness, and responsibility towards environmental protection and nature preservation. 4. To develop the critical thinking for shaping strategies such as; scientific, social, economic, administrative & legal, environmental protection, conservation of biodiversity, environmental equity and sustainable development. 5. To prepare for the competitive exams.	
6.	Credit Value	2	
7.	Total Marks	Max. Marks: 50	Min. Passing Marks:17

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PART B: Content of the Course		
Total No. of Lectures-30 Hrs. (02 hours per week)		
Unit	**Topics**	**No. of Lectures**
I	**Environment and Natural Resources:** Multidisciplinary nature, Scope and Importance of Environment Components of Environment: Atmosphere, Hydrosphere, Lithosphere, and Biosphere. Brief account of Natural Resources and associated problems: Land Resource, Forest Resource, Water Resource, Energy Resource Concept of Sustainability and Sustainable Development. **Keywords: Environment, Forest, Mineral, Food, Land, Water, Energy, Sustainable Development**	10 Hrs.
II	**Biome, Ecosystem and Biodiversity:** Major Biomes: Tropical, Temperate, Forest, Grassland, Desert, Tundra, Wetland, Estuarine and Marine Ecosystem: Structure function and types their Preservation & Restoration Biodiversity: Importance, Threats, and Conservation Measures **Keywords: Biome, Ecosystem, Biodiversity**	8 Hrs.
III	**Environmental Pollution, Management and Social Issues:** Pollution: Types, Control measures, Management, and associated problems. Climate Change: Causes, Impacts, and Mitigation Strategies Environmental Law and Legislation: Protection and conservation Acts. International Agreement & Programme. Environmental Movements, communication and public awareness programme. National and International organizations related to environment conservation and monitoring. Role of information technology in environment and human health. **Keywords: Pollution, Environmental Legislation, Environmental Movement, Environmental programme and organization.**	12 Hrs.

Suggested activities: (at least one)

1. Visit to an area to document environmental assets: rivers / forest / flora / fauna.
2. Visit to a local polluted site Urban / Rural/ Industrial / Agricultural
3. Study of simple ecosystem.

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PART C: Learning Resources
Textbooks, Reference Books, Other Resources
• Singh; J.S., Singh S.P. and Gupta, S.R.; "Ecology; Environment Science and Conservation ",S Chand publishing , New Delhi , (2018) • Divan, S. and Rosencranz , A. , "Environmental Law and Policy in India :Cases, Material & Status" Oxford University Press , India , (2002) 2nd Edition . • Odum , E.P. , "Fundamentals of Ecology " , Philadelphia Saundres , (1971) • Bharucha , Erach , "Environmental studies " Universities Press India Pvt. Ltd. Hyderabad (2014) (Hindi Edition also available). • Kaushik, Anubha , Kaushik , C.P. "Perspectives in Environmental Studies "New age International Publishers , (2018), 6th Edition • Asthana, D. K Asthana Meera, "A Textbook of Environmental Studies", S. Chand.Publishing, New Delhi, (2007) • National Digital Library (https://ndl.iitkgp.ac.in/homestudy/science) • Epg- pathshala (https://epgp.inflibnet.ac.in/Home/Download) • NPTEL (https://nptel.ac.in/course.html) • Coursera (https://www.coursera.org/search?query=environmental+science&page=1)
Suggested equivalent online course — i. The Health Effects of Climate Change (edx) ii. Climate Change: Financial Risks and Opportunities (edx) iii. Introduction to Environmental Law and Policy (coursera) iv. Women in environmental biology (coursera) v. Our Earth: It's Climate, History, and Processes (coursera) vi. Ecology, physiology, environmental science (national digital library)

Part D: Assessment and Evaluation			
Max Marks: 50	Min Marks: 17	University Exam (UE)	Total: 50
	External Assessment (UE)	Time: 2 Hours	
Fifty Multiple Choice /Objective/True-False type questions to be asked. Each question carries one mark			

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BRIDGE COURSE SYLLABUS

Department of Science and Computer Science
Basics of Mathematics

Course Objectives:

A. Equip students with a fundamental understanding of key concepts and the principles of mathematics
B. The purpose of a bridge course is to help students by developing their academic skills and knowledge in Mathematics writing and reading.

Course Outline:

1. Introduction to Set Theory its representation and operations
2. Introduction to Matrices: Types, Representation and Operations on matrices
3. Logical connectives: Basic Logic Operations Logical Equivalence/Equivalent Statements
4. Progressions: Arithmetic Progression, Geometric Progression & Harmonic Progression

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Part A Introduction		
Program: Value Added Course	**Class: B.Sc. I Semester**	**Session:2025-2026**
Certificate Course: Artificial Intelligence		
1	**Course Code**	**CSD-S1-18**
2	**Course Title**	**Artificial Intelligence**
3	**Pre-requisite (if any)**	**Not Required (Open for All)**
4	**Course Learning outcomes (CLO)**	**The course will enable the students to:** 1. Understand AI fundamentals, including history, types, and applications. 2. Learn and apply basic machine learning algorithms. 3. Handle and preprocess various types of data for AI models. 4. Grasp the concepts of neural networks and deep learning. 5. Develop practical skills using popular AI tools and programming languages. 6. Appreciate ethical considerations and explore future trends in AI.

Part B- Content of the Course (Semester I)		
Total No. Hours - 36 Hours		
Unit	**Topics**	**No. of Lectures**

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I	**Introduction to Artificial Intelligence** **Definition and History of AI:** Concept of AI, Key milestones in AI development. Pioneers in AI: Alan Turing, John McCarthy, etc. **Types of AI:** Weak AI vs. Strong AI, Narrow AI vs. General AI, Reactive Machines, Limited Memory, Theory of Mind, and Self-aware AI **Applications of AI:** Everyday applications (smart assistants, recommendations, etc.). AI in various fields (healthcare, finance, education, transportation, etc.) **Case studies of successful AI implementations**	12
II	**Fundamentals of Machine Learning** **Overview of Machine Learning:** Concept of Machine Learning, Differences between AI and Machine Learning, Types of Machine Learning: Supervised, Unsupervised and Reinforcement Learning **Supervised Learning:** Linear Regression, Classification: K-Nearest Neighbors (KNN). Decision Trees, Overfitting and Underfitting **Unsupervised Learning:** Clustering: K-means, Hierarchical Clustering. Dimensionality Reduction: Principal Component Analysis (PCA) **Reinforcement Learning:** Basic concepts of Reinforcement Learning. Real-world applications (e.g., game playing, robotics)	**12**
III	**Data and Preprocessing** **Understanding Data:** Types of data: structured, unstructured, semi-structured. Data sources and data collection techniques. Importance of data quality **Data Preprocessing Techniques:** Data Cleaning: handling missing values, outliers. Data Transformation: scaling, normalization, standardization. Feature Selection: methods and importance **Exploratory Data Analysis (EDA):** Descriptive statistics, Data visualization techniques (e.g., histograms, scatter plots). Identifying patterns and correlations.	12

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Part A Introduction		
Program: Value Added Course	Class: B.Sc. II Semester	Session:2025-2026
Certificate Course: Artificial Intelligence		
1	Course Code	CSD-S2-18
2	Course Title	Artificial Intelligence
3	Pre-requisite (if any)	Not Required (Open for All)
4	Course Learning outcomes (CLO)	The course will enable the students to: 1. Understand AI fundamentals, including history, types, and applications. 2. Learn and apply basic machine learning algorithms. 3. Handle and preprocess various types of data for AI models. 4. Grasp the concepts of neural networks and deep learning. 5. Develop practical skills using popular AI tools and programming languages. 6. Appreciate ethical considerations and explore future trends in AI.

Part B- Content of the Course (Semester II)		
Total No. Hours - 36 Hours		
Unit	Topics	No. of Lectures

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I	**Neural Networks and Deep Learning** **Introduction to Neural Networks:** Biological inspiration behind neural networks, Neurons and Perceptrons. Architecture of Neural Networks: input layer, hidden layers, output layer **Deep Learning Basics:** Introduction to Deep Learning. Convolutional Neural Networks (CNNs): applications in image recognition, Recurrent Neural Networks (RNNs): applications in natural language processing. Basic training process of neural networks: forward propagation, backpropagation **Advanced Deep Learning Topics (optional):** Generative Adversarial Networks (GANs), Transfer Learning	12
II	**AI Tools and Technologies** **Popular AI Frameworks and Libraries:** TensorFlow: overview and basic usage, Keras: high-level neural networks API, PyTorch: flexible and dynamic deep learning framework **AI Programming Languages:** Python for AI: importance and advantages. Basic Python coding skills: variables, data types, control structures. Introduction to Jupyter Notebooks for interactive coding **AI Development Tools:** Integrated Development Environments (IDEs) for AI development (e.g., PyCharm, Jupyter)	**12**
III	**Ethical Considerations and Future of AI** **Ethics in AI:** Introduction to AI ethics. Bias and Fairness in AI: sources of bias, mitigating bias. Privacy and Security Concerns: data privacy, ethical hacking. Legal and societal implications of AI **Future Trends in AI:** Emerging Technologies: quantum computing and AI. The impact of AI on jobs and society: automation, future job market. AI in futuristic applications: smart cities, autonomous vehicles. AI research and developments: current trends, future possibilities	**12**

Keywords: Artificial Intelligence, Machine Learning, Data Preprocessing, Neural Networks, Deep Learning, Python, TensorFlow, Keras, Ethics, Future Trends.

PART C: Learning Resources

Textbooks:

1. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.
2. Machine Learning Yearning by Andrew Ng

Reference Books:

1. Pattern Recognition and Machine Learning by Christopher M. Bishop.
2. Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville.

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Part A Introduction		
Program: Value Added Course	Class: B.Sc. I Semester	Session:2025-2026
Certificate Course: Data Science		
1	Course Code	CSD-S1-19
2	Course Title	Data Science
3	Pre-requisite (if any)	Not Required (Open for All)
4	Course Learning outcomes (CLO)	The course will enable the students to: 1. Understand AI fundamentals, including history, types, and applications. 2. Learn and apply basic machine learning algorithms. 3. Handle and preprocess various types of data for AI models. 4. Grasp the concepts of neural networks and deep learning. 5. Develop practical skills using popular AI tools and programming languages. 6. Appreciate ethical considerations and explore future trends in AI.

Part B- Content of the Course (Semester I)		
Total No. Hours - 36 Hours		
Unit	Topics	No. of Lectures

I	**Understanding Data Science** What is Data Science? Basics of data science and its applications. Real-Life Applications: Examples from areas like healthcare, business, and sports. Data Types and Sources: Structured vs. Unstructured Data. Where data comes from (databases, surveys, etc.). Introduction to Tools: Overview of tools like Python and Excel.	12
II	**Basics of Python for Data Analysis** Python Basics: Variables, data types, and basic operations. Input/output and writing simple programs. Working with Data Structures: Lists, dictionaries, and arrays in Python. Introduction to Numpy and Pandas: Loading and exploring datasets. Performing basic data manipulations.	12
III	**Data Visualization** Why Visualization Matters: How graphs and charts help us understand data. Types of Charts: Bar charts, pie charts, line graphs, and scatter plots. Hands-On with Matplotlib and Seaborn: Writing simple scripts to create plots. Customizing visualizations for better insights.	12

Keywords/Tags:
Data Science, Data Analysis, Data Visualization, Machine Learning, Artificial Intelligence, Big Data, Predictive Analytics

PART C: Learning Resources

Textbooks:
1. "Introduction to Data Science" by Laura Igual and Santi Seguí.
2. "Statistics for Data Scientists" by Peter Bruce and Andrew Bruce

Reference Books:
1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
2. "SQL for Data Scientists" by Renee M. P. Teate

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Part A Introduction		
Program: Value Added Course	Class: B.Sc. II Semester	Session:2025-2026
Certificate Course: Data Science		
1	Course Code	CSD-S2-19
2	Course Title	Data Science
3	Pre-requisite (if any)	Not Required (Open for All)
4	Course Learning outcomes (CLO)	The course will enable the students to: 1. Understand AI fundamentals, including history, types, and applications. 2. Learn and apply basic machine learning algorithms. 3. Handle and preprocess various types of data for AI models. 4. Grasp the concepts of neural networks and deep learning. 5. Develop practical skills using popular AI tools and programming languages. 6. Appreciate ethical considerations and explore future trends in AI.

Part B- Content of the Course (Semester II)

Total No. Hours - 36 Hours

Unit	Topics	No. of Lectures

I	**Basics of Statistics** Descriptive Statistics: Mean, median, mode, standard deviation. Probability Basics: What is probability? Simple probability examples using data. Introduction to Correlation: Understanding relationships between variables.	**12**
II	**Data Cleaning and Exploration** Data Cleaning Techniques: Handling missing or incorrect data. Introduction to encoding categorical data. Exploring Data: Summary statistics (min, max, average). Identifying patterns and trends in datasets. Practical Exercises in Python: Using Pandas for data cleaning.	**12**
III	**Capstone Mini-Project** Project Overview: Students solve a small real-world problem using datasets. Steps to Follow: Loading and cleaning a dataset. Visualizing the data. Performing basic analysis to draw conclusions. Presentation: Students present their findings with simple graphs and insights.	**12**

Keywords/Tags:
Data Science, Data Analysis, Data Visualization, Machine Learning, Artificial Intelligence, Big Data, Predictive Analytics

PART C: Learning Resources

Textbooks:

1. "Introduction to Data Science" by Laura Igual and Santi Seguí.
2. "Statistics for Data Scientists" by Peter Bruce and Andrew Bruce

Reference Books:

1. "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron
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Part A - Introduction		
Program: Certificate/Diploma/ Degree	**Class:** B.Sc. I Year –Semester I	**Session:** 2025-2026
Subject: Physics		
1.	Course Code	**BS-103T-S**
2.	Course Title	**Mechanics and General Properties of Matter**
3.	Course Type (Core/Elective/Generic Elective/Vocational/...)	**Minor**
4.	Pre- requisite (If any)	To study this course, a student must have had the subject Physics in 12th class.
5.	Course Learning Outcomes (CLO)	The course would empower the students to develop the idea about the behavior of physical bodies. 1. It will provide the basic concepts related to the motion of all the objects around us in daily life. 2. The students would be able to build foundation to various applied field in science and technology especially in the field of mechanical engineering. 3. The students will acquire the knowledge of basic 4. mathematical methods to solve the global various problems in physics. 5. The students will be able the understand the relativistic effect and the relation between energy and mass.
1.	Credit Value	**Theory 4 Credits** **Practical 2 Credits**
2.	Total Marks	Max. Marks: **30+70** Min. Passing Marks: **35**

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Part B - Content of the Course		
Total number of Lectures (in hours): 60		
Unit	**Topics**	**Number of Lectures**
I	**Historical background and Mathematical Physics** **1.Historical background:** 1.1. A brief historical background of mathematics and mechanics in the context of India and Indian culture. 1.2. A brief biography of Varaha-nihira and V ikram Sarabhai with their major contribution to science and society. **2. Mathematical Physics:** 2.1. Scalar and vector fields, Gradient of a scalar field and its physical significance. 2.2. Vector integral: line integral, surface integral and volume integral, Divergence of a vector field and its physical significance, Gauss divergence theorem. 2.3. Curl of a vector field and its physical significance, Stokes and Green's theorem, Numerical problems based on the above topics. **Keywords/Tags:** Scalar field, Vector field, Vector integral, Gradient, Divergence, Curl.	12
II	**Mechanics of Rigid and deformable bodies** **1. Rigid body mechanics:** 1.1. System of particles and concept of Rigid body, Torque, Centre of mass : position of the Centre of mass, Motion of the Centre of mass, Conservation of linear & angular momentum with examples, Single stage and multistage rocket. 1.2. Rotatory motion and concept of moment of inertia, Theorems on moment of inertia: theorem of addition, theorem of perpendicular axis, theorem of parallel axis, Calculation of moment of inertia of rectangular lamina, disc, solid cylinder, solid sphere. **2. Mechanics of deformable bodies:** 2.1. Hook's law, Young's modulus, Bulk modulus, Modulus of rigidity and Poisson's ratio, Relationship between various elastic moduli. 2.2. Possible values of Poisson's ratio, Finding Poisson's ratio of rubber in the laboratory, Torsion of a cylinder, Strain energy of twisted cylinder. 2.3. Finding the modulus of rigidity of the material of a wire by Barton's method, Torsional pendulum and Maxwell's needle, Searl's method to find Y, ri and a of the material of a wire, Bending of beam, Cantilever, Beam supported at its ends and loaded in the middle. **Keywords/Tags:** Rigid body, Centre of mass, Moment of inertia, Poisson's ratio.	12

III	**Fluid mechanics** **1. Surface Tension:** 1.1. Inter-molecular forces and potential energy curve, force of cohesion and adhesion. 1.2. Surface tension, Explanation of surface tension on the basis of intermolecular forces, Surface energy, Effect of temperature and impurities on surface tension, Daily life application of surface tension. 1.3. Angle of contact, The pressure difference between the two sides of a curved liquid surface, Excess pressure inside a soap bubble, Capillarity, determination of surface tension of a liquid - capillary rise method, Jaeger's method. **2. Viscosity:** 2.1. Ideal and viscous fluid, Streamline and turbulent flow, Equation of continuity, Rotational and irrotational flow, Energy of a flowing fluid, Euler's equation of motion of a non-viscous fluid and its physical significance. 2.2. Bernoulli's theorem and its applications (Velocity of efflux, shapes of wings of airplane, Magnus effect, Filter pump, Bunsen's burner). 2.3. Viscous flow of a fluid, Flow of liquid through a capillary tube, Derivation of Poiseuille's formula and limitations, Stocks formula, Motion of a spherical body falling in a viscous fluid. **Keywords/Tags:** Inter-molecular force, Surface tension, Angle of contact, Capillarity, Viscosity, Euler's equation, Poiseuille's formula.	12

IV	**Gravitational potential and Central forces** **1. Gravitational potential:** 1.1. Conservative and non-conservative force field, Conservation of energy in motion under the conservative and non-conservative forces, Potential energy. 1.2. Conservative force, Conservation of energy, Gravitational potential and gravitational potential energy, Gravitational potential and intensity of gravitational field due to a uniform spherical shell and a uniform solid sphere. 1.3. Gravitational self-energy, Gravitational self-energy of a uniform spherical shell and a uniform solid sphere. **2. Central forces:** 2.1. Motion under Central forces, Conservative characteristics of central forces. 2.2. The motion of a two particles system in Central force, Concept of reduced mass, Reduced mass of positron ium and hydrogen. 2.3. Motion of particles in an inverse-square central force, Motion of celestial bodies and derivation of Kepler's laws, **2.4. Elastic** and inelastic scattering (elementary idea).	12
V	**Relativistic Mechanics and Astrophysics** **Relativistic Mechanics:** 1.1. Frarne of references, Galilean transformation, Michelson- Morley experiment. 1.2. Postulates of special theory of relativity, Lorentz Transformation, Simultaneity and order of events, Length contraction, Time dilation, Relativistic transformation of velocities, Variation of mass with velocity. 1.3. Mass-energy equivalence and its experimental verification. **Astrophysics:** **2.1. Introductionn** to the Universe, Properties of the Sun, Concept of Astronomical Distance. **2.2. Life** cycle of a stars, Chandrasekhar Limit, H-R diagram, Red giant star, White dwarf star, Neutron star, Black hole, 2.3.Big Bang Theory (elementary idea). **Keywords/Tags:** Transformation, Mass-energy equivalence,	12

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Part C- Learning Resources
Text Books, Reference Books, Other resources
Suggested Readings: 1. Spiegel M. R., "Vector Analysis: Schaum Outline Series", McGraw Hill Education, 2017. 2. Mathur D. S., "Mechanics", S. Chand, 2012. Ghatak A. K., Goyal I.C. and Chua S.J., "Mathematical Physics", Laxmi Publications Private Limited, 2017. 4. Mathur D. S., "Properties of Matter", Shyamlal Charitable Trust, New Delhi. 5. Sears and Zeemansky, "University Physics", Pearson Education.
Suggested equivalent online courses: 1. https://nptel.ac.iri/courses/115/103/115103036/ Mathematical Physics by Dr. Saurabh Basu ,
Department of Physics, Indian Institute of Technology Guwahati 2. https://npte 1 .ac. in/courses/115/106/115106090/ Mechanics, Heat, Oscillations and Waves by
Prof. V. Balakrishnan, Department of Physics, Indian Institute of Technology, Madras

Part D- Assessment and Evaluation		
Suggested Continuous Evaluation Methods: Maximum Marks: 100 Continuous Comprehensive Evaluation (CCE): 30 marks University Exam (UE) :70 marks		
Internal Assessment: Continuous Comprehensive Evaluation (CCE):30	Class Test Assignment/Presentation E-quiz	30
External Assessment: University Exam Section: 70 Time : 03.00 Hours	**Section(A) : Six Very Short Questions**	06 x 01 = 06
	Section (B) : Five Short Questions	05 x 08 = 40
	Section (C) : Two Long Questions	02 x 12 = 24 Total 70

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Part A-Introduction

Programme : Certificate/Diploma/Degree	**Class: B.Sc. I Year- Semester II**	**Session 2025-26**
Subject: Computer Science		
	Course Code	**BS-102P-S**
2	Course Title	**Office Tools & Programming Methodology Lab**
3	Course Type	Core Course
4	Pre-requisite	To study this course, a student must have had the subject Physics/Maths in 12 class.
5	Course Learning Outcomes	On completion of this course, learners will be able to: 1. Develop simple algorithms and flow charts to solve a problem with programming using top-down design principles. 2. Writing efficient and well-structured computer algorithms/programs. 3.Learn to formulate iterative solutions and array processing algorithms for problems. 4. Use recursive techniques, pointers and searching methods in programming. 5.Possess ability to choose a data structure to suitably model any data used in computer applications. 6. Implementation of algorithms for searching and sorting.
6	Credit Value	**Practical 2 Credits**
7	Total Marks	Max marks:**30 +70** Minimum Passing Marks **35**

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PART B: Content of the Course

No. of Lab Practical (in hours per week): 2 Hrs. per week

Total No. of Lab – 30 Hours

Suggestive list of Practical -

I Office Tools

a. Using a Text Editor Tool	1. Create a document and apply different Editing options. 2. Implement Mail Merge. 3. Insert a table into a document and try different formatting options for the table
b. Using a Spreadsheet Tool	1.Prepare a generic Bill of a Super Market. 2. Work on the following exercises on a Workbook: a. Copy an existing Sheet b. Rename the old Sheet c. Insert a new Sheet into an existing Workbook d. Delete the renamed Sheet. 3. Prepare an Attendance sheet of 10 students for any 6 subjects of your syllabus. Calculate their total attendance, total percentage of attendance of each student & average of attendance. 4.Create a worksheet of Students list of any 4 faculties and perform following database functions on it a. Sort data by Name b. Filter data by Class c. Subtotal of no. of students by Class.

c. Using a Presentation Tool	1.Design a presentation illustrating insertion of movie, animation and sound. 2.Illustrate use of custom animation and slide transition (usin(2, different effects). 3.Design a presentation using charts and tables of the marks obtained in class

II. Given the problem statement, students are required to formulate problem, develop flowchart/algorithm, write code in C++, execute and test it. Students should be given assignments on following:

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4. Write a program to swap the contents of two variables.
4. Write a program for finding the roots of a Quadratic Equation.
5. Write a program to find area of a circle, rectangle, square using switch case.
6. Write a program to check whether a given number is even or odd.
7. Write a program to print table of any number.
8. Write a program to print Fibonacci series.
9. Write a program to find factorial of a given number.
10. Write a program to convert decimal (integer) number into equivalent binary number.
11. Write a program to check given string is palindrome or not.
12. Write a program to perform multiplications of two matrices.
13. Write a program to print digits of entered number in reverse order.
14. Write a program to print sum of two matrices.
15. Write a program to print multiplication of two matrices.
16. Write a program to generate even/odd series from 1 to 100.
17. Write a program whether a given number is prime or not.
18. Write a program for call by value and call by reference.
19. Write a program to generate a series 1+1/1 !+2/2!+3/3!+---+n/n!
20. Write a program to create a pyramid structure

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21. Write a program to create a pyramid structure
22. Write a program to check entered number is Armstrong or not.
23. Write a program for traversing an Array.
24. Write a program to input N numbers, add them and find average.
25. Write a program to find largest element from an array.
26. Write a program for Linear search.
27. Write a program for Binary search.
28. Write a program for Bubble sort.
29. Write a program for Selection sort.
30. Write a program for Insertion sort.

Keywords/Tags: Programming, C++, Data Structures, if, else, for, while, do, File Handling, call by value, call by reference, recursion, Arrays, Union, Hash. Linear search, Binary search, Bubble sort, Selection sort.

12/03

Part C

Suggested Readings: Textbooks, Reference Books, Other Resources:

1. J. R. Hanly and E. B. Koffman, "Problem Solving and Program Design in C", Pearson, 2015
2. E. Balguruswamy, "C++", TMH Publication ISBN 0-07-462038-X
3. Herbert Shildt, "C++ The Complete Reference "TMH Publication ISBN 0-07-463880-7
4. मध्य प्रदेश हिंदी ग्रंथ अकादमी से प्रकाशित विषय से संबंधित पुस्तक
5. R. Lafore, 'Object Oriented Programming C++
6. N. Dale and C. Weems, "Programming and problem solving with C++: brief edition", Jones & Bartlett Learning.
7. Adam Drozdek, "Data Structures and algorithm in C++". Third Edition, Cengage Learning.
8. Sartaj Sahani, "Data Structures, Algorithms and Applications with C++", McGraw Hill.
9. Robert L. Kruse, "Data Structures and Program Design in C++", Pearson.
10. D.S. Malik, "Data Structure using C++", Second edition, Cengage Learning.
11. M. A. Weiss, "Data structures and Algorithm Analysis in C", 2nd edition, Pearson.
12. Lipschutz, "Schaum's outline series Data structures". Tata McGraw-Hill

Suggestive digital platform web links:

1. https://www.youtube.com/watch?v=BCIS40yzssA
2. https://www.youtube.com/watch?v=yLnPwxZdW4Y&vl=en
3. https://www.youtube.com/watch?v=Umm1ZQ5ltZw

Suggested equivalent online courses

S. No.	Online Course	Duration	Platform
1.	Programming in C++ https://nptel.ac.in/courses/106/105/106105151/	8 weeks	NPTEL
2.	Beginning C++ Programming- From Beginner to Beyond https://www.udemy.com/course/beginning-c-plus-plus-programming/	Self placed	Udemy

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PART D: Assessment and Evaluation			
Internal Assessment: Continuous Comprehensive Evaluation (CCE): 30 **Marks**		**External Assessment:** University Exam (UE) – **70 Marks** Time: **02.00 Hours**	
Internal Assessment	**Marks**	**External Assessment**	**Marks**
Hands-on Lab Practice	10 Marks	Practical record file	10 Marks
Mock Viva	5 Marks	Viva voce practical	20 Marks
Lab Test from practical list	7 Marks	Table works/ Exercise Assigned (02) in practical exam	30 Marks
Assignments (Charts/ Models) Technology Dissemination/ Excursion/ Lab visit/ Industrial Training	8 Marks	Reports of excursion/ Lab visits/ Industrial training/ Survey/ Collection/ Models	10 Marks
Total ***Excursion/ Lab visits/ Industrial Training is compulsory**	**30 Marks**	Total	**70 Marks**

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B.Sc. I Semester

Type	Subject Group	Course Code	Course Title	Credit	Total Credit Hours	Lecture Hours Per Week	Max. Marks		Total marks
							External	Internal	
Major	Computer Science	BS-101T-S	Computer System Architecture	4	60	4	70	30	100
	Computer Science	BS-101P-S	Computer Architecture Lab	2	30	2	100		100
Minor	Physics	BS-103T-S	Mechanics and General Properties of Matter	4	60	4	70	30	100
	Physics	BS-103P-S	Mechanics and General Properties of Matter Lab	2	30	2	100		100
Vocational	Management	VO-101T-S	Digital Marketing	2	30	2	70	30	100
	Management	VO-101P-S	Digital Marketing	2	30	2	100		100
	Computer Science	VO-102T-S	Web Designing	2	30	2	70	30	100
	Computer Science	VO-102P-S	Web Designing	2	30	2	100		100
	Personality Development	VO-103T-S	Personality Development	2	30	2	70	30	100
	Personality Development	VO-103P-S	Personality Development	2	30	2	100		100
	Management	VO-104T-S	Retail Management	2	30	2	70	30	100
	Management	VO-104P-S	Retail Management	2	30	2	100		100
	Management	VO-105T-S	Export Import Management	2	30	2	70	30	100
	Management	VO-105P-S	Export Import Management	2	30	2	100		100
	Taxation	VO-106T-S	E-Accounting and Taxation with GST	2	30	2	70	30	100
	Taxation	VO-106P-S	E-Accounting and Taxation with GST	2	30	2	100		100
	Accounts	VO-107T-S	Accounting and Tally Course	2	30	2	70	30	100
	Accounts	VO-107P-S	Accounting and Tally Course	2	30	2	100		100
	Management	VO-108T-S	Financial Services and Insurance	2	30	2	70	30	100
	Management	VO-108P-S	Financial Services and Insurance	2	30	2	100		100
	Management	VO-109T-S	Salesmanship	2	30	2	70	30	100

	Management	VO-109P-S	Salesmanship	2	30	2	100		100
Foundation	Hindi	FC-101-S	Bhasha aur Sanskriti	2	30	2	50		50
	Yogic Science	FC-103-S	Yoga and Meditation	2	30	2	50		50

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B.Sc. II Semester

Type	Subject Group	Course Code	Course Title	Credit	Total Credit Hours	Lecture Hours Per Week	Max. Marks		Total marks
							External	Internal	
Major	Computer Science	BS-102T-S	Programming Methodologies and data Structure	4	60	4	70	30	100
	Computer Science	BS-102P-S	Office Tools & Programming Methodology Lab	2	30	2	100		100
Elective	Management	EL-107T-S	Basics of Business Studies	4	60	4	70	30	100
	Management	EL-107P-S	p	2	30	2	100		100
	Generic English	EL-103T-S	Communicative English	4	60	4	70	30	100
	Generic English	EL-103P-S	Communicative English	2	30	2	100		100
	Physical Education	EL-104T-S	Introduction and Concept of Physical Education	4	60	4	70	30	100
	Physical Education	EL-104P-S	Introduction and Concept of Physical Education	2	30	2	100		100
	Mathematics	EL-110-S	Calculus and Differetial Equations	6	90	6	70	30	100
Foundation	English	FC-102-S	English Language and Indian Culture	2	30	2	50		50
	Environmental Education	FC-104-S	Environmental Education	2	30	2	50		50
Project	Field Work	PR-101A-S	Internship	4	60		100		100
	Field Work	PR-101B-S	Apprenticeship	4	60		100		100
	Field Work	PR-101C-S	Communality Engagement	4	60		100		100
	Project Work	PR-101D-S	Project	4	60		100		100