Affiliated to

University of Mumbai

R. P. Gogate College of Arts & Science and

R. V. Jogalekar College of Commerce, Ratnagiri

(Autonomous)

**Bachelor of Science (Computer Science) (B.Sc. CS)
Programme Four Year Integrated Programme-
Eight Semesters**

Course Structure

Under Choice Based Credit System (CBCS)

**To be implemented from Academic Year 2023-2024
Progressively**

Preamble

The restructured curriculum for the First year computer science is systematically designed considering the National Education Policy (NEP) along with the Autonomy constraints.

The rise of Information and Communication Technology (ICT) has profoundly affected modern society. Increasing applications of computers in almost all areas of human endeavor has led to vibrant industries with concurrent rapid change in technology.

As the computing field advances at a rapid pace, the students must possess a solid foundation that allows and encourages them to maintain relevant skills as the field evolves. Specific languages and technology platforms change over time. Thus students must continue to learn and adapt their skills throughout their careers. To develop this ability, students will be exposed to multiple programming languages, tools, paradigms and technologies as well as the fundamental underlying principles throughout this programme.

The core philosophy of this programme is to –
   o   Form strong foundations of Computer Science
   o   Nurture programming, analytical & design skills for the real world problems.
   o   Introduce emerging trends to the students in a gradual way.
   o   Groom the students for the challenges of ICT industry

The students these days not only aspire for a career in the industry but also look for research opportunities. The main aim of this programme is to deliver a modern curriculum that will equip graduates with strong theoretical and practical backgrounds to enable them to excel in the workplace and to be lifelong learners. Not only does it prepare the students for a career in the Software industry, it also motivates them towards further studies and research opportunities. In the first year i.e. for semester I & II, the basic foundation of important skills required for software development is laid. The syllabus proposes to have two major courses of Computer Science and one minor course of Applied Mathematics. All major subjects are to have theory as well as practical tracks. While the Computer Science courses will form fundamental skills for solving computational problems, the Applied Mathematics allows students to develop the use of quantitative methods in thinking about and solving problems.

Courses on Value Education plays an important role in helping individuals carry out social, moral, and democratic obligations. The main purpose of Skill Enhancement courses is to provide students with life-skills in the hands-on mode to increase their employability. The purpose of Ability Enhancement Course is to introduce students to the theory, fundamentals and tools of communication and to develop vital communication skills in them which should be integral to personal, social and professional interactions. Vocational and Skill Enhancement Courses like web designing and Linux focuses on developing technical skills in Computer Science. Indian Knowledge System courses focuses on the evolution of computer and the computing environment in technology. Open Elective courses are offered to construct basic diluted structure of computer science.

We sincerely believe that any student enrolling in this programme will get very strong foundation and exposure to basics, advanced and emerging trends of the subject.

We wholeheartedly thank all experts who shared their valuable feedbacks and suggestions in order to improvise the contents; we have sincerely attempted to incorporate each of them. We further thank Chairperson and members of Board of Studies for their confidence in us.

Special thanks to Department of Computer Science and colleagues from various colleges, who volunteered or have indirectly, helped designing certain specialized courses and the syllabus as a whole.

The performance of the learners shall be evaluated into two parts. The learner's performance shall be assessed by Internal Assessment with 40% marks in the first part and by conducting the Semester End Examinations with 60% marks in the second part.

Name of Programme	**BACHELOR OF SCIENCE (B.Sc.)(Computer Science)**
Level	Under Graduate
No of Semesters	06
Year of Implementation	**2023-24**
Programme Specific Outcomes (PSO)	1. To formulate, model, design solutions, procedure and to use software tools to solve real world problems. 2. To design and develop computer programs/computer - based systems in the areas such as networking, web design, security, cloud computing, IoT, data science and other emerging technologies. 3. To familiarize with the modern-day trends in industry and research based settings and thereby innovate novel solutions to existing problems. 4. To apply concepts, principles, and theories relating to computer science to new situations. 5. To use current techniques, skills, and tools necessary for computing practice 6. To apply standard Software Engineering practices and strategies in real-time software project development 7. To pursue higher studies of specialization and to take up technical employment. 8. To work independently or collaboratively as an effective team member on a substantial software project. 9. To communicate and present their work effectively and coherently. 10. To display an ethical code of conduct in usage of Internet and Cyber systems. 11. To engage in independent and life-long learning in the background of rapid changing IT industry

Relevance of PSOs to the local, regional, national, and global developmental needs	The revised and restructured curriculum for the Three-year integrated course is systematically designed considering the National Education Policy (NEP) along with the Autonomy constraints. The focus is on current industry needs in terms of skills sets demanded under the new technological environment. It also endeavors to align the programme structure and course curriculum with student aspirations and corporate expectations. The curriculum is more contextual, industryfriendly and suitable to cater the needs of society and nation in thepresent day context. As the world is heading towards digitalization, the syllabus is framed by concentrating on such needs. With the help of basic programming skills and designing technique, a student is able to make small workable projects which can be beneficial for local vendors. To make these projects strong, various concepts of project management, database management are involved. Various industries need IT support at local or across the country. Students having the skills of computers are able to sustain in the IT industry at various locations. Development in thought processes can lead one in a research area to contribute to an upcoming trend. Students can become entrepreneurs since the techniques of management and entrepreneurship are taught to them. Due to the learning of cyber safety, ethical hacking, students can become ethical hackers where students can contribute to national security. Students can make community awareness due to learning about cyber safety. Continuous growth in trends requires students updated which will help them mercurial. This will help in sustaining the IT industry and become employable.

Evaluation Scheme

For Theory Course:

The allocation of marks for the Internal Assessment and Semester End Examinations are as follows-

Evaluation for the course will be of 100 marks conducted in a 60: 40 pattern.

60 marks will be for semester end examination and 40 marks will be for internal evaluation. At the end of semester, total marks obtained will be converted to 50 marks as 2 credits are equivalent to 50 marks.-

A) Internal Assessment: 40 % (40 Marks)

Sr. No.	Particulars	Marks
01	**Mid-Term Class Test** It should be conducted using any **learning management system** such as **Moodle**(Modular object-oriented dynamic learning environment) Question Paper Pattern for Periodical Class Test/ Online Examination Duration: 40 Minutes Match the Column / Fill in the Blanks / Multiple Choice Questions/ True or False / Answer in One or Two Lines (Concept based Questions) (1 Marks each)	**20**
02	**Assignment/ Case study/ Presentations**	**10**
03	**Attendance**	**05**
04	**Behavior**	**05**

B) Semester End Examination: 60% (60 Marks)

Question Paper Pattern

Maximum Marks: 60
Questions to be set: 04
Duration: 2 Hours

Question No.	Unit	Options	Marks
Q1	Unit 1	Any 3 out of 6	15
Q2	Unit 2	Any 3 out of 6	15
Q3	Unit 3	Any 3 out of 6	15
Q4	All Units	Objective Based	15

Evaluation Scheme

For Practical Course:

The allocation of marks for the Internal Assessment and Semester End Examinations are as follows-

Evaluation for the course will be of 100 marks conducted in a 60: 40 pattern. 60 marks will be for semester end examination and 40 marks will be for internal evaluation. At the end of semester, total marks obtained will be converted to 50 marks as 2 credits are equivalent to 50 marks.

A. Internal Examination: 40 Marks

Sr. No	Criterion	Marks
1	Journals containing minimum 20 practical's which are timely completed with desired output	**30**
2	Attendance & Practical Performance	**10**

B. Semester End Examination: 60 Marks
Duration: 2 hours

Sr. No	Criterion	Marks
1	One Practical Question **OR** Combination of Practical Questions **OR** Combination of Practical Question and Theory Question	**30**
2	One Practical Question **OR** Combination of Practical Questions **OR** Combination of Practical Question and Theory Question	**25**
3	Viva	**05**

Standard of Passing

The learner to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Internal Assessment & Semester End Examination. The learner shall obtain minimum of 40% marks (i.e. 16 out of 40) in the Internal Assessment and 40% marks in Semester End Examination (i.e. 24 out of 60) separately, to pass the course and minimum of Letter Grade "P" in the project component, wherever applicable to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment & Semester End Examination together.

Performance Grading:

Letter Grades and Grade Points

Semester GPA/ Program CGPA Semester/Program	% of Marks	Alpha-Sign / Letter Grade Result
9.00-10.00	90.0 -100	0 (Outstanding)
$8.00 \leq 9.00$	$80.0 \leq 90.0$	A+ (Excellent)
$7.00 \leq 8.00$	$70.0 \leq 80.0$	A (Very Good)
$6.00 \leq 7.00$	$60.0 \leq 70.0$	B+ (Good)
$5.50 \leq 6.00$	$55.0 \leq 60.0$	B (Above Average)
$5.00 \leq 5.50$	$50.0 \leq 55.0$	C (Average)
$4.00 \leq 5.00$	$40.0 \leq 50.0$	P (Pass)
Below 4.00	Below 40	F (Fail)
Ab (Absent)	-	Absent

B.Sc.(Computer Science) Programme

F.Y.B.Sc.(Computer

Under Choice Based Credit System(CBCS) Course Structure (Autonomous)

(To be implemented from Academic Year- 2023-24)

No. of Courses	Semester I	Credits	No. of Courses	Semester II	Credits
	Department Specific Courses (DSC)			*Department Specific Courses (DSC)*	
	Major			*Major*	
USCS101	Digital Systems & Architecture	**02**	USCS201	Database Systems	**02**
USCS102	Fundamentals of Programming Paradigm	**02**	USCS202	Programming with C++	**02**
USCS103	Computer Science Practical 1	**02**	USCS203	Computer Science Practical 2	**02**
	Minor			*Minor*	
USCS104	Applied Mathematics - I	**02**	USCS204	Applied Mathematics - II	**02**
USCS105	Statistics using R practical	**02**	USCS205	Data Structures	**02**
			USCS206	Minor Practical	**02**
	Generic / Open Elective			*Generic / Open Elective*	
	Any one course from the List given below	**02**		Any one course from the List given below	**02**
	Indian Knowledge System (IKS)				
USCS106	Evolution of Computing in India	**02**			
	Vocational Skill Course (VSC)			*Skill Enhancement Course (SEC)*	
USCS107	Programming with Python Practical	**02**	USCS207	LINUX Practical	**02**
	Ability Enhancement Course (AEC)			*Ability Enhancement Course (AEC)*	
USCS108	English (Soft Skill Development -I)	**02**	USCS208	Content Writing	**02**

	Value Education Course (VEC)			Value Education Course (VEC)	
USCS109	Green Computing - I	**02**	USCS209	Green Computing - II	**02**
	Co-Curricular			Co-Curricular	
USCS110	Any one course from the List given below	**02**	USCS210	Any one course from the List given below	**02**
Total Credits		**22**	**Total Credits**		**22**

Table 1: Open Electives for Science, IT, BT, CS Faculty

Open Elective Course		Open Elective Course	
USOE101	Astronomy for Beginners	USOE201	Observational Astronomy
USOE102	Discrete Mathematics	USOE202	Numerical Methods
USOE103	Google workspace and multimedia applications	USOE203	Basic computer system
USOE104	Health and Hygiene - I	USOE204	Health and Hygiene - II
USOE105	Health and Nutrition	USOE205	Health and Nutrition
USOE106	Social media marketing	USOE206	Introduction to Bioinformatics
USOE107	Plants in Human Welfare - I	USOE207	Plants in Human Welfare – II
		USOE208	Advance Excel
		USOE209	Food Science

Table 2: Co-Curricular Courses

	Semester I Co-Curricular Courses		Semester II Co-Curricular Courses
1	National Social Service (NSS)	1	National Social Service (NSS)
2	National Cadet Corps (NCC)	2	National Cadet Corps (NCC)
3	Sports	3	Sports
4	Cultural	4	Cultural
5	Yoga	5	Yoga
6	Life Long Learning	6	Life Long Learning
7	Research (Shodhavedh – Avishkar)	7	Research (Shodhavedh – Avishkar)
8	Publications	8	Publications
9	Marathi Vidnyan Parishad	9	Marathi Vidnyan Parishad
10	Nature Club	10	Nature Club
11	Science Association	11	Science Association
12	Astronomy Club	12	Astronomy Club
13	Women Development Cell	13	Women Development Cell
14	Literary Association	14	Literary Association
15	Sahyadri Mountaineering Club	15	Sahyadri Mountaineering Club
16	Film Club	16	Film Club
17	Infosys Course	17	Infosys Course
18	Career katta	18	Career katta

Semester I
Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Major Course

Name of the Course	Digital Systems & Architecture
Course Code	USCS101
Class	FYBSC
Semester	I
No of Credits	2
Nature	Theory
Type	Major
Employability/ entrepreneurship/ skill development	This course introduces basic components used in computer system. Various number systems such as binary, hexadecimal and octal are introduced which will help learners how data gets stored in computer system and transmitted through computer system. Logic gates, combinational and sequential circuits are introduced in practical. Hardware concepts are kept so that learners will able to understand mechanism of hardware. This course will help those students who are interested in hardware and networking.

Digital Systems & Architecture
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Fundamentals of Digital Logic ,Computer System	10
2	Memory System Organization, Processor Organization	10
3	Control Unit, Fundamentals of Advanced Computer Architecture	10
	Total	**30**

Course Outcomes
The learner will be able to

1. To have an understanding of Digital Systems and operation of a digital computer.
2. To learn different architectures & organizations of memory systems, processor organization and control unit.
3. To understand the working principles of multiprocessor and parallel organization's as advanced computer architectures

Sr. No.	Modules / Units
1	**Fundamentals of Digital Logic ,Computer System (10 Lectures)**
	Boolean algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Combinational Circuits: Adders, Mux, De-Mux, Sequential Circuits: Flip- Flops (SR, JK & D), Counters: synchronous and asynchronous Counter. Comparison of Computer Organization & Architecture, Computer Components and Functions, Interconnection Structures. Bus Interconnections, Input / Output: I/O Module, Interrupt Driven I/O, Direct Memory Access, Number System: Binary, Decimal, Octal, Hexadecimal.
2	**Memory System Organization, Processor Organization (10 Lectures)**
	Classification and design parameters, Memory Hierarchy, Internal Memory: RAM, SRAM and DRAM, Cache Memory: Design Principles, Virtual Memory, External Memory: Magnetic Discs, Optical Memory, Flash Memories. Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Register Organization, Basic Microprocessor operations: Data Transfer (Register / Memory) Operations, Arithmetic & Logical Operations, Introduction to RISC and CISC Architecture, Micro-Operations,
3	**Control Unit, Fundamentals of Advanced Computer Architecture (10 Lectures)**
	Processor Control, Hardwired Implementation, Micro-programmed Control. Parallel Architecture: Classification of Parallel Systems, Flynn's Taxonomy, Array Processors, Clusters, and NUMA Computers. Multiprocessor Systems: Structure & Interconnection Networks, Multi-Core Computers: Introduction, Organization and Performance.

Learning Resources recommended

Textbook(s):
   1. M. Mano, Computer System Architecture 3rd edition, Pearson
   2. Carl Hamacher et al., Computer Organization and Embedded Systems, 6 ed., McGraw-Hill 2012
   3. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010
 Additional Reference(s):
   1.   William Stallings (2010), Computer Organization and Architecture- designing for performance,8th edition, Prentice Hall, New Jersy.
  2. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, PearsonEducation Inc,
  3. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Major Course

Name of the Course	Fundamentals of Programming Paradigm
Course Code	USCS102
Class	FYBSC
Semester	I
No of Credits	2
Nature	Theory
Type	Major
Employability/ entrepreneurship/ skill development	This course is new and concentrates on various programming concepts. General overview of programming concepts is introduced in this course. Also the course works on logic building of learners. Main thought behind this course is that 'any learner will get structure of various types/ formats of languages.' This will help learners to learn any language in future.

Fundamentals of Programming Paradigm
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Functional Programming, Logical Programming	10
2	Object Oriented Programming	10
3	Scripting Language	10
	Total	**30**

Course Outcomes
Course Outcomes: 1. To understand basic programing structure.   2. To be able to implement programming structure in various formats.   3. To understand the basic building blocks of programming Languages.

Sr. No.	Modules / Units
1	**Fundamental of Programming** (10 Lectures)
	Logic Development - Overview of Computers and Logic, Introduction to logic building, Algorithm development, Understanding Program Structure and Design. General Terminology - literals , variables, scope of variable, operators, Special Symbols and its use, Wildcards and its use, Constants variables, static variables, Interface, User Interface, Data, Data Manipulation-Add, Delete, View, Update. Introduction to Control Statement- Various control statement, Loop, Breaking of Loop, Interface, User Interface Types of Language and language hierarchy
2	**Functional Programming and Logical Programming** (10 Lectures)
	Functional Programming: Language design, why to study programming language, compilation and interpretation, programming environments. Definition of a function: domain and range, total and partial functions, strict functions. Recursion, Referential transparency, Side effects of functions
	Logical Programming: Basic constructs, Facts: queries, existential queries, conjunctive queries and rules. Definition and semantics of a logic program, Recursive programming: Computational model of logic programming, Goal reduction, Negation in logic programming
3	**Object Oriented Programming and Scripting Language** (10 Lectures)
	Object Oriented Programming: Basic concepts: objects, classes, methods, overloading methods, messages inheritance: overriding methods, single inheritance, multiple inheritance Interfaces, encapsulation, polymorphism. Scripting Language: What is scripting language, Problem domain(Shell languages, Text processing and report generation, Mathematics and statistics, General purpose scripting, Extension languages), Scripting the world wide web(CGI scripts, Embedded server side script, client side script, Java Applets, XSLT,Python)

Learning Resources recommended
Textbook(s):
● Programming Language Pragmatics 4th edition, Michael Scott, Morgan Kaufmann
Additional Reference(s):
● "Foundations of Programming Languages Design & Implementation 3rd Editon . Roosta Seyed Cenage Learning

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Major Course

Name of the Course	Computer Science Practical 1
Course Code	USCS103
Class	FYBSC
Semester	I
No of Credits	2
Nature	Major- Practical
Type	Major-Mandatory
Employability/ entrepreneurship/ skill development	Practical approach is given to understand circuit design and basic programming concepts. For circuit design any simulator can be used. This course also introduces algorithmic development of various problems which will get constructed using concepts taught in theory. previously no internal marking is defined for practical courses. This course will take a 60: 40 evaluation pattern where 60 marks for practical examination at the end of semester and 40 marks will be used for continuous internal evaluation form.

Course Outcomes

Course Outcomes:

- To understand basic programing structure.
- To be able to implement programming structures in various formats.
- To understand the basic building blocks of programming Languages.

Course Code	Course Title	Credits
USCS103	**Computer Science Practical 1**	**02**

Note: The following practical should be implemented with logisim:
Link : logisim : https://sourceforge.net/projects/circuit/
Minimum 20 practicals should be submitted as Journal work.

Sr. No.	Practical Title
1	Write pseudo code to detect whether a number is even or odd.
2	Write pseudo code for calculating whether no is prime or not.
3	Write a pseudocode for calculating the sum of 10 numbers.
4	Write a pseudo code for calculating Fibonacci series.
5	Demonstrate and Implement Recursive function for calculating square of a number
6	Demonstrate and Implement Recursive function for calculating factorial of a number
7	Write a JavaScript for basic mathematical functions (add, subtract, multiply and division)
8	Write a JavaScript to compare two numbers.
9	Write a JavaScript to print the factorial of a number.
10	Write a JavaScript to change background colour property.
11	Study and verify the truth table of various logic gates (NOT, AND, OR, NAND, NOR, EX-OR, and EX-NOR).
12	Simplify given Boolean expression and realize it.
13	Design and verify a half/full adder
14	Design and verify half/full subtractor
15	Design a 4 bit magnitude comparator using combinational circuits.
16	Design and verify the operation of flip-flops using logic gates.
17	Verify the operation of a counter.
18	Verify the operation of a 4-bit shift register.
19	Design and implement expression using multiplexers / demultiplexers.
20	Design and implement 3-bit binary ripple counter using JK flip flops.
21	Simple microprocessor programs for data transfer operations
22	Simple microprocessor programs for arithmetic & logical transfer operations

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Minor Course

Name of the Course	Applied Mathematics I
Course Code	USCS104
Class	FYBSC
Semester	I
No of Credits	2
Nature	Theory
Type	Minor
Employability/ entrepreneurship/ skill development	This theoretical course will be more calculative and interesting for students. This course emphasizes on basic mathematics concepts which are required for understanding concepts of computer science. Many concepts are required and due course of time it is impossible to cover all concepts. Hence mathematical concepts are divided into three parts which are completed in a cascading semester.

Applied Mathematics I
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Set Theory, Functions	10
2	Relations, Recurrence Relations	10
3	Permutations and Combinations, Counting Principles	10
	Total	**30**

Course Outcomes

Course Outcomes:
- The purpose of the course is to familiarize the prospective learners with mathematical structures that are fundamentally discrete.
- This course will enhance prospective learners' reason and ability to articulate mathematical problems.
- This course will introduce functions, forming and solving recurrence relations and different counting principles. These concepts will be useful to study or describe objects or problems in computer algorithms and programming languages and these concepts can be used effectively in other courses.

Sr. No.	Modules / Units
1	**Set Theory, Functions** (10 Lectures)
	Language of sets, Language of relation and functions, Definitions Properties of Sets, Algebraic & Boolean Definitions. Definition of function; Domain, co-domain, range of a function; Examples of standard functions such as identity and constant functions, absolute value function, logarithmic and exponential functions, flooring and ceiling functions; Injective, surjective and bijective functions; Composite and inverse functions.
2	**Relations, Recurrence Relations** (10 Lectures)
	Definition and examples of relation; Properties of relations, Representation of relations using digraphs and matrices; Equivalence relation; Partial Order relation, Hasse Diagrams, maximal, minimal, greatest, least element, Lattices. Definition and Formulation of recurrence relations; Solution of a recurrence relation; Solving recurrence relations- Backtracking method, Linear homogeneous recurrence relations with constant coefficients; Homogeneous solution of linear homogeneous recurrence relation with constant coefficients; Applications- Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi, Intersection of lines in a plane, Sorting Algorithms.
3	**Permutations and Combinations, Counting Principles** (10 Lectures)
	Permutation without and with repetition; Combination without and with repetition; Binomial numbers and identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem (without proof) and applications; Multinomial numbers, Multinomial theorem (without proof) and applications Basic Counting Principles (Sum and Product Rule); Pigeonhole Principle (without proof) - Simple examples; Inclusion Exclusion Principle (Sieve formula) (without proof); Counting using Tree diagrams.

Learning Resources recommended
1. Discrete Mathematics and Its Applications, Seventh Edition by Kenneth H. Rosen, McGraw Hill Education (India) Private Limited. (2011)   2. Discrete Mathematics: SemyourLipschutz, Marc Lipson, Schaum's out lines, McGraw-Hill Inc, 3rd edition   **Additional References**:   1. Elements of Discrete Mathematics: C.L. Liu, Tata McGraw- Hill Edition.   2. Concrete Mathematics (Foundation for Computer Science): Graham, Knuth, Patashnik Second Edition, Pearson Education.   3. Discrete Mathematics: SemyourLipschutz, Marc Lipson, Schaum's out lines, McGraw-Hill Inc.   4. Foundations in Discrete Mathematics: K.D. Joshi, New Age Publication, New Delhi.

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I

with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Minor Course Practical

Name of the Course	Statistics using R Practical
Course Code	USCS105
Class	FYBSC
Semester	I
No of Credits	2
Nature	Practical
Type	Minor
Employability/ entrepreneurship/ skill development	R is a programming language that is becoming very popular in the data analytics and data science field. It provides the foundation to the students on elementary topics of Statistics and prepares them to describe the given data. The students try to know and measure the chance of different events happening and their occurrence numerically. Students understand how probability has been distributed to the different events and standard notions of probability distributions. Students will be able to understand statistical concepts through the implementation in the programming language.

Statistics using R Practical
Modules at a Glance

Course Outcomes
Course Outcomes: ● Understand how to describe the data with available measures ● Learn how to implement statistics concept using R language ● Apply probability in real time situations and identify randomness in experiments ● Differentiate between types of random variables and its distributions ● Study the standard distributions and its properties

Course Code	Course Title	Credits
USCS105	Statistics using R Practical	02
Note: The following practical should be implemented in R studio **Link: R studio: https://posit.co/download/rstudio-desktop/** **Minimum 20 practicals should be submitted as Journal work.**		
Sr. No.	**Practical Title**	
1	Frequency distribution and data presentation using R Programming	
2	Create a Measures of central tendency using R Programming	
3	Data entry using, functions, c(), scan (), Creating vectors, Mathematical Operations: ** +/-/*//^ , exp, log, log10, etc, matrix operations, seq(), split()	
4	Creating vector of text type, useful functions: data, frame R Programming	
5	Implement Frequency distribution using cut(), table() and Data presentation R program.	
6	Understanding Arithmetic mean, Median, mode: grouping and ungrouping data, effect of shift of origin.	
7	Using R can read and write into various file formats like csv, excel, xml etc.	
8	Create a grouped bar chart using R programming language.	
9	Perform Skewness and Kurtosis in R Programming	
10	Create histogram in R programming language.	
11	Create Boxplots in R Programming Language.	
12	Implement various functions to generate binomial distribution.	
13	Implement Kruskal-Wallis test in R programming.	
14	Implement simple linear regression in R programming.	
15	Implement multiple linear regression in R programming	
16	Calculate Sampling Distributions in R programming.	
17	Perform one way ANOVA test in r programming.	
18	Perform Exception Error handling in R programming.	
19	Perform Exception Condition handling in R programming.	
20	Represent data using frequency distribution, Histogram, Ogive curve.	
21	Implementation of the concept of measures of central tendency.	
22	Recognizing Partition values such as Quartiles, Deciles and Percentiles.	
23	Importing/Reading Files in R, Exporting/Writing Files in R.	

Learning Resources recommended

Textbooks:

1. R Programming : Statistical Analysis with R For Dummies Paperback – 16 May 2017
2. Trivedi, K.S.(2001) : Probability, Statistics, Design of Experiments and Queuing theory, with applications of Computer Science, Prentice Hall of India, New Delhi
3. The Book of R a First Course in Programming and Statistics by Tilman M. Davies.

Additional References:

1. Kulkarni, M.B., Ghatpande, S.B. and Gore, S.D. (1999): common statistical tests. Satyajeet Prakashan, Pune
2. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi
3. Gupta, S.C. and Kapoor, V.K. (1999): Applied Statistics, S. Chand and Son‟s, New Delhi

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Generic / Open Elective (OE) Course

Name of the Course	Social Media Marketing
Course Code	USOE106
Class	FYBSC
Semester	I
No of Credits	2
Nature	Theory
Type	OE
Employability/ entrepreneurship/ skill development	Enhance Your Employability and Entrepreneurial Skills! 1. Unlock your potential with our comprehensive social media marketing program! 2. Boost your employability: Gain in-demand skills that employers crave in today's digital world. 3. Unleash your entrepreneurial spirit: Learn how to leverage social media platforms to create and grow your own successful business. 4. Master the art of engagement: Discover effective strategies to captivate your audience, increase brand visibility, and drive conversions. 5. Stay ahead of the competition: Stay up-to-date with the latest trends and best practices in social media marketing.

Introduction to Social Media
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Social Media	10
2	Understanding Social Media and tools	10
3	Introduction to Social Media Marketing	10
	Total	**30**

Course Outcomes
1. To know the importance of Social media Platforms and importance of Social media in Digital Marketing.
2. Demonstrate an understanding of social media, the various channels through which it operates, and its role in marketing strategy.
3. Identify globally acceptable best practices for digital and social media marketing.

Sr. No.	Modules / Units
1	**Introduction to Social Media** (10 Lectures)
	What is Social Media & its significance? , Necessity of Social media, The changing face of social media, Social Media Past and Present, Who owns the social Media, Classification of Social Media, Identification of social media, Profile Creation, expanding the network, Engagement.
2	**Understanding Social Media and tools** (10 Lectures)
	Monitoring and Analysis, Needs of Social Media in business, Benefits of social media for individuals, Benefits of social media for Business, Social Networking, Photo and Video Sharing, Blogs, Micro Blog, Social Curation, Reviews and Ratings, Location, Business Networking, Social Gaming.
3	**Introduction to Social Media Marketing** (10 Lectures)
	History of Social Media Marketing, Importance of Social Media, Facebook Marketing, LinkedIn Marketing, Pinterest Marketing, Video Marketing, Social Bookmarking, Image Optimization.

Learning Resources recommended
Textbook(s):
1. Understanding Social Media by Varinder Taprial, Priya Kanwar
Additional Reference(s):
2. Social Media Marketing by tutorialspoint.com

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)

Indian Knowledge System (IKS) Cource

Name of the Course	Evolution of Computing in India
Course Code	USCS106
Class	FYBSC
Semester	I
No of Credits	02
Nature	Theory
Type	IKS
Employability/ entrepreneurship/ skill development	The early stages of India's computer industry required a combination of technical expertise, visionary leadership, strategic planning, collaboration, innovation, and resource management. These skills collectively laid the foundation for the growth and development of the computer industry in the country. The individuals and leaders involved in the early efforts to establish the computer industry in India exhibited visionary thinking and strategic planning. Advocating the importance of computers and their potential impact on various sectors of society was a critical skill in garnering support and resources. Efficiently managing resources, both financial and technological, to acquire and set up the first computer was essential. Developing comprehensive plans and strategies to promote the growth of the computer industry as a driver of economic and technological development. Policies that emphasized education and training in computer-related fields contributed to a skilled workforce in technology. Skills in policy formulation, strategic planning, stakeholder engagement, and economic analysis were pivotal in achieving the desired outcomes and fostering sustainable growth in the technology sector. Anticipating future technological trends and innovating to stay relevant in a rapidly evolving industry. Adapting to varying international regulations and compliance standards while conducting business abroad.Contributing to a dynamic innovation ecosystem through research, development, and technology-driven solutions.

Evolution of Computing in India
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Computing Science in Ancient India	10
2	Contribution in Computing in 19th Century	10
3	Government Policies and Status of IT industry	10
Total		**30**

Course Outcomes
1. To understand the history of Computer system in India.
2. To understand government policies for inculcating the IT industry in India.
3. To understand structure of IT industry
4. To understand the struggle of India for creating the country as an IT hub.
5. To understand the Future of IT industry in India

Sr. No.	Modules / Units
1	**Computing Science in Ancient India** **(10 Lectures)**
	An overview of Ancient Indian Science - Vedic Cognitive science, mathematical and physical science, Scientist of ancient India, Binary numbers in Indian Antiquity -Pingala's classification of Meters, Encode decode system in Ancient India- Katayapadi Scheme, Panini's contribution in computing -The Panini-Backus Form, Fowlers' automaton .
2	**Contribution in Computing in 19th Century** **(10 Lectures)**
	Laying the foundation, First computer in India, TIFRAC, Self-reliant growth of computer industry, ECIL's computer division, PARAM super computer, NASSCOM, Contribution of CDAC, Development of multilingual software. Indian computer scientist, Indian IT industrialist.
3	**Government Policies and Status of IT industry** **(10 Lectures)**
	Economy of India, Government initiative, Role of government institution & Ministry of Information Technology, Government Policies at early stage and revised policies, Consequences of Government policies., Entry of private sector in computer industry, Liberalization of economy and software expert growth, The period of rapid growth of IT industry, Indian IT industry in global perspective, Indian ICT industry in global perspective, Future of IT industry

Learning Resources recommended

Book(s):
 Learning Resources Recommended:
     1. "Computing science in Ancient India", T.R.N. Rao / Subhash Kak
     2. "History of Computing in India 1955-2010", V. Rajaraman, IEEE Computer Society
     3. "Homi Bhabha and the Computer Revolution", R.K. Shyamsunder and M. A. Pai, Oxford University, 2011
 Additional references:
     1. https://www.scribd.com/document/57187049/History-of-Computer-Technology-in-India#
     2. https://en.m.wikipedia.org/wiki/TCIFRAC
     3. https://en.m.wikipedia.org/wiki/Information_technology_in_India

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Vocational Skill Course (VSC)

Name of the Course	Programming with Python Practical
Course Code	USCS107
Class	FYBSC
Semester	I
No of Credits	2
Nature	Practical
Type	VSC
Employability/ entrepreneurship/ skill development	In past curriculum, Programming with Python was a course based on theory and practical approach. Python is a language which will get learned with hands-on training. Hence to develop practical approach the more trace is given on practical in this course. This will help learners to become more practically sound in programming language.

Course Outcomes
1. To learn how to design and program Python applications.
2. To explore the innards of Python Programming and understand components of Python Program To define the structure and components of a Python program.
3. To learn how to write loops and decision statements in Python
4. To learn about inbuilt input/output operations and compound data types in Python

Course Code	Course Title		Credits
USCS107	**Programming with Python Practical**		**02**
Note: The following practical should be implemented in Python IDLE **Link: Python IDLE** : **https://www.python.org/downloads/** **Minimum 20 practical's should be submitted as Journal work.**			
Sr. No.	**Aim of the Practical**		**Literature**
1	Introduction to Python IDLE, Python Shell		Information about IDLE, Diagram of IDLE, Menus and three commands delivering information about python
2	Understanding of Literal and variables		Information about literal (integer, float, character, string, etc…) and variable
3	Illustration of I/O functions such as print(), int(), float() functions		Syntax and examples of all functions
4	Use of Operators in Python		Information about all Operators
5	Implementation of simple programs		All the programs with statements containing basic I/O functions, operators, etc..

6	Understanding if statement	Syntax of if statement, if else statement, elif ladder, programs examining all types of if statement
7	Understanding while statement	Syntax of while statement, while else statement, break statement, continue statement , programs examining all types of while statement
8	Understanding for statement	Syntax of for statement, for else statement, range() function, programs examining all types of for statement
9	Understanding modules in python	Concept of modules, examining various modules such as math module, random module, time module
10	Implementation of List data structure in python	Information of list and all operations performed on list, programs on list and list operation
11	Implementation of Dictionary data structure in python	Information of dictionary and all operations performed on dictionary, programs on dictionary and dictionary operation
12	Implementation of Tuple data structure in python	Information about tuple and demonstrative program on Tuple
13	Implementation of Functions	Syntax of function definition, function call, concept of local and global parameters and programs on functions
14	Illustration of Exception handling	Demonstration of programs on exception handling
15	File handling	File handling concepts and programs to examine file handling concepts
16	Database handling	Database concepts, CRUD operations Write a Python Program to work with databases in Python to perform operations such as a. Connecting to database b. Creating and dropping tables c. Inserting and updating into tables.
17	Database handling	Concept of Transaction handling, Join operation, Python Programs to perform transactions.
18	GUI programming	GUI concepts with widgets and layout manager, GUI Programs in Python to design application that implements a. Different Widgets b. Different Layout Managers
19	GUI programming	Illustration of concept of event driven programming, demonstrative GUI programs in python to design application that demonstrates Different Fonts and Colors Event Handling
20	Networking	Concept of networking, connection-oriented server client communication, a Python program to create server-client and exchange basic information.
21	Networking	Connection less server client communication and its implementation
22	OOP concept	Concepts of OOP, Python programs to implement

		concepts of OOP such as a. Types of Methods b. Inheritance c. Polymorphism
23	OOP Concept	Python programs to implement concepts of OOP such as a. Abstract methods and classes b. Interfaces

Learning Resources recommended

Textbooks:
1. Practical Programming: An Introduction to Computer Science Using Python 3, Paul Gries , Jennifer Campbell, Jason Montojo, Pragmatic Bookshelf, 2nd Edition, 2014

2. Programming through Python, M. T Savaliya, R. K. Maurya& G M Magar, Sybgen Learning India, 2020

Additional References:
1. Python: The Complete Reference, Martin C. Brown, McGraw Hill, 2018
2. Beginning Python: From Novice to Professional, Magnus Lie Hetland, Apress, 2017
3. Programming in Python 3, Mark Summerfield, Pearson Education, 2nd Ed, 2018
4. Python Programming: Using Problem Solving Approach, ReemaThareja, Oxford Univeristy Press, 2017
5. Let Us Python, Yashwant. B. Kanetkar, BPB Publication, 2019

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Ability Enhancement Course (AEC)

Name of the Course	Soft Skill Development - I
Course Code	USCS108
Class	FYBSC
Semester	I
No of Credits	2
Nature	Theory
Type	AEC I
Employability/ entrepreneurship/ skill development	The main aim of the paper is to learn basic communication skills required in the IT industry. To help learners develop their soft skills and develop their personality along with technical skills. Focus on various communication enhancement along with academic and professional ethics.

Soft Skill Development - I
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Soft Skills: An Introduction, Personality Development, Communication Skills, Etiquettes and Mannerism	10
2	Employment Communication, Job Interviews, Group Discussion	10
3	Professional Presentation, Leadership and Team Building, Stress and Time Management	10
	Total	**30**

Course Outcomes
1. Understand the significance and essence of a wide range of soft skills.
2. Learn how to apply soft skills in a wide range of routine social and professional settings
3. Learn how to employ soft skills to improve interpersonal relationships
4. Learn how to employ soft skills to enhance employability and ensure workplace and career success

Sr. No.	Modules / Units
1	**Soft Skills: An Introduction, Personality Development, Communication Skills, Etiquettes and Mannerism** **(10 Lectures)**
	Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development, Identifying your soft skills, SWOT analysis Knowing Yourself, Positive Thinking, Johari's Window, Effective communication Spoken English, Phonetics, Accent, Intonation Introduction, Professional Etiquette, Technology Etiquette.
2	**Employment Communication, Job Interviews, Group Discussion (10 Lectures)**
	Introduction, Resume, Curriculum Vitae, Scannable Resume, Developing an Impressive Resume, Formats of Resume, Job Application or Cover Letter Introduction, Importance of Resume, Definition of Interview, Background Information, Types of Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, Introduction, Ambience/Seating Arrangement for Group Discussion, Importance of Group Discussions, Types of Group Discussions
3	**Professional Presentation, Leadership and Team Building, Stress and Time Management** **(10 Lectures)**
	Nature of Oral Presentation, planning a Presentation, Preparing the Presentation, Delivering the Presentation Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams. Stress, Sources of Stress, Ways to Cope with Stress.

Learning Resources recommended

Textbook(s):
  1. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2017.
  2. Soft Skills: An Integrated Approach to Maximize Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India
Additional References:
  1. Personality Development and Soft Skills, Barun K. Mitra, Oxford Press
  2. Business Communication, ShaliniKalia, Shailja Agrawal, Wiley India
  3. Cornerstone: Developing Soft Skills, Sherfield, Pearson India

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester I
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Value Education Course (VEC)

Name of the Course	Green Computing I
Course Code	USCS109
Class	FYBSC
Semester	I
No of Credits	2
Nature	Theory
Type	VEC
Employability/ entrepreneurship/ skill development	Being a green in the IT field is a need in today's era. Harmful components present in the system may cause damage to the environment if not properly disposed of. Hence to give a more concentration on this concern, syllabus tried to cover all issues related with green technology. This vast topic is covered in two parts. Second semester will be a continuation of the first semester.

Green Computing I
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Green IT Overview, Green Devices and Hardware	10
2	Green Software, Sustainable Software Development	10
3	Green Data Centers, Green Data Storage	10
	Total	**30**

Course Outcomes
1. Learn about green IT can be achieved in and by hardware, software, network communication and data center operations. 2. Understand the strategies, frameworks, processes and management of green IT 3. Understand energy resource management

Sr. No.	Modules / Units
1	**Green IT Overview, Green Devices and Hardware** (10 Lectures)
	Introduction, Environmental Concerns and Sustainable Development, Environmental Impacts of IT, Green I , Holistic Approach to Greening IT, Greening IT, Applying IT for Enhancing Environmental Sustainability, Green IT Standards and Eco-Labelling of IT , Enterprise Green IT Strategy, Green Washing, Green IT: Burden or Opportunity? Introduction , Life Cycle of a Device or Hardware, Reuse, Recycle and Dispose
2	**Green Software, Sustainable Software Development** (10 Lectures)
	Introduction, Processor Power States , Energy-Saving Software Techniques, Evaluating and Measuring Software Impact to Platform Power Introduction, Current Practices, Sustainable Software, Software Sustainability Attributes, Software Sustainability Metrics, Sustainable Software Methodology, Defining Actions
3	**Green Data Centers, Green Data Storage** (10 Lectures)
	Data Centers and Associated Energy Challenges, Data Centre IT Infrastructure, Data Centre Facility Infrastructure: Implications for Energy Efficiency, IT Infrastructure Management, Green Data Centre Metrics Introduction , Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management

Learning Resources recommended
Book(s):
1. Harnessing Green IT: Principles and Practices, San Murugesan, G. R. Ganadharan, Wiley & IEEE.
Additional References:
1. Green IT, Deepak Shikarpur, Vishwkarma Publications, 2014
2. Green Communications: Principles, Concepts and Practice- Samdanis et al, J. Wiley
3. Green IT for Sustainable Business Practice: An ISEB Foundation Guide, Mark G. O'Neill, The Chartered Institute for IT, 2010

Semester II
Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Major Course

Name of the Course	Database system
Course Code	USCS201
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	Major
Employability/ entrepreneurship/ skill development	Database is a core concept that every IT professional needs to know. All the basic concepts of database are included in this course. This course will make learners aware about the database concepts and they can learn advanced concepts. Due to the course schedule only necessary concepts are mentioned in this course. Indexes and views are taken as a part of theory. Data models which are included in previous course are omitted as per time constraints. Concepts which are used frequently and need more attention are included in course.

Database system
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to DBMS,Entity Relationship Model,DDL Statements DML Statements	10
2	Relational data model, Relational Algebra, Functions ,Joining Tables, Sub-queries	10
3	Schema refinement and Normal forms, Database Protection , Transaction control commands	10
	Total	**30**

Course Outcomes
The learner will be able to 1. To make students aware fundamentals of database system. 2. To give idea how ERD components helpful in database design and implementation. 3. To experience the students working with database using MySQL. 4. To familiarize the student with normalization, database protection and different DCL Statements. 5. To make students aware about importance of protecting data from unauthorized users.

Sr. No.	Modules / Units
1	**Introduction to DBMS,Entity Relationship Model,DDL Statements** **DML Statements** **(10 Lectures)**
	Introduction to DBMS Database, DBMS – Definition, Overview of DBMS, Advantages of DBMS, Levels of abstraction, Data independence, DBMS Architecture Entity Relationship Model Entities, attributes, entity sets, relations, relationship sets, Additional constraints (key constraints, participation constraints, weak entities, aggregation / generalization, Conceptual Design using ER (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER) DDL Statements - Creating Databases, Using Databases, datatypes, Creating Tables (with integrity constraints – primary key, default, check, not null), Altering Tables, Renaming Tables, Dropping Tables, Truncating Tables DML Statements Viewing the structure of a table insert, update, delete, Select all columns, specific columns, unique records, conditional select, in clause, between clause, limit, aggregate functions (count, min, max, avg, sum), group by clause, having clause
2	**Relational data model, Relational Algebra, Functions ,Joining Tables, Sub-queries** **(10 Lectures)**
	Relational data model : Domains, attributes, Tuples and Relations, Relational Model Notation, Characteristics of Relations, Relational Constraints - primary key, referential integrity, unique constraint, Null constraint, Check constraint Relational Algebra : Operations (selection, projection, set operations union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division) Functions : String Functions (concat, instr, left, right, mid, length, lcase/lower, ucase/upper, replace, strcmp, trim, ltrim, rtrim), Math Functions (abs, ceil, floor, mod, pow, sqrt, round, truncate) Date Functions (adddate, datediff, day, month, year, hour, min, sec, now, reverse) Joining Tables. Inner join, outer join (left outer, right outer, full outer) Subqueries : Subqueries with IN, EXISTS, subqueries restrictions, Nested subqueries, ANY/ALL clause, correlated subqueries.
3	**Schema refinement and Normal forms, Database Protection , Transaction control commands Architecture** **(10 Lectures)**
	Schema refinement and Normal forms : Functional dependencies, first, second, third, and BCNF normal forms based on primary keys, lossless join decomposition. Database Protection: Security Issues, Threats to Databases, Security Mechanisms, Role of DBA, Discretionary Access Control, Backing Up and Restoring databases Transaction control commands: Commit, Rollback

Learning Resources recommended

Textbooks:
1. "Fundamentals of Database System", ElmasriRamez, NavatheShamkant, Pearson Education, Seventh edition, 2017
2. "Database Management Systems", Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 2014
3. "Murach's MySQL", Joel Murach, 3rd Edition, 3rd Edition, 2019

Additional References:
1. "Database System Concepts", Abraham Silberschatz,HenryF.Korth,S.Sudarshan, McGraw Hill, 2017
2. "MySQL: The Complete Reference", VikramVaswani , McGraw Hill,

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Major Course

Name of the Course	Programming with C++
Course Code	USCS202
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	Major
Employability/ entrepreneurship/ skill development	As being a new structure and abject oriented language; course delivers constructs of C++. Introduction of UML and concepts of UML such as class diagram will get included in software engineering which will get introduced in the upcoming year. This course illustrated implementation of object oriented programming through C++. The highly configured objects are formed by taking the help of the C++. Hence the course 'Programming with C++' is included in the program.

Programming with C++
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to C++,Data Types, Data Input Output and Operators, Decision Making, Loops, Arrays and Strings, Classes, Abstraction & Encapsulation	10
2	Constructors and Destructors, Working with objects, Polymorphism	10
3	Inheritance, Pointers, File Handling	10
	Total	**30**

Course Outcomes
The learner will be able to
1. After successful completion of this course, students would be able to Work with numeric, character and textual data and arrays.
2. Understand the importance of OOP approach over procedural language.
3. Apply the concepts of OOPS like encapsulation, inheritance and polymorphism. Handle basic file operations.

Sr. No.	Modules / Units
1	**Introduction to C++,Data Types, Data Input Output and Operators, Decision Making, Loops, Arrays and Strings, Classes, Abstraction & Encapsulation** **(10 Lectures)**
	Introduction to C++: Features of C++ and its basic structure, simple C++ program without class, compiling and running C++ program. Data Types, Data Input Output and Operators :Basic data types, variables, rules for naming variables, programming constants, the type cast operator, implicit and explicit type casting, cout and cin statements, operators, precedence of operators. Decision Making, Loops, Arrays and Strings: Conditional statements-if, if...else, switch loops- while, do...while, for, types of arrays and strings Classes, Abstraction & Encapsulation: Classes and objects, Dot Operator, data members, member functions, passing data to functions, scope and visibility of variables in function.
2	**Constructors and Destructors,Working with objects, Polymorphism** **(10 Lectures)**
	Constructors and Destructors: Default constructor, parameterized constructor, copy constructor, private constructor, destructors. Working with objects Accessor - mutator methods, static data and static function, access specifiers, array of objects. Polymorphism: Binding-static binding & overloading, constructor overloading function overloading, operator overloading, overloading unary and binary operators. Run time Polymorphism
3	**Inheritance, Pointers, File Handling** **(10 Lectures)**
	Inheritance: Defining base class and its derived class, access specifiers, types of inheritance-single, multiple, hierarchical, multilevel, hybrid inheritance, friend function and friend class, constructors in derived classes. Pointers : Introduction to pointers, * and & operators, assigning addresses to pointer variables, accessing values using pointers, pointers to objects & this pointer, pointers to derived classes File Handling: File Stream classes, opening and closing file-file opening modes, text file handling, binary file handling.

Learning Resources recommended
Textbooks: 1. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India. 2. UML & C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition2015 **Additional References:** 1. Mastering C++ by Venugopal, Publisher: McGraw-Hill Education, 2017 2. Let Us C++ by KanetkarYashwant, Publisher: BPB Publications, 2020 3. Object Oriented Analysis and Design by Timothy Budd TMH, 2001

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Major Course

Name of the Course	Computer Science Practical 2
Course Code	USCS203
Class	FYBSC
Semester	II
No of Credits	2
Nature	Major- Practical
Type	Major-Mandatory
Employability/ entrepreneurship/ skill development	These course focuses on practical implementation of databases and C++. Giving hands on theory topics helps to understand theoretical concepts very easily. Previously no internal marking was defined for practical courses. This course will take a 75: 25 evaluation pattern where 75 marks for practical examination at the end of semester and 25 marks will be used for continuous internal evaluation form.

Course Outcomes

Course Outcomes:

1. To make students aware of the fundamentals of the database system.

2. To give an idea how ERD components are helpful in database design and implementation.

3. To experience the students working with databases using MySQL.

4. To familiarize the student with normalization.

5. To be able to implement programming structures in various formats.

6. To understand the basic building blocks of programming Languages.

7. Work with numeric, character and textual data and arrays.

8. Apply the concepts of OOPS like encapsulation, inheritance and polymorphism. Handle basic file operations.

Course Code	Course Title	Credits
USCS203	Computer Science Practical 2	02

Note: The following practical should be implemented in MySQL and Turbo C
Link: MySQL (S/W) https://www.mysql.com/downloads/
Minimum 20 practical's should be submitted as Journal work.

Sr. No.	Practical Title
1	Conceptual Designing using ER Diagrams (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.)
2	Perform the following: • Viewing all databases • Creating a Database • Viewing all Tables in a Database • Creating Tables (With and Without Constraints) • Inserting/Updating/Deleting Records in a Table
3	Perform the following: • Altering a Table • Dropping/Truncating/Renaming Tables • Backing up / Restoring a Database
4	Perform the following: • Simple Queries • Simple Queries with Aggregate functions
5	Queries involving • Date Functions • String Functions • Math Functions
6	Sub queries • With IN clause • With EXISTS clause
7	Converting ER Model to Relational Model and apply Normalization on database. (Represent entities and relationships in Tabular form, Represent attributes as columns, identifying keys and normalization up to 3rd Normal Form).
8	Views Creating Views (with and without check option) Dropping views Selecting from a view
9	Program to demonstrate use of data members & member functions.
10	Programs based on branching and looping statements using classes.
11	Program to demonstrate one- and two-dimensional arrays using classes
12	Program to use scope resolution operator. Display the various values of the same variables declared at different scope levels.
13	Programs to demonstrate various types of constructors and destructors.
14	Programs to demonstrate use of public, protected & private scope specifiers.
15	Programs to demonstrate single and multilevel inheritance.
16	Programs to demonstrate multiple inheritance and hierarchical inheritance.

17	Programs to demonstrate inheritance and derived class constructors.
18	Programs to demonstrate friend function, inline function, this pointer.
19	Programs to demonstrate function overloading and overriding.
20	Programs to demonstrate use of pointers.
21	Programs to demonstrate text and binary file handling.

Learning Resources recommended

Textbooks:
1. "Fundamentals of Database System", ElmasriRamez, NavatheShamkant, Pearson Education, Seventh edition, 2017
2. "Database Management Systems", Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 2014
3. "Murach's MySQL", Joel Murach, 3rd Edition, 3rd Edition, 2019
4. Object Oriented Programming with C++, Balagurusamy E., 8th Edition, McGraw Hill Education India.
5. UML & C++: A Practical Guide to Object Oriented Development, Lee/Tepfenhart, Pearson Education, 2nd Edition2015.

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Minor Course

Name of the Course	Applied Mathematics II
Course Code	USCS204
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	Minor
Employability/ entrepreneurship/ skill development	This course tries to cover a few more concepts of mathematics which are lagged in semester I due to course schedule. Concentration of this course is on derivatives and integration. These concepts helps learners to understand machine learning, optimization concepts.

Applied Mathematics II
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Derivative, Partial Derivatives	10
2	Integration, Applications of Integration	10
3	Random Variables, Standard Probability distributions	10
	Total	**30**

Course Outcomes
Course Outcomes: ● The primary objective of this course is to introduce the basic tools of Calculus which are helpful in understanding their applications to the real world problems.   ● It covers topics from as basic as definition of functions to partial derivatives of functions in a gradual and logical way.   ● The learner is expected to solve as many examples as possible to a get compete clarity and understanding of the topics covered.   ● To make learner aware about basic probability axioms and rules and its application. To understand the concept of conditional probability and Independence of events.   ● To make learner familiar with discrete and continuous random variables as well as standard discrete and continuous distributions.

Sr. No.	Modules / Units
1	**Derivative,Partial Derivatives** (10 Lectures)
	Derivative In Graphing And Applications: Increase, Decrease, Concavity, Relative Extreme; Graphing Polynomials, Rational Functions, Cusps and Vertical Tangents. Absolute Maxima and Minima, Applied Maximum and Minimum Problems, Newton's Method. Partial Derivatives, Differentiability, Differentials, and Local Linearity, Chain Rule, Implicit Differentiation, Directional Derivatives and Gradients
2	**Integration,Applications of Integration** (10 Lectures)
	An Overview of the Area Problem, Indefinite Integral, Definition of Area as a Limit; Sigma Notation, Definite Integral, Evaluating Definite Integrals by Substitution, Numerical Integration: Simpson's Rule. Area between two curves, Length of a plane curve.
3	**Random Variables, Standard Probability distributions** (10 Lectures)
	Concept and definition of a discrete random variable and continuous random variable. Probability mass function, Probability density function and cumulative distribution function of discrete and continuous random variable, Properties of cumulative distribution function. Introduction, properties, examples and applications of each of the following distributions: Binomial distribution, Normal distribution, Chi-square distribution, t distribution, F distribution

Learning Resources recommended
Learning Resources recommended: 1. Calculus: Early transcendental (10th Edition): Howard Anton, IrlBivens, Stephen Davis, John Wiley & sons, 2012.   2. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi   3. Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta   **Additional References**:   1. Mood, A. M. and Graybill, F. A. and Boes D.C. (1974). Introduction to the Theory of Statistics, Ed. 3, McGraw Hill Book Company.

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Minor Course

Name of the Course	Data Structures
Course Code	USCS205
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	Minor
Employability/ entrepreneurship/ skill development	The course focuses to give an understanding of different types of data structures that can be used to store data in memory, how to create-manipulate them and to use them in the best possible manner as per the requirements of the application. Understanding the data structures used in computer system will help them how data gets organized in memory. This will help them in the development of their software related to memory management.

Data Structures
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Derivative, Partial Derivatives	10
2	Integration, Applications of Integration	10
3	Random Variables, Standard Probability distributions	10
	Total	**30**

Course Outcomes
Course Outcomes: ● To introduce data abstraction and data representation in memory   ● To describe, design and use of elementary data structures such as stack, queue, linked list, tree and graph   ● How and why different data structures are used for different types of problems.

Sr. No.	Modules / Units
1	**Abstract data Type, Linked Structures, Stacks, Queues** (10 Lectures)
	Different Data Types, different types of data structures & their classifications, Introduction to ADT ADT for linked list, Advantages & Disadvantages, Singly Linked List-Traversing, Searching, Prepending and Removing Nodes Stack ADT for Stack, Advantages & Disadvantages, Applications of stack Queue ADT, Advantages & Disadvantages, linked representations. Circular Queue operations, Dequeues
2	**Doubly Linked list, Trees, Priority Queues & Heaps** (10 Lectures)
	ADT of doubly linked list, Advantages & Disadvantages, Insertion and deletion of nodes at various positions ADT for Tree Structure. Advantages & disadvantages, Binary Tree-Properties, Implementation and Traversals, Binary Search Tree, Balanced BST,Threaded Binary Trees, AVL Trees, Applications of Tree like Huffman Coding Priority Queue, Priority Queue ADT, Advantages and Disadvantages, Applications, Heaps, types of heaps, Heapifying the element
3	**Graph, Hashing** (10 Lectures)
	Introduction, Graph ADT, Advantages and Disadvantages, Graph Representation using adjacency matrix and adjacency list, Graph operations like insertion and deletion of nodes, Graph Traversals using BFS & DFS, Applications of Graphs like shortest path algorithms, Hash Table ADT, Advantages & Disadvantages, Concept of hashing, hash table, hash functions, collision, collision avoidance techniques, Applications of hashing

Learning Resources recommended

Textbooks:
  1. Introduction to Algorithm, Thomas H Cormen, PHI
  2. Data Structures And Algorithms Made Easy, Narasimha Karumanchi, 2021.
 	
Additional References:
 	
  1. Fundamentals of Computer Algorithms, SartajSahni and SanguthevarRajasekaran Ellis Horowitz, Universities Press, 2018
  2. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley, 2016

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Minor Course Practical

Name of the Course	Minor-Practical
Course Code	USCS206
Class	FYBSC
Semester	II
No of Credits	2
Nature	Practical
Type	Minor
Employability/ entrepreneurship/ skill development	Mathematics serves as a base for Computer Science. This paper helps in logic building and basic computational techniques. Previously no internal marking was defined for practical courses. This course will take a 60: 40 evaluation pattern where 60 marks for practical examination at the end of semester and 40 marks will be used for continuous internal evaluation form.

Minor-Practical
Data Structure
Modules at a Glance

Course Outcomes
Course Outcomes: - To make students aware of different fundamental data structures.   - To describe, design and use of elementary data structures such as stack, queue, linked list, tree and graph   - To build strong logic foundation for mathematics   - Know basic methods for series generation

Course Code	Course Title	Credits
USCS203	**Minor-Practical**	**02**
Note: The following practical should be implemented with Python IDLE and SageMath. **Link: SageMath: https://www.sagemath.org/download-windows.html** **Link: Python IDLE: https://www.python.org/downloads/** **Minimum 20 practicals should be submitted as Journal work.**		
Sr. No.	**Practical Title**	
1	Implement Continuity of functions and Derivative of functions with suitable example.	
2	Calculate Relative maxima, relative minima, absolute maxima, absolute minima with suitable example.	

3	Implement Newton's method to find approximate solution of an equation.
4	Implement Solution of a first order first degree differential equation, Euler's method
5	Calculate partial derivatives of given suitable functions .
6	Implement any Problems based on binomial distribution & Property Plotting.
7	Implement any Problems based on normal distribution & Property Plotting.
8	Calculate and Plot pdf, cdf, pmf, for discrete and continuous distribution .
9	Implement t test, normal test, F test with suitable example.
10	Implement Non parametric tests- I & II .
11	Implement Post-hoc analysis of one-way analysis.
12	Write a program to implement Abstract Data Types (ADT).
13	Write a program to implement Singly Linked list with insertion, deletion, traversal operations.
14	Write a program to implement Doubly Linked list with insertion, deletion, traversal operations.
15	Write a program to implement Stack with insertion, deletion, traversal operations.
16	Write a program to implement Queue with insertion, deletion, traversal operations.
17	Write a program to implement Priority Queue with insertion, deletion, traversal operations.
18	Write a program to implement Binary Tree with insertion, deletion, traversal operations.
19	Write a program to implement Huffman Coding.
20	Write a program to implement Graph with insertion, deletion, traversal operations.
21	Write a program to implement Travelling Salesman Problem.

Learning Resources recommended
Textbooks: ● Data Structure and algorithm Using Python, Rance D. Necaise, 2016 Wiley India Edition   ● Data Structure and Algorithm in Python, Michael T. Goodrich, Robertom Tamassia, M. H. Goldwasser, 2016 Wiley India Edition   **Additional References**:   ● Data Structure and Algorithmic Thinking with Python- Narasimha Karumanchi, 2015, Careermonk Publications   ● Fundamentals of Python: Data Structures, Kenneth Lambert, Delmar Cengage Learning

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Open Elective

Name of the Course	Advanced Excel
Course Code	USOE208
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	Open Elective
Employability/ entrepreneurship/ skill development	This paper focuses on advanced statistical techniques and its computation programmatically. It gives best opportunity in the field of data science.

Advanced Excel
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to Excel, Understanding and Using Basic Functions	10
2	Proofing and Formatting, Printing Workbooks , Advance Paste Special Techniques, Time and Date Functions	10
3	Filtering and Sorting, Pivot Tables, Charts, Introduction to Excel	10
	Total	**30**

Course Outcomes
The learner will be able to 1. Will have in depth understanding of MS Excel 2. Organize data for analysis. 3. Draw graphical representation of data.

Sr. No.	Modules / Units
1	**Introduction to Excel, Understanding and Using Basic Functions (10 Lectures)**
	Introduction to Excel : A description of the interface, the menu system, and the fundamentals of spreadsheets, Various methods of selecting, ShortCut Keys ,Personalizing Excel: Changing Excel's Default Options Using AutoCorrect and Customizing It Customizing the Ribbon Understanding and Using Basic Functions :Using Functions – Sum, Average, Max, Min, Count, Counta ,Text Functions:Upper, Lower, Proper,Left, Mid, Right,Trim, Len, Exact, Concatenate, Find, Substitute Arithmetic Functions SumIf,,SumIfs CountIf, CountIfs AverageIf, AverageIfs
2	**Proofing and Formatting, Printing Workbooks , Advance Paste Special Techniques, Time and Date Functions (10 Lectures)**
	Proofing and Formatting : Formatting Cells with Number formats, Font formats, Alignment, Borders, Basic conditional formatting Protecting Excel- Excel Security. File Level Protection: Workbook, Worksheet Protection Printing Workbooks: Printing Workbooks: Setting Up Print Area. Customizing Headers & Footers. Designing the structure of a template. Print Titles –Repeat Rows / Columns Advance Paste Special Techniques : Paste Formulas, Paste Formats, Transpose Tables, Paste Validations Time and Date Functions: Today, Now, Date, Date if, DateAdd, Day, Month, Year, Month, Weekday
3	**Filtering and Sorting, Pivot Tables, Charts, Introduction to Excel (10 Lectures)**
	Filtering and Sorting :Filtering on Text, Numbers & Colors, Sorting Options, Advanced Filters Pivot Tables :Creating Simple Pivot Tables, Classic Pivot table Basic and Advanced Value Field Setting, Calculated Field & Calculated Items, Grouping based on numbers and Dates Charts : Various Charts i.e. Bar Charts / Pie Charts / Line Charts

Learning Resources recommended
Additional References: 1. https://www.w3schools.com/EXCEL/index.php 2. https://edu.gcfglobal.org/en/excel/# 3. https://www.javatpoint.com/excel-tutorial 4. https://www.excel-easy.com/ 5. https://support.microsoft.com/en-au/office/excel-video-training-9bc05390-e94c-46af-a5b3-d7c22f6990bb

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Open Elective

Name of the Course	Basic Computer System
Course Code	USOE203
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	Open Elective
Employability/ entrepreneurship/ skill development	It gives basic computer knowledge and techniques to the students which create a base for employability in various fields.

Basic Computer System
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Introduction to computers	10
2	Computer networking	10
3	The Internet and Internet Services	10
Total		**30**

Course Outcomes
The learner will be able to 1. Develop an understanding of computer networking and internet. 2. Develop skills to use word processing, spreadsheet.

Sr. No.	Modules / Units
1	**Introduction to computers** (10 Lectures)
	Introduction to computers: Overview and functions of a computer system, Input and output devices, Storage devices.Modern computers: The workstation, The Minicomputer, Mainframe Computers, Parallel processing Computer & The Super Computer **Introduction to operating systems:**Operating System concept, Windows, Unix/Linux & servers **Word Processing:**Basic Operations, Creating and Editing documents, Formatting documents. **Spreadsheet:**Creating and editing workbook, Organizing and formatting worksheets; Data analysis and management; Using formulas and functions.
2	**Computer networking** (10 Lectures)
	Introduction to networking: Various terminologies Associated hardware devices, gadgets (Router, Switch) tools, services, and resources Network Topologies and Protocols, LAN, WAN and MAN World Wide Web (WWW) Network security: fire walls **Computer viruses:** An overview of Computer viruses: What is a virus? Virus signs, how do they get transmitted? What are the dangers? General Precautions
3	**The Internet and Internet Services** (10 Lectures)
	The Internet and Internet Services: Introduction, History of Internet, Internetworking Protocol, The Internet Architecture, Managing the Internet, connecting to Internet, Internet Connections: Dial-up Access, Leased Line, Integrated Services Digital Network (ISDN), Digital Subscriber Line (DSL), Cable, Modem Internet Address **Internet Services:** World Wide Web (WWW), Web Browser, Uniform Resource Locator (URL), Internet Search Engines, WWW Development Languages, Uses of Internet **Electronic Mail:** E-mail Address, E-mail Message Format, E-mail Services, How E-mail Works File Transfer Protocol (FTP), How FTP Works, Terminal Network (Telnet), News, Internet Relay Chat (IRC), MS Outlook.

Learning Resources recommended

References:
1. Sinha, P. K., Sinha, P. (2004). Computer Fundamentals. India: BPB Publications.
2. Goel, A. (2010). Computer Fundamentals. India: Pearson Education.
3. Wempen, F. (2014). Computing Fundamentals: Introduction to Computers. Germany: Wiley.

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
Skill Enhancement Course

Name of the Course	Linux Practical
Course Code	USCS207
Class	FYBSC
Semester	II
No of Credits	2
Nature	SEC- Linux Practical
Type	SEC-Mandatory
Employability/ entrepreneurship/ skill development	This syllabus will help to train students in fundamental skills and build-up sustainable interest in Linux Operating System. It will improve the necessary knowledge base to understand Linux Operating System and its practical implementation, it will also help to develop Linux based solutions for real life problems.
	The said course requires theory as well as practical sessions. Theoretical session will be covered during the practical session. Visual appearance of theory topic will be given during practical work. Commands and scripts are taken in the form of practical sessions.
	Previously no internal marking is defined for practical courses. This course will take a 60:40 evaluation pattern where 60 marks for practical examination at the end of semester and 40 marks will be used for continuous internal evaluation form.

Course Outcomes

1. To learn basic concepts of Linux in terms of operating system

2. To learn use of various shell commands with regular expressions

3. To set Linux Environment variables and learn setting file permissions to maintain Linux security implementation

4. To learn various editors available in Linux OS

5. To learn shell scripting.

Course Code		Course Title	Credits
USCS207		**Linux Practical**	**02**
Note: The following practical should be implemented using virtual box and Ubuntu **Link: for virtual box: https://www.virtualbox.org/wiki/Downloads** ** For Ubuntu OS : https://ubuntu.com/desktop** **Minimum 20 practicals should be submitted as Journal work.**			
Sr. No.	**Concept**	**Practical Title**	
1	Introduction	Introduction to Linux and its distributions.	
2	Installation	Booting and installing from (USB/DVD)	
3	Managing Desktop	Customize desktop environment by changing different default options like changing default background, themes, and screensavers.	
4	Operations performed on a Linux	Administering system and User setting-Screen Resolution, Time Settings etc.	
5	Becoming Ubuntu power user	Learning Unity keyboard Using the Terminal	
6	File System Commands	touch, help, man, more, less, pwd, cd, mkdir, rmdir, ls, find, ls	
7	File handling Commands	cat, cp, rm, mv, more, file, wc, od, cmp, diff, comm,	
8	Zipping Com mands	gzip and gunzip, zip and unzip, tar	
9	Advanced File handling Commands	chmod, chown, chgrp, , ln, umask,, chmod, chgrp, chown, etc	
10	Generl purpoe utility Commans	cal, date, echo, man, printf, passwd, script, who, uname, tty, stty	
11	Simple Filters and I/O redirection	head, tail, cut paste, sort, grep family, tee, uniq, tr, etc.	
12	Networking Commands	who, whoami, ping, telnet, ftp, ssh, etc	
13	Shell scripting I	Conditions (for loop, until loop and while loop) arithmetic operations, examples	
14	Shell scripting II	Redirecting Input / Output in scripts, creating your own Redirection	
15	Editors	vi, sed, awk	
16	Working and Managing with processes	sh, ps, kill, nice, at and batch etc.	
17	Shell scripting III	Defining variables, reading user input, exit and exit status	

		commands
18	Shell scripting IV	expr, test, [], if conditional, logical operators
19	Use of Functions	Create a function, pass value to a function and return a value from a function.
20	Maths scripting	Pipes performing maths

Learning Resources recommended

Textbooks:
1. "Linux Command line and Shell Scripting Bible", Richard Blum, Wiley India.
2. "Unix: Concepts and Applications", Sumitabha Das, 4th Edition, McGraw Hill.
3. "Official Ubuntu Book", Matthew Helmke& Elizabeth K. Joseph with Jose Antonio Rey and Philips Ballew, 8th Ed.

Additional References:
1. "Linux Administration: A Beginner's Guide", Fifth Edition, Wale Soyinka, Tata McGraw-Hill, 2008.
2. "Linux: Complete Reference", Richard Petersen, 6th Edition, Tata McGraw-Hill
3. "Beginning Linux Programming", Neil Mathew, 4th Edition, Wiley Publishing, 2008.

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
AEC

Name of the Course	Content Writing
Course Code	USCS208
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	AEC
Employability/ entrepreneurship/ skill development	With the advent of the internet, content writing has become a very lucrative and promising career. The course is designed to equip students to comprehend, refine, and enhance their writing abilities so that they may become proficient web content developers. The course aims to prepare students to enter the industry with enhanced skill and substantial competence. Tools for content writing, developing contents on web sites are curtain from unit I as these points will be covered in Unit II and Unit III. Also grammatical errors and legal English vocabulary are eliminated to cope up with 30 hours since the course originally designed for 45 hours.

Content Writing
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Basics of Content writing , Best Practices for Writing for the Web	10
2	Social Media Writing, Info graphics	10
3	Schema refinement and Normal forms, Database Protection , Transaction control commands	10
	Total	**30**

Course Outcomes
The learner will be able to 1. To introduce students to the concepts of content writing. 2. To connect them with various writing and editing styles and techniques. 3. To help them develop their creative abilities. 4. To improve the learners' employability

Sr. No.	Modules / Units
1	**Basics of Content writing, Best Practices for Writing for the Web (10 Lectures)**
	Basics of Content writing: Introduction to Content Writing, Learning Tone in Writing and Its Types, Comprehending style in writing and its Types. Best Practices for Writing for the Web: Making our story Elegant, Professional, Write with an Attitude, Keep Verbs Active, List Items, Title and Subtitle, Organize for Your Audience.
2	**Social Media Writing, Info graphics** **(10 Lectures)**
	Social Media Writing: Writing for Twitter, writing with Hashtags, Writing Social Media with Humor, writing for Facebook, writing for LinkedIn, Writing Your LinkedIn Profile, writing for Email, Writing Landing Pages, Writing Headlines, writing a Home Page, Writing the About Us Page, Writing Better Blog Posts, Writing Annual Reports. Infographics : Visual Communication-What Are Infographics?, The Science of Visualization, Creating Infographics-Purpose, The Art of Observation, Processing Your Ideas, Designing Your Infographics, Publishing Your Infographics.
3	**Content Tools, Ethical and Legal aspects of content writing** **(10 Lectures)**
	Content Tools.: Research and Knowledge Management Tools, Writing Tools, Productivity Tools, Editing Tools, Non-Text Writing Tools, Image Sources, Tools for Content Writing. Ethical and Legal aspects of content writing : Learn Legal English, Learn Legal Vocabulary In Legal Writing, IPR Laws, and Copywriting, Plagiarism laws in Content Writing.

Learning Resources recommended

Textbooks:
   1. Content Writing Handbook, Author:Kounal Gupta, 2020, Henry Harvin.
   2. Feldar, Lynda. Writing for the Web: Creating Compelling Web Content Using Words, Pictures, and Sound. New Riders, CA, USA, 2011
Additional References:
   1. Everybody Writes: Your Go-To Guide to Creating Ridiculously Good Content Paperback Ann Handley Pan Macmillan India 2016
   2. The Power of Infographics: Using Pictures to Communicate and Connect With Your Audiences Paperback – 15 June 2012 Mark Smiciklas
   3. Law Relating to Intellectual Property Rights Book by V. K. Ahuja, 2017
Web Resources:
   1. https://www.locationrebel.com/b2b-writing/
   2. https://www.mindler.com/blog/how-to-become-a-content-writer-in-india/
   3. https://study.com/articles/What_is_a_Content_Writer.htmlhttps://www.mondaq.com/india/contracts-and-commercial-law/445620/legal-contractsagreements-drafting-and-legal-vetting
   4. https://www.crazyegg.com/blog/copywriting/

Syllabus of Courses of B.Sc. Computer Science
Programme at Semester II
with Effect from the Academic Year 2023-2024
Department Specific Courses (DSC)
VEC

Name of the Course	Green Computing II
Course Code	USCS209
Class	FYBSC
Semester	II
No of Credits	2
Nature	Theory
Type	VEC
Employability/ entrepreneurship/ skill development	This course is a continuation of the Semester I paper. Topics like the role of IT and managing green IT are introduced. These topics will make awareness about green IT among students and develop an era of Computer Systems which are less harmful to the environment.

Green Computing II
Modules at a Glance

Sr. No.	Modules	No. of Lectures
1	Green Networks and Communications, Enterprise Green IT Strategy	10
2	Sustainable Information Systems and Green Metrics, Enterprise Green IT Readiness	10
3	Sustainable IT Services, Green Enterprises and the Role of IT, Managing Green IT	10
	Total	**30**

Course Outcomes
The learner will be able to 1. Learn about green IT can be achieved in and by hardware, software, network communication and data center operations. 2. Understand the strategies, frameworks, processes and management of green IT

Sr. No.	Modules / Units
1	**Green Networks and Communications, Enterprise Green IT Strategy** **(10 Lectures)**
	Green Networks and Communications : Introduction, Objectives of Green Network Protocols, Green Network Protocols and Standards Enterprise Green IT Strategy: Introduction, Approaching Green IT Strategies, Business Drivers of Green IT Strategy, Business Dimensions for Green IT Transformation, Organizational Considerations in a Green IT Strategy, Steps in Developing a Green IT Strategy, Metrics and Measurements in Green Strategies.
2	**Sustainable Information Systems and Green Metrics, Enterprise Green IT Readiness** **(10 Lectures)**
	Sustainable Information Systems and Green Metrics: Introduction, Multilevel Sustainable Information, Sustainability Hierarchy Models, Product Level Information, Individual Level Information, Functional Level Information, Organizational Level Information, Measuring the Maturity of Sustainable ICT Enterprise Green IT Readiness: Introduction, Readiness and Capability, Development of the G-Readiness Framework, Measuring an Organization's G-Readiness.
3	**Sustainable IT Services, Green Enterprises and the Role of IT, Managing Green IT** **(10 Lectures)**
	Sustainable IT Services: Creating a Framework for Service Innovation: Introduction, Factors Driving the Development of Sustainable IT, Sustainable IT Services (SITS), SITS Strategic Framework Green Enterprises and the Role of IT : Introduction, Organizational and Enterprise Greening, Information Systems in Greening Enterprises, Greening the Enterprise: IT Usage and Hardware, Inter-organizational Enterprise Activities and Green Issues Managing Green IT : Introduction, Strategizing Green Initiatives, Implementation of Green IT, Information Assurance, Communication and social media, case study

Learning Resources recommended

Text book:
  1. Harnessing Green IT: Principles and Practices, San Murugesan, G. R. Ganadharan, Wiley & IEEE.
 Additional References:
  1. Green IT, Deepak Shikarpur, Vishwkarma Publications, 2014
  2. Green Communications: Principles, Concepts and Practice- Samdanis et al, J. Wiley Green IT for Sustainable Business Practice: An ISEB Foundation Guide, Mark G. O'Neill, The Chartered Institute for IT, 2010

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