

Shiv Chhatrapati Shikshan Sanstha's
Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)



**Structure and Curriculum of Four-Year Multidisciplinary
Degree (Honors/Research) Programme with Multiple
Entry and Exit option**

Undergraduate Programme of Science & Technology
B.Sc. (Honors / Research) in Computer Science

**Board of Studies
in
Computer Science**

Rajarshi Shahu Mahavidyalaya, Latur
(Autonomous)

**Rajarshi Shahu Mahavidyalaya,
Latur (Autonomous)**

w.e.f. June, 2023

(In accordance with NEP-2020)

Review Statement

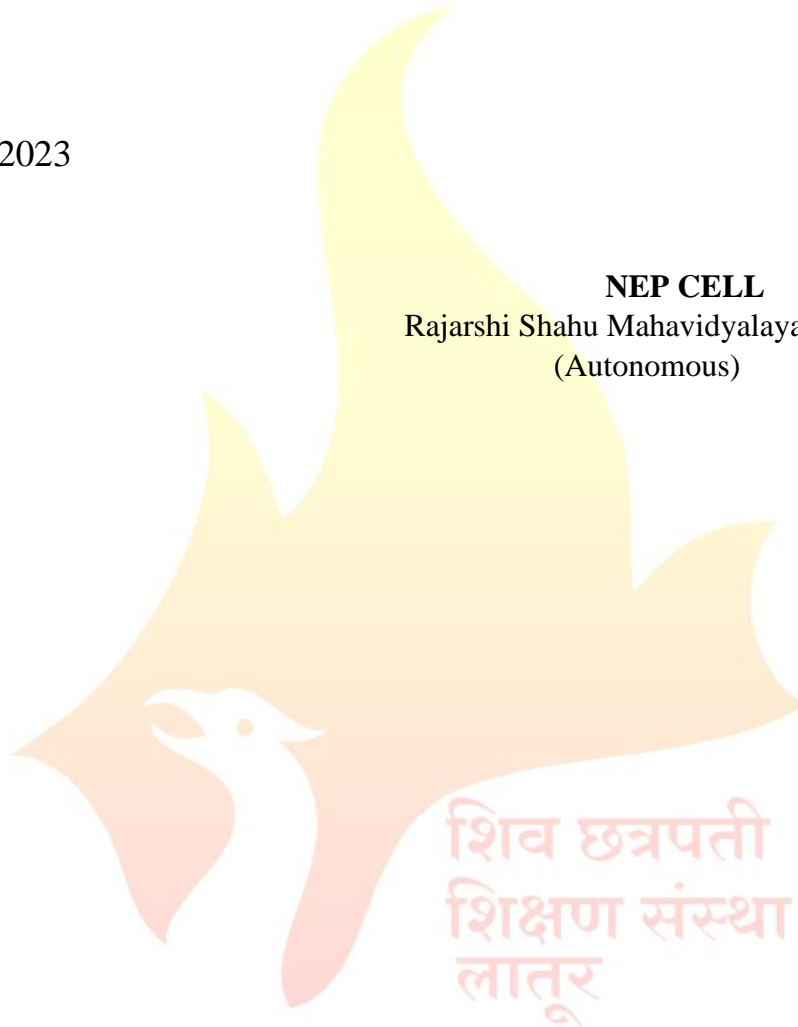
The NEP Cell reviewed the Curriculum of **B. Sc. (Honors/ Research) in Computer Science** Programme to be effective from the **Academic Year 2023-24**. It was found that, the structure is as per the NEP-2020 guidelines of Govt. of Maharashtra.

Date: 09/08/2023

Place: Latur

NEP CELL

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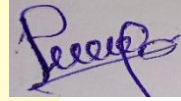
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CERTIFICATE

I hereby certify that the documents attached are the Bonafide copies of the curriculum of **B. Sc. (Honors/Research) in Computer Science** Programme to be effective from the **Academic Year 2023-24**.

Date: 14.07.2023

Place: Latur



(Dr. Renuka R Londhe)
Board of Studies in Computer Science
Rajarshi Shahu Mahavidyalaya, Latur
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Sr. No.	Name	Designation	In position
1	Dr Renuka R. Londhe Head, Department of Computer Science, Rajarshi Shahu Mahavidyalaya (Autonomous), Latur	Chairperson	HoD
2	Dr. Girish Choudhari Professor and Head of Department School of Computational Sciences, SRTMU, Nanded	Member	V.C. Nominee
3	Dr. Ramesh R. Manza Professor, Department of Computer Science and IT, BAMU, Aurangabad	Member	Academic Council Nominee
4	Dr. Shriram Raut Associate Professor Department of Computer Science, PAHU, Solapur	Member	Academic Council Nominee
5	Dr. Poorna Shankar Professor, Indira College of Engineering, Pune	Member	Expert from outside for Special Course
6	Mr N. D. Jagtap Technical Trainer OHI-IITC, Muscat Oman	Member	Expert from Industry
7	Dr. Santosh Shrikhande Assistant Professor, School of Technology, SRTMU Subcenter Latur	Member	P.G. Alumni
8	Mrs. Suchitra K. Kasbe	Member	Faculty Member
9	Mrs. Pooja S. Laturiya	Member	Faculty Member
10	Mr. Arun S. Shinde	Member	Faculty Member
11	Mrs. Sunita M Jadhav	Member	Faculty Member
12	Dr. Mahesh Wavare	Member	Member from same Faculty

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From the Desk of the Chairperson...

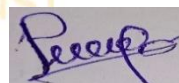
With the tremendous growth of IoT, Data Science, Artificial Intelligence, and Machine Learning technologies over the past ten years, computers have been influencing the future of humanity. Any student taking B.Sc. (Computer Science) program should be able to understand the philosophy, architecture, and mathematics behind the technologies that advance our modern society. The ever-growing discipline of computer science has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular domain. Computer science has a wide range of specialties. These include Computer Programming, Software Systems, Graphics, Artificial Intelligence, Mathematical and Statistical Analysis, Data Science, Computational Science, and Software Engineering.

A real genuine attempt has been made while designing the new curriculum of four-year B.Sc. (Computer Science) program under NEP-2020 by Board of Studies in Computer Science of Rajarshi Shahu Mahavidyalaya, Latur (Autonomous) with an aim to develop the core competence in computing and problem solving amongst its graduates. After successful completion of B.Sc. (Computer Science), students can fetch employment directly in companies as programmer, Web Developer, Software Engineer, Network Administrator, Data Scientist, or AI/ML personnel.

The curriculum focuses on building theoretical foundations in Computer Science to enable its students to think critically when challenged with different and new problems. It includes the learner-centric features of NEP-2020 including Multiple Entry and Multiple Exit, Employability, Flexibility to Choose, Multidisciplinary, Research, Advance Courses, etc.

The BoS in Computer Science believe that any student taking B.Sc. (Computer Science) program will get very strong foundation and exposure to basics, advanced and emerging trends of the subject. The curriculum makes it easier to understand the principles of computer science and offers a platform for the development of abilities like programming, networking, and database management. It also emphasizes the ethics of creating and using new technologies by making compelling arguments in favor of secure computing, user privacy protection, and green computing. The curriculum prepares the students for a career in Software industry and also inspires them towards further studies and research opportunities.

We sincerely thank all of the experts who provided their insightful comments and recommendations in order to improve the contents; we have made every effort to take each of them into consideration.



(Dr. Renuka R Londhe)

Board of Studies in Computer Science



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Faculty of Science and Technology

Structure for Four Year Multidisciplinary Undergraduate Degree Programme in Computer Science Multiple Entry and Exit (In accordance with NEP-2020)

Year & Level	Sem	Major		Minor	GE/OE	VSC/ SEC (VSEC)	AEC/ VEC	OJT,FP,CEP, RP	Credit per Sem.	Cum./Cr. per exit
		DSC	DSE							
1	2	3		4	5	6	7	8	9	10
I 4.5	I	DSC I: 04 Cr. DSC II: 04 Cr.	NA	NA	GE-I: 04 Cr.	VSC-I: 02 Cr. SEC-I: 02 Cr.	AEC-I MIL: 02 Cr. VEC-I: 02 Cr.	CC-I: 02 Cr. (NSS, NCC, Sports, Cultural)/ CEP-I: 02 Cr. (SES-I)/ OJT: 02 Cr. / Mini Project: 02 Cr.	22	44 Cr. UG Certificate
	II	DSCIII: 04 Cr. DSC IV: 04 Cr.	NA	NA	GE-II: 04 Cr.	VSC-II: 02 Cr. SEC-II: 02 Cr.	AEC-II MIL: 02 Cr. VEC-II: 02 Cr.	Generic IKS: 02 Cr.	22	
	Cum. Cr.	16	-	-	08	04+04= 08	04+02 +02=0 8	04	44	
Exit Option: Award of UG Certificate in Major with 44 Credits and Additional 04 Credits Core NSQF Course/Internship or continue with Major and Minor										

Abbreviations:

1. DSC : Discipline Specific Core (Major)
2. DSE : Discipline Specific Elective (Major)
3. DSM : Discipline Specific Minor
4. GE/OE : Generic/Open Elective
5. VSEC : Vocational Skill and Skill Enhancement Course
6. VSC : Vocational Skill Courses
7. SEC : Skill Enhancement Course
8. AEC : Ability Enhancement Course
9. MIL : Modern Indian Languages
10. IKS : Indian Knowledge System
11. FSRCE : Fostering Social Responsibility & Community Engagement
12. VEC : Value Education Courses
13. OJT : On Job Training
14. FP : Field Projects
15. CEP : Community Engagement and Service
16. CC : Co-Curricular Courses
17. RP : Research Project/Dissertation
18. SES : Shahu Extension Services

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Department of Computer Science

B.Sc. (Honors/Research) in Computer Science

Year & Level	Semester	Course Code	Course Title	Credits	No. of Hrs.
I 4.5	I	101COS1101 (DSC-I)	Basics of Computer System	03	45
		101COS1103	Lab Course-I	01	30
		101COS1102 (DSC-II)	Basics of Computer Programming with C	03	45
		101COS1104	Lab Course-II	01	30
		GE-I	From Basket	04	60
		101COS1501 (VSC-I)	WEB Programming-I	02	45
		(SEC-I)	From Basket	02	30
		(AEC-I)	From Basket	02	30
		(VEC-I)	Constitution of India	02	30
		AIPC/OJT-I	Min Project	02	60
	Total Credits			22	
	II	101COS2105 (DSC-III)	Introduction to Python Programming	03	45
		101COS2107	Lab Course-III	01	30
		101COS2106 (DSC-IV)	Data Structure	03	45
		101COS2108	Lab Course-IV	01	30
		GE-II	From Basket	04	60
		101COS2502 (VSC-II)	WEB Programming-II	02	45
		(SEC-II)	From Basket	02	30
		(AEC-II)	From Basket	02	30
		(VEC-II)	FSRCE (CBPR)	02	30
		Generic IKS	Introduction to Indian Knowledge System	02	60
	Total Credits			22	
Total Credits (Semester I & II)				44	



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Faculty of Science & Technology

Programme Outcomes (POs) for B.Sc. Programme	
PO 1	
PO 2	
PO 3	
PO 4	
PO 5	
PO 6	
PO 7	



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Programme Specific Outcomes (PSOs) for B.Sc. Computer Science (Honors/Research)	
PSO No.	Upon completion of this programme the students will be able to
PSO 1	Acquire knowledge on basics of Computer Science and ability to apply to design principles in the development of solutions for problems of varying complexity
PSO 2	Identify skills required to program a computer for various issues and problems of day-to-day applications with thorough knowledge on programming languages of various levels.
PSO 3	Relate a sound knowledge on computer application software and ability to design and develop app for applicative problems.
PSO 4	Demonstrate professional ethics to maintain the integrality in a working environment and also have concern on societal impacts due to computer-based solutions for problems.
PSO 5	Become an independent learner. So, learn to learn ability.
PSO 6	Inspiration to continue educations towards advanced studies on Computer Science.
PSO 7	Apply standard Software Engineering practices and strategies in real -time software project development
PSO 8	Apply the knowledge and understanding noted above to the analysis of a given information handling problem.
PSO 9	Work independently on a substantial software project and as an effective team member



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Department of Computer Science

Course Type: DSC I

Course Title: Basics of Computer System

Course Code: 101COS1101

Credits: 03

Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To describe the basics of computer system, its architecture, software and Networks.
- LO 2. To memorize the basic concepts, terminology of IT and familiar with the use of IT tools.
- LO 3. To Discuss functioning of computer components
- LO 4. To develop a vocabulary of key terms related to the computer and to software program
- LO 5. To express the role of operating system in computer system and applications of computer networks

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Identify the components of a personal computer system.
- CO 2. Describe Input/output unit functions.
- CO 3. Demonstrate window and menu commands and how they are used
- CO 4. Use internet for navigate and search the information and communicate with the people
- CO 5. Describe FTP, TCP/IP, HTTP and usage of Internet

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Computers and Data Representation	12
	Introduction Basic structure-ALU, Memory, CPU, I/O devices Generations of computer, Evolution of computer Classification of computers: Notebook computers, personal computers, Workstation, micro, mini, mainframe, super computers, Computer Codes. Introduction to number system: Decimal, Binary, Octal, Hexadecimal. Conversions: Binary Arithmetic, Floating point numbers.	
	Unit Outcomes: UO 1. Outline the basic structure of computer system. UO 2. Perform binary conversions and operations.	

II	Input / Output Devices and Memory	10
	<p>Input Devices: Keyboard, Point & Draw Devices, Data Scanning Devices, Digitizer, Electronic Card Reader, Voice Recognition Devices. Output Devices: Monitor, Printer, Plotter, Screen Image Projector, Voice Response System.</p> <p>Memory: RAM, ROM, PROM, EPROM, EEPROM Base Memory, Extended Memory, Expanded Memory, Cache Memory</p> <p>Storage Devices: Tape, FDD, HDD, CD ROM</p> <p>Unit Outcome: UO 1. Recognize the I/O devices and usage of it. UO 2. Memorize computer Memory and its types</p>	
III	Computer Software and Introduction to OOPs	13
	<p>Definition of Software, Types of Software Operating System: Main function of operating system, Files and Directories, Types of OS, Introduction to DOS, Introduction to Windows, Computer Languages- Structured Programming, Basics of OOPs</p> <p>Unit Outcomes: UO 1. Distinguish system software and application software. UO 2. Practice on DOS & Windows Operating System Platforms.</p>	
IV	Computer Networks and Introduction to Internet	10
	<p>Definition of computer network Network types: LAN, MAN and WAN Network Topologies: Star, Ring, Hybrid Network Wireless Networks, Different Search Tools, Web Browsers, Definition, Uses of Internet Basic Services: Electronic mail, File Transfer Protocol, Telnet</p> <p>Unit Outcomes: UO 1. State the terminology of Computer Networks UO 2. Explain FTP, TCP/IP, HTTP and usage of Internet</p>	

Learning Resources:

1. Computer Fundamentals, P. K. Sinha, BPB Publications
2. Fundamental of Computers, E Balaguru Swamy, TataMc- Graw Hill Publishing Co. Ltd.- New Delhi
3. Computer Fundamentals, Ankita Goel, Pearson Publications
4. Fundamentals of Computer Science, V. Rajaraman and N. Adabala, Prentice Hall India Learning Private Limited Publications
5. DOS: Disk Operating System, Dr Suhas Rode
6. Networking Essentials, Jeffery S Beasley, Pearson Publications
7. Windows Operating System Fundamentals, Crystal Panek, Publisher(s): Sybex 2019
8. <https://www.geeksforgeeks.org/basics-computer-networking/>
9. https://mycsvtunotes.weebly.com/uploads/1/0/1/7/10174835/computer_fundamental_complete-i.pdf
10. <https://www.w3schools.com/c/index.php>



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Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course –I (Based on DSC-I)

Course Code: 101COS1103

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives

- LO 1. To learn the working knowledge of hardware and software of computer.
- LO 2. To learn the basic concepts of DOS Operating System.
- LO 3. To practice the various features of Windows O.S.
- LO 4. To practice the various features of MS Office
- LO 5. To analyze the data in excel

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Execute DOS commands and create batch file.
- CO 2. Demonstrate how to organize files and documents on a USB/hard drive.
- CO 3. Compose, format and edit a word document
- CO 4. Analyze data in excel
- CO 5. Use Google drive

Practical No.	Unit
1	Introduction to DOS, Booting Process, Use of Internal DOS commands.
2	Creating a directory & file structure in DOS
3	Study of external DOS Commands
4	Study of creation of batch file.
5	Introduction to Windows Operating System with Installation of Windows
6	Study of File operations using windows explorer
7	Study of MS –Word 2019.
8	Study of MS- Power Point 2019.
9	Study of MS-Excel 2019.
10	Basic study of Networking (LAN, MAN, WAN, Creating & Accessing Shared Printer, Folders etc.)
11	Practical on use of Internet (Creating email account, sending and receiving emails, using effective use of Google drive.)



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Department of Computer Science

Course Type: DSC-II

Course Title: Basics of Computer Programming with C Language

Course Code: 101COS1102

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives

- LO 1. To develop Problem Solving abilities using computers
- LO 2. To describe basic principles of programming Languages
- LO 3. To apply skills for writing simple programs using 'C'
- LO 4. To design structured programs
- LO 5. To construct C Programs using arrays, structure and unions

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Develop and modify an algorithmic and flowchart-based solution for a given problem.
- CO 2. Write a maintainable C program using conditional and control statements.
- CO 3. Apply Skills to write and use user-defined functions in C Programming.
- CO 4. Use pointers for file handling in C Programming and various storage classes.
- CO 5. Develop Programs using arrays, functions and pointers in C Language.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Programming	10
	Algorithm – Definition, Characteristics, Space Complexity, Time Complexity, Problem Solving and Writing Simple Algorithms Flow Chart and Its Symbol, Problem Solving with Flowchart Compilers and Interpreters, Keywords, Identifiers, Variables Constants – Character, Integer, Float, String, Escape Sequences Data Types – Built-In and User Defined, Operators And Expressions, Operator Types, Simple Programs Using printf () and scanf ()	
	Unit Outcome: UO 1. Develop algorithms and draw flow charts for problem solving. UO 2. Define datatypes in C Language	
II	Control, Loop Control and Array Handling	12
	Conditional statements, Looping Statements Introduction to Array- Declaration and Initialization of Arrays, Accessing Array Elements, Memory Representation of Array, Arrays and Its Types, String Handling Functions.	
	Unit Outcome: UO 1. Write programs using conditional statements	

Unit No.	Title of Unit & Contents	Hrs.
	UO 2. Write programs using looping statements	
III	Functions, Structure and Union	13
	Types of functions, defining functions, Arguments Function prototype, calling function, returning function results, Call by value and call by reference, Recursion, Introduction to Structure - Declaration of structure, Accessing Structure Elements, Array of Structures. Introduction to Union: Declaration of Union Accessing Union Elements, how union elements are stored Unit Outcomes: UO 1. Explain functions in Programming. UO 2. Define and use user defined datatypes in Programming	
IV	Storage Classes, Pointers and File Management In C	10
	Types of Storage classes, Introduction to Pointers, Pointer declaration, Initialization, Dereferencing pointers, Pointer arithmetic, Pointer to pointer, Arrays and pointers. Defining and opening a file - closing file I/O operations on files Error handling during I/O operations, Random access to files Command line arguments Unit Outcome: UO 1. Define and use various storage class required for programming. UO 2. Handle files in C programming	

Learning Resources:

1. Let Us C, Yashwant Kanetkar , BPB Publications
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, PHI Learning
3. Computer Fundamentals, P. K. Sinha, BPB Publications
4. Programming in ANSI C, E. Balaguruswamy, TataMc- Graw Hill Publishing Co.Ltd.- New Delhi
5. How To Solve It by Computer, R G Dromey, PHI Series in Computer Science.
6. Programming in C, Ashok N. Kamthane, Dorling Kindersley (India), 2011
7. C programming language, Brian Kernighan Dennis Ritchie, Prentice Hall
8. <http://pdvpmtasgaon.edu.in/uploads/dptcomputer/Let%20us%20c%20-%20yashwantkanetkar.pdf>
9. <https://www.w3schools.com/c/index.php>
10. <https://www.cprogramming.com/tutorial/c-tutorial.html>

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Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course –II (Based on DSC-II)

Course Code: 101COS1104

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives

- LO 1. To write and execute the simple programs in 'C' language.
- LO 2. Learn array processing algorithms coupled with iterative methods.
- LO 3. Develop the skills for formulating iterative solutions to a problem.
- LO 4. Learn searching techniques and use of pointers.
- LO 5. Understand recursive techniques in programming.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Write and execute simple programs in 'C' language.
- CO 2. Create Various Patterns / designs using control & looping statements.
- CO 3. Implement single & multi - dimensional arrays in C
- CO 4. Handle the various file operations in C
- CO 5. Implement recursive functions

Practical No.	Unit
1	Program to understand Control Statements
2	Program to understand Looping Statements (Entry Control & Exit Control)
3	Program to understand various header files in C
4	Program to understand Arrays in C language
5	Program to understand string handling
6	Program to understand Functions in C language
7	Argument Passing Call by Value & call by reference
8	Recursive function
9	Program to understand Structure & Union in C language
10	Program to understand storage classes in C language
11	Program to understand pointers in C language



Rajarshi Shahu Mahavidyalaya, Latur

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Department of Computer Science

Course Type: VSC-I

Course Title: Web Programming 1

Course Code: 101COS1501

Credits: 02

Max. Marks: 50

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To Create static web sites using HTML5, CSS3
- LO 2. To Create Responsive web pages with form validation
- LO 3. Effective Use of Visual Studio Code editor
- LO 4. Effective use of CSS3 to define styles
- LO 5. To construct and modify websites

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Design basic programming structures to implement functionality for web page designing.
- CO 2. Develop static websites.
- CO 3. Modify code of website
- CO 4. define styles for web pages, including the design, layout and variations in display for different devices and screen sizes
- CO 5. Develop websites independently

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Web & HTML5	8
	World Wide Web, Web browser, Website & Web Page Structure of HTML documents Basic Tags: HTML, HEAD, TITLE, BODY Use of Formatting tags List & Types of Lists Creating HyperLinks	
	Unit Outcomes: UO 1. Outline the Structure of Webpage and Website UO 2. Apply the practical knowledge of various HTML tags to create web pages	
II	Working with Tables & Forms	7
	Creating tables with all table formatting & attribute, rowspan & colspan, cell spacing & padding, tag, creating user forms, creating basic forms using check boxes and radio buttons, creating lists, additional input types in HTML5 incorporating sound and video, Audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page, Image Mapping.	

	Unit Outcomes: UO 1. Create tables and forms in HTML UO 2. Embedding & incorporating audio on web	
III	Basics of CSS3 and Web Designing with CSS3	10
	Introduction to CSS and Syntax, Types of CSS, Identification and grouping of elements, Components of CSS: selectors, colors, background, fonts, text, links, lists, tables. CSS Box model: Margin, Padding, Border, height and width, floating elements, CSS display: positioning of elements, align, dropdowns, navigation bar, counters, Image gallery. Development of small website with the use of above contents	
	Unit Outcome: UO 1. Memorize the basics of CSS & its syntax UO 2. Apply the styles of CSS to create web pages	
IV	Practical	20
	Development of Website using HTML and CSS	
	Unit Outcomes: UO 1. Develop and deploy website	

Learning Resources:

1. The Complete Reference HTML & CSS, Thomas A Powell, TataMc- Graw Hill Publishing Co. Ltd.-New Delhi
2. HTML5 Black Book, DT Editorial Services
3. Web Technologies: Html, Javascript, Php, Java, Jsp, Xml, And Ajax, Black Book, Kognet Learning Solutions Dreamtech Press.
4. Responsive Web Design with HTML5 and CSS: Develop future-proof responsive websites using the latest HTML5 and CSS techniques, Ben Frain, Packt
5. Mastering HTML, CSS & Java Script Web Publishing, Laura Lemay, Rafe Colburn, BPB Publications
6. Wen Design a Practical Approach, Abhishek R. Mehata, Notion Press
7. <https://www.javatpoint.com/html5-tutorial>
8. <https://www.geeksforgeeks.org/html5-introduction/>
9. <https://www.w3schools.com/html/default.asp>
10. <https://www.w3schools.com/css/default.asp>

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Department of Computer Science

Course Type: DSC III

Course Title: Introduction to Python Programming

Course Code: 101COS2105

Credits: 03

Marks: 75

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To acquire programming skills in core Python.
- LO 2. To be aware about the data types, looping structure.
- LO 3. To be able to know the use of string, lists, dictionary and tuples.
- LO 4. To learn the concepts of Exception handling and file handling.
- LO 5. To acquire Object Oriented Skills in Python.
- LO 6. To use Graphical User Interface for the application development.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Write python programs that use strings, lists, tuples and dictionaries.
- CO 2. Demonstrate the concepts of Object-Oriented Programming using python programs.
- CO 3. Write python programs that stores and manipulates data using file handling functions.
- CO 4. Develop Windows applications with Graphical User Interface.

Unit No.	Title of Unit & Contents	Hrs.
I	Getting Started	12
	Introduction, History, important features, overview of python and installation, Lexical Matters: Variables, Comments, Names and Tokens, Doc Strings, Simple Program, Identifiers, Reserved Words, Multi-Line Statements, Operators, Numbers (int, long, float and complex), Strings. Decision and Looping Statements, Introduction to decision statement- If Statement, if—else statement, if-elif-else statement. Introduction to Looping statement- while loop, for loop, nesting of loop, break, continue and pass statement.	
	Unit Outcomes: UO 1. Define variables of various datatypes in Python UO 2. Able to write Python programs using conational & control statements	
II	Sequence: String, List, Tuples and Error, exception	10
	Strings, Strings and Operators, String Built-in methods, Lists, List type built-in method, Tuples, Special features of Tuples, Dictionary, what are exceptions? exceptions in Python, Detecting and handling	

Unit No.	Title of Unit & Contents	Hrs.
	exceptions, raising exception, Assertions, Standard exceptions, creating exceptions. Unit Outcome: UO 1. Able to handle strings & string operations in Python. UO 2. Write python programs that use strings, lists, tuples and dictionaries	
III	Functions, Class and OOPs	13
	What are functions? calling functions, creating functions, passing functions, formal arguments, positional arguments, default arguments, variable length argument, recursion, Introduction to OOP, Classes, Class attributes, Instances, Instance attribute, building and Method of invocation, Sub classing and derivation, Inheritance, Built-in functions for classes, instances and other objects privacy Unit Outcomes: UO 1. Demonstrate the concepts of Object-Oriented Programming using python programs UO 2. Write programs using class objects & functions.	
IV	Graphical Interfaces	10
	Graphical user interfaces, event-driven programming paradigm, tkinter module, creating simple GUI, button, labels, entry, dialogs, widget attribute – sizes, fonts, color layouts, nested frames. Unit Outcomes: UO 1. Use Tkinter for GUI UO 2. Write applications with GUI components	

Learning Resources:

1. Core Python Programming- Dr. R Nageswara Rao (Dreamtech Press)
2. Learning Python- Mark Lutz, O'Reilly, 5th edition.
3. Starting Out with Python plus My Programming Lab- Tony Gaddis, Pearson
4. Programming in Python 3 A Complete Introduction to the Python Language
5. Mastering Python Rick van Hattem
6. The Big Book of Small Python Projects: 81 Easy Practice Programs Al Sweigart
7. A Python Book: Beginning Python, Advanced Python, and Python Exercises By Dave Kuhlman · 2011
8. The Python Book. The Ultimate Guide to Coding with Python.

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Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course –I (Based on DSC-III)

Course Code: 101COS2107

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives:

- LO 1. To acquire programming skills in core Python.
- LO 2. To be aware about the data types, looping structure.
- LO 3. To be able to know the use of string, lists, dictionary and tuples.
- LO 4. To learn the concepts of Exception handling and file handling.
- LO 5. To acquire Object Oriented Skills in Python.
- LO 6. To use Graphical User Interface for the application development.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Write python programs that use strings, lists, tuples and dictionaries.
- CO 2. Demonstrate the concepts of Object-Oriented Programming using python programs.
- CO 3. Write python programs that stores and manipulates data using file handling functions.
- CO 4. Develop Windows applications with Graphical User Interface.

Practical No.	Unit
1	Program to demonstrate Datatypes
2	Program to demonstrate branching & Looping statement
3	Program to demonstrate Method & Functions of String
4	Program to demonstrate Method & Functions of List
5	Program to demonstrate Method & Functions of Tuple
6	Program to demonstrate Method & Functions of Dictionary
7	Program to demonstrate function a) Scope of variable b) Types of arguments c) Recursive Function
8	Program to demonstrate class and object a) Types of variables b) Types of Methods
9	Program to demonstrate Constructor & Destructor
10	Program to demonstrate inheritance a) Types of Inheritance b) Method / Constructor Overriding c) Super()
11	Program to demonstrate GUI a) tkinter module b) root window



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Department of Computer Science

Course Type: DSC-IV

Course Title: Data Structure

Course Code: 101COS2105

Credits: 03

Max. Marks: 75

Lectures: 45 Hrs.

Learning Objectives

- LO 1. To provide the students with solid foundations in the basic concepts of programming: data structures and algorithms.
- LO 2. To understand basic computational concepts and elementary data structures.
- LO 3. To translate well-structured plans into working programs.
- LO 4. To analyze simple problems involving text and numbers.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Implement Arrays and Link-list for representation of Data.
- CO 2. Understand how several fundamental algorithms work particularly those concerned with Stack, Queues, Trees and various Sorting algorithms.
- CO 3. Design new algorithms or modify existing ones for new applications and able to analyze the space and time efficiency of most algorithms.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Data Structure and Arrays	10
	Definition, Classification of Data Structure: Primitive and non-primitive. Operations of Data Structures, Introduction to arrays, Representation of Array in Computers Memory Array Operations: Traversing, Insertion, Deletion, Searching, Sorting	
	Unit Outcome: UO 1. Identify and classify different types of data structures, including primitive and non-primitive data structures. UO 2. Understand the operations of data structures and their importance in computer science.	
II	Linked List	13
	Definition, Components of Linked List, Representation of Linked List in Computers Memory Advantages and Disadvantages of Linked List Types Of Linked List: Singly Linked List, Doubly Linked List, Circular Linked List and Circular Doubly Linked List. Operations On Singly Linked List: Creation, Insertion, Deletion, Search and Display	
	Unit Outcome: UO 1. Understand the concept of a linked list and its components, and be able to represent a linked list in computer memory.	

Unit No.	Title of Unit & Contents	Hrs.
	UO 2. Evaluate the advantages and disadvantages of using a linked list as a data structure in different scenarios.	
III	Stack and Queue	12
	<p>Stack - Definition of Stack, Array Representation of Stack Operations on Stack- PUSH And POP</p> <p>Queue - Definition of Queue, Types of Queues: Simple Queue, Circular Queue, Double Ended Queue (Deque) Priority Queue, Operations on Queue-Insertion and Deletion, Tower of Hanoi Problem.</p> <p>Unit Outcomes:</p> <p>UO 1. Understand the concept of a stack and its components, and be able to represent a stack in computer memory using an array.</p> <p>UO 2. Evaluate the advantages and disadvantages of using a stack as a data structure in different scenarios, and identify when to use a stack over other data structures.</p>	
IV	Tree and Graph	10
	<p>Definition: Tree, Binary tree, complete binary tree, Binary search tree, Traversal of Binary Tree: Preorder, Inorder and Postorder. Graphs - Terminology Representation of Graph, Graph Traversals (DFS And BFS)</p> <p>Unit Outcome:</p> <p>UO 1. Understand the concept of a tree and its components, and be able to represent a binary tree and complete binary tree in computer memory using arrays or linked structures.</p> <p>UO 2. Evaluate the advantages and disadvantages of using a binary search tree as a data structure in different scenarios, and identify when to use a binary search tree over other data structures.</p>	

Learning Resources:

1. Data Structure Using C, Yashwant Kanetkar, BPB Publication
2. Data Structures Using C, Tenenbaum
3. Data Structure, Seymour Lipschutz Outline Series
4. Data Structures and Algorithms using C , R. S. Salaria Khanna Book Publications
5. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, Career Monk
6. Data Structures And Algorithms In C & Python, Chandan Banerjee Atanu Das, Universities Press
7. Indian Knowledge Systems: Vol. 2 , Kapil Kapoor (Author), Awadhes Kumar Singh (Author), D.K. Print World Ltd
8. <https://www.geeksforgeeks.org/data-structures/>
9. <https://www.programiz.com/dsa>



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Department of Computer Science

Course Type: Lab Course

Course Title: Lab Course –IV (Based on DSC-IV)

Course Code: 101COS2108

Credits: 01

Max. Marks: 50

Hours: 30

Learning Objectives

- LO 1. To provide the students with solid foundations in the basic concepts of programming: data structures and algorithms.
- LO 2. To understand basic computational concepts and elementary data structures.
- LO 3. Develop the skills for formulating iterative solutions to a problem.
- LO 4. To analyze simple problems involving text and numbers.

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Implement Arrays and Link-list for representation of Data.
- CO 2. Understand how several fundamental algorithms work particularly those concerned with Stack, Queues, Trees and various Sorting algorithms.
- CO 3. Design new algorithms or modify existing ones for new applications and able to analyze the space and time efficiency of most algorithms

Practical No.	Unit
1	Program for traversing an array
2	Program for searching an element in an array
3	Program for sorting array elements
4	Program for inserting & deleting elements from an array
5	Program for stack implementation
6	Program for queue implementation
7	Program for implementation of Linked List
8	Program for searching from Linked List
9	Program for sorting Linked List
10	Program for implementation of dequeue

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Department of Computer Science

Course Type: VSC-II

Course Title: Web Programming II

Course Code: 101COS1502

Credits: 02

Max. Marks: 50

Lectures: 45 Hrs.

Learning Objectives:

- LO 1. To Create dynamic web sites using HTML5, CSS3 & JavaScript
- LO 2. To Create Responsive web pages with grid layout
- LO 3. To Create mobile-friendly website
- LO 4. Effective use of HTML & CSS with JavaScript
- LO 5. To Utilize HTML5, CSS3, and JavaScript to build a functional and visually appealing website

Course Outcomes:

After completion of the course, students will be able to-

- CO 1. Design Responsive Web pages with HTML5, CSS3 & JavaScript
- CO 2. Apply JavaScript to manipulate the Document Object Model (DOM) and handle user events on the website.
- CO 3. Design user-friendly interfaces and incorporate usability testing and accessibility considerations.
- CO 4. Create a comprehensive web design project using HTML5, CSS3, and JavaScript, with a focus on responsive design

Unit No.	Title of Unit & Contents	Hrs.
I	Advanced CSS3 Techniques	8
	Responsive Web Design Media queries Flexbox and Grid layout CSS transitions and animations Creating a mobile-friendly website Using CSS preprocessors such as SASS or LESS Implementing a CSS framework like Bootstrap or Foundation	
	Unit Outcomes: UO 1. Create responsive web design UO 2. Creating mobile friendly websites	
II	JavaScript for Web Designers	7
	Introduction to JavaScript Basic JavaScript syntax Working with variables, data types, and operators Control structures: loops and conditional statements DOM manipulation with JavaScript	

	Event handling and form validation AJAX and JSON	
	Unit Outcomes: UO 1. Apply JavaScript to manipulate the Document Object Model UO 2. Apply JavaScript to handle user events on the website.	
III	Web Design Principles and User Experience	10
	Understanding design principles such as balance, contrast, emphasis, and rhythm, Color theory and typography in web design, User interface and user experience design , Usability testing and accessibility considerations, Incorporating design trends and best practices	
	Unit Outcomes: UO 1. Able to test web pages UO 2. Able design trends and best practices	
IV	Web Design Project	20
	Planning and creating a comprehensive web design project Utilizing HTML5, CSS3, and JavaScript to build a functional and visually appealing website Incorporating responsive design techniques Testing and debugging the website Deploying the website to a web server	
	Unit Outcomes: UO 1. Plan and create a comprehensive web design project UO 2. Testing & debugging the website.	

Learning Resources:

1. Web Design with HTML, CSS, JavaScript and jQuery Set" by Jon Duckett
2. Responsive Web Design with HTML5 and CSS3" by Ben Frain
3. CSS3: Visual QuickStart Guide" by Jason Cranford Teague
4. CSS Grid Layout: A Quick Start Guide" by Eric Meyer
5. JavaScript and JQuery: Interactive Front-End Web Development" by Jon Duckett
6. Eloquent JavaScript: A Modern Introduction to Programming" by Marijn Haverbeke
7. JavaScript: The Good Parts" by Douglas Crockford
8. <https://alistapart.com/>
9. <https://css-tricks.com/>
10. <https://developer.mozilla.org/en-US/docs/Web/JavaScript>
11. <https://www.nngroup.com/>

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UG First Year

Basket I: Generic/Open Elective (GE/OE)

(GEs offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing GE/OE	Code	Course Title	Credits	Hrs.
1	Commerce	101AAF1401	Mutual Fund Management	04	60
2	Commerce	101MAE1401	Fundamentals of Statistics	04	60
3	English	101ENG1402	English for Science and Technology	04	60
4	Geography	101GEO1401	General Geography	04	60
5	Commerce	101BAI1401	Personal Financial Management	04	60
6	Marathi	101MAR1401	स्पर्धा परीक्षा आणि मराठी भाषा	04	60
7	Political Science	101POL1401	Human Rights	04	60
8	Biotechnology	101BIO1401	Nutrition, Health and Hygiene	04	60
9	Music	101MUS1401	Indian Vocal Classical & Light Music	04	60
10	NCC Studies	101NCC1401	Introduction to NCC	04	60
11	Sports	101SPO1401	Counseling and Psychotherapy	04	60

Note: Student can choose any one GE from the basket

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Basket II: Skill Enhancement Courses (SEC)

(SEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing SEC	Code	Course Title	Credits	Hrs.
1	Chemistry	101CHE1601	Pesticides and Green Chemistry	02	30-45
2	Information Technology	101COM1601	Basics of Python Programming	02	30-45
3	Physics	101PHY1601	Physics Workshop Skills	02	30-45
4	Biotechnology	101BIO1601	Food Processing Technology	02	30-45
5	Botany	101BOT1601	Mushroom Cultivation Technology	02	30-45
6	English	101ENG1601	Proof Reading and Editing	02	30
7	Information Technology	101COA1601	PC Assemble and Installation	02	30-45
8	Marathi	101MAR1601	कथा/पटकथालेखन	02	30
9	Zoology	101ZOO1601	Bee Keeping	02	30-45

Note: Student can choose any one SEC from the basket

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Basket III: Ability Enhancement Courses (AEC)

(AEC offered to the Science & Technology students in Sem.-I)

Sr. No.	BoS Proposing AEC	Code	Course Title	Credits	Hrs.
1	Marathi	101MAR7101	भाषिक कौशल्य भाग - १	02	30
2	Hindi	101HIN7101	हिंदी भाषा शिक्षण भाग - १	02	30
3	Sanskrit	101SAN7101	व्यावहारीक व्याकरण व नितिसुभाषिते	02	30
4	Pali	101PAL7101	उपयोजित व्याकरण	02	30

Note: Student can choose any one AEC from the basket.



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UG First Year

Extra Credit Activities

Sr. No.	Course Title	Credits	Hours T/P
1	MOOCs	Min. of 02 credits	Min. of 30 Hrs.
2	Certificate Courses	Min. of 02 credits	Min. of 30 Hrs.
3	IIT Spoken Tutorial Courses	Min. of 02 credits	Min. of 30 Hrs.

Guidelines:

Extra -academic activities

1. All extra credits claimed under this heading will require sufficient academic input/contribution from the students concerned.
2. Maximum 04 extra credits in each academic year will be allotted.
3. These extra academic activity credits will not be considered for calculation of SGPA/CGPA but will be indicated on the grade card.

Additional Credits for Online Courses:

1. Courses only from SWAYAM and NPTEL platform are eligible for claiming credits.
2. Students should get the consent from the concerned subject Teacher/Mentor/Vice Principal and Principal prior to starting of the course.
3. Students who complete such online courses for additional credits will be examined/verified by the concerned mentor/internal faculty member before awarding credits.
4. Credit allotted to the course by SWAYAM and NPTEL platform will be considered as it is.

Additional Credits for Other Academic Activities:

1. One credit for presentation and publication of paper in International/National/State level seminars/workshops.
2. One credit for measurable research work undertaken and field trips amounting to 30 hours of recorded work.
3. One credit for creating models in sponsored exhibitions/other exhibits, which are approved by the concerned department.
4. One credit for any voluntary social service/Nation building exercise which is in collaboration with the outreach center, equivalent to 30 hours
5. All these credits must be approved by the College Committee.

Additional Credits for Certificate Courses:

1. Students can get additional credits (number of credits will depend on the course duration) from certificate courses offered by the college.
2. The student must successfully complete the course. These credits must be approved by the Course Coordinators.
3. Students who undertake summer projects/ internships/ training in institutions of repute through a national selection process, will get 2 credits for each such activity. This must be done under the supervision of the concerned faculty/mentor.

Note:

1. The respective documents should be submitted within 10 days after completion of Semester End Examination.
2. No credits can be granted for organizing or for serving as office bearers/ volunteers for Inter-Class / Associations / Sports / Social Service activities.
3. The office bearers and volunteers may be given a letter of appreciation by the respective staff coordinators. Besides, no credits can be claimed for any services/activities conducted or attended within the college.
4. All claims for the credits by the students should be made and approved by the mentor in the same academic year of completing the activity.
5. Any grievances of denial/rejection of credits should be addressed to Additional Credits Coordinator in the same academic year.
6. Students having a shortage of additional credits at the end of the third year can meet the Additional Credits Coordinator, who will provide the right advice on the activities that can help them earn credits required for graduation.



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Examination Framework

Theory:

40% Continuous Assessment Tests (CATs) and 60% Semester End Examination (SEE)

Practical:

50% Continuous Assessment Tests (CATs) and 50% Semester End Examination (SEE)

Course	Marks	CAT & Mid Term Theory				CAT Practical		Best Scored CAT & Mid Term	SEE	Total
1	2	3				4		5	6	5 + 6
		Att.	CAT I	Mid Term	CAT II	Att.	CAT			
DSC/DSE/GE/OE/Minor	100	10	10	20	10	-	-	40	60	100
DSC	75	05	10	15	10	-	-	30	45	75
Lab Course/AIPC/OJT/FP	50	-	-	-	-	05	20	-	25	50
VSC/SEC/AEC/VEC/CC	50	05	05	10	05	-	-	20	30	50

Note:

1. All Internal Exams are compulsory
2. Out of 02 CATs best score will be considered
3. Mid Term Exam will be conducted by the Exam Section
4. Mid Term Exam is of Objective nature (MCQ)
5. Semester End Exam is of descriptive in nature (Long & Short Answer)
6. CAT Practical (20 Marks): Lab Journal (Record Book) 10 Marks, Overall Performance 10 Marks.

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