

**Haribhai V Desai College
of Arts, Science & Commerce, Pune.
(Autonomous)**

Faculty of Science and Technology

B.Sc. (Computer Science) Program



**Syllabus
For
F.Y B.Sc. (Computer Science)**

**Choice Based Credit System (CBCS)
Syllabus Under National Education Policy (NEP)
with effect from Academic Year 2024-25**

Title of the Program: B.Sc. (Computer Science)

Preamble:

The B. Sc. (Computer Science) and B. Sc. (Computer Science) (Honors) and (Research) course is a systematically designed program with Computer Science as a major subject under the faculty of Science and Technology. The objective of the course is to prepare students to undertake careers involving problem solving using computer science and technologies, or to pursue advanced studies and research in computer science. The syllabus which comprises of Computer Science (Major) subject along with that of the three allied subjects (Mathematics, Electronics and Statistics) (Minor) covers the foundational aspects of computing sciences and also develops the requisite professional skills and problem-solving abilities using computing sciences.

Introduction:

At the first year of under-graduation, the basic foundations of two important skills required for software development are laid. A course in problem solving and programming along with a course in database fundamentals forms the preliminary skill set for solving computational problems. The practical courses are designed to supplement the theoretical training in the year. Along with Computer Science (Major), VSC and SEC courses help in building a strong technical foundation. Another aspect of this course is IKS which tells about the rich heritage and advancement of India in the field of computation.

In the second year of under-graduation, computational problem-solving skills are further strengthened by a course in Data structures, C++ and python programming. Software engineering concepts that are required for project design are also introduced. Essential concepts of computer networking are also introduced this year. The practical course included in both semesters complements the theory courses. Field projects/ OJT is introduced so that students can implement the concept they have learnt in first year.

In Second Year, the “Subject 1 : Computer Science” will be the Major Subject and the Minor subject will be chosen from “Subject 2 or Subject 3”. Subject 2 and Subject 3 will not be available as Major Subjects in Second Year and Third Year.

At the third year of under-graduation, all the subjects are designed to fulfill core Computer Science requirements as well as meet the needs of the software industry. Theory courses are adequately supplemented by hands-on practical courses. Major elective courses are taking care of recent advancement in the field of computer science. Minor and Skill Enhancement courses enable the students to acquire additional skills.

At the fourth year (honors) and (research) of under-graduation, all the subjects are designed to fulfill core Computer Science requirements as well as meet the needs of the software industry. Practical courses and field projects enable students to get hands-on training. Various learning tracks are open through Major elective courses. Research methodology course will create interest among the students to carry research in the field of computer science.

Objectives:

- To develop problem solving abilities using a computer.
- To build the necessary skillset and analytical abilities for developing computer-based solutions for real life problems.
- To train students in professional skills related to the Software Industry.
- To prepare the necessary knowledge base for research and development in Computer Science.
- To help student's build-up a successful career in Computer Science and to produce entrepreneurs who can
- Innovate and develop software products.

Eligibility:

1. H.S.C. (10 + 2) Science stream with Mathematics.
2. Three years diploma course after S.S.C. (10th std.) of Board of Technical Education conducted by Government of Maharashtra or its equivalent.

Program Outcomes:

PO No.	Outcomes
PO1	Develop creative skills, critical thinking, analytical skills and research to address the real-world problems using computational skills.
PO2	Understand and apply mathematical foundation, computing and domain knowledge and develop computing models for defined problems.
PO3	Understand software project management and computing principles with computing knowledge to manage projects in multidisciplinary environments.
PO4	Illustrate the concepts of systems fundamentals, including architectures and organization, operating systems, networking and communication.
PO5	Understand and apply the concepts of Digital Electronics, Computer Architecture, IoT etc.
PO6	Recognize the need for and develop the ability to engage in continuous learning as a Computing professional.
PO7	Apply modern computing tools, skills and techniques necessary for innovative software solutions.
PO8	Communicate effectively with the computing community as well as society by being able to comprehend effective documentations and presentations.
PO9	Gain Self Discipline and commit Professional Ethics in global economic environment.
PO10	Individual & Team Work: Ability to work as a member or leader in diverse teams in multidisciplinary environment.
PO11	Identify opportunities, entrepreneurship vision and use innovative ideas to create value and wealth for the betterment of the individual and society.

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune
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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-I

Level: 4.5 (First Year)

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hour/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CIE	SEE	Total
Subject-1	CS-101-TH	Problem Solving using 'C' Programming	2		2		15	35	50
	CS-102-PR	Lab Course based on CS-101-TH		2		4	15	35	50
Subject-2	MTC-101-TH	Matrix Algebra	2		2		15	35	50
	MTC-102-TH	Mathematics Practical I		2		4	15	35	50
Subject-3	ELC-101-TH	Principles of Analog Electronics	2		2		15	35	50
	ELC-102-PR	Electronics Practical Course I		2		4	15	35	50
IKS (2)	IKS-101-TH	Indian Knowledge System (Generic)	2		2		15	35	50
GE/OE* (2)	OE-101-CS - TH/ OE-102-CS - TH/ OE-103-CS - TH	Fundamentals of Computers I / Office Automation I / Introduction to Google Apps I / (Offering to other stream students)	2		2		15	35	50
SEC (2)	SEC-101-STS-PR	Statistical Methods for Computer Science I		2		4	15	35	50
AEC (2)	AEC-104-ENG-TH	Professional Communication -I	2		2		15	35	50
VEC (2)	VEC-101-ENV-TH	Environmental Science EVS-I	2		2		15	35	50
TOTAL			14	08	14	16	165	385	550

* The subjects offered to other faculty students under OE vertical are OE-101-CS -TH/ OE-102-CS -TH/OE-103-CS -TH The students of B.Sc. (Computer Science) will opt the subjects offered by other faculty given in College Basket.

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-II

Level: 4.5 (First Year)

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hour/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CIE	SEE	Total
Subject-1	CS-151-TH	Advanced C Programming	2		2		15	35	50
	CS-152-PR	Lab Course Based on CS-151-TH		2		4	15	35	50
Subject-2	MTC-151-TH	Graph Theory	2		2		15	35	50
	MTC-152-TH	Mathematics Practical II		2		4	15	35	50
Subject-3	ELC-151-TH	Principles of Digital Electronics	2		2		15	35	50
	ELC-152-PR	Electronics Practical Course II		2		4	15	35	50
GE/OE* (2)	OE-151-CS -PR/ OE-152-CS -PR/ OE-153-CS-PR	Fundamentals of Computers II / Office Automation II / Introduction to Google Apps II / (Offering to other stream students)		2		4	15	35	50
SEC (2)	SEC-151-STs-PR	Statistical Methods for Computer Science II		2		4	15	35	50
AEC (2)	AEC-154-ENG-TH	Professional Communication -II	2		2		15	35	50
VEC (2)	VEC-151-ENV-TH	Environmental Science EVS-II	2		2		15	35	50
CC (2)	CC-151-PE-PR	Physical Education (From CC Basket)		2		4	15	35	50
TOTAL			10	12	10	24	165	385	550

* The subjects offered to other faculty students under OE vertical are OE-101-CS -PR/ OE-102-CS -PR/OE-103-CS-PR The students of B.Sc. (Computer Science) will opt the subjects offered by other faculty given in College Basket.

Exit Option:

Award of UG Certificate in Major with 44 credits and an additional 4 credits core as per university guidelines OR Continue with Major and Minor Continue option: Student will select one subject among the (subject 2 and subject 3) as minor and subject 1 will be major subject.

In Second Year, the “Subject 1: Computer Science” will be Major Subject and the Minor subject will be chosen from “Subject 2 or Subject 3”. Subject 2 and Subject 3 will not be available as Major Subjects in Second Year and Third Year.

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-III

Level- 5.0 (Second Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (4T+2P)	CS-201-MJ-TH	Data Structure-I	2		2		15	35	50
	CS-202-MJ-TH	Database Management System	2		2		15	35	50
	CS-203-MJ-PR	Lab Course based on CS-201-MJ-TH & CS-202-MJ-TH		2	2		15	35	50
VSC (2T)	CS-221-VSC-TH	Agile & Software Engineering	2		2		15	35	50
FP/OJT/CEP (2)	CS-231-FP	Mini Project		2		4	15	35	50
Minor (4T+2P)	MTC-241-MN-TH Or ELC-241-MN-TH	Mathematics -I OR Electronics -I	2		2		15	35	50
	MTC-242-MN-PR Or ELC-242-MN-PR	Mathematics Practical based on MTC-241-MN-TH OR Electronics Practical based on ELC-241-MN-TH		2		4	15	35	50
	MTC-243-MN-TH Or ELC-243-MN-TH	Mathematics -II OR Electronics -II	2		2		15	35	50
GE/OE (2T)	OE-201-CS-TH	Web Designing	2		2		15	35	50
AEC (2T)	AEC-204-ENG-TH	From College Basket	2		2		15	35	50
CC (2)	CC-201-TH	From College Basket	2		2		15	35	50
TOTAL			16	6	16	12			550

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-IV

Level- 5.0 (Second Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6T+2P)	CS-251-MJ-TH	Data Structure - II	2		2		15	35	50
	CS-252-MJ-TH	Relational Database Management System	2		2		15	35	50
	CS-253-MJ-PR	Lab Course based on CS-251-MJ-TH & CS-252-MJ-TH		2		4	15	35	50
VSC (2T/P)	CS-271-VSC-PR	Python Programming		2		4	15	35	50
FP/OJT/CEP (2)	CS-281-CEP	Mini Project		2		4	15	35	50
Minor (2T+2P)	MTC-291-MN-TH	Mathematics OR	2		2		15	35	50
	ELC-291-MN-TH	Electronics							
	MTC-292-MN-PR Or ELC-292-MN-PR	Mathematics Practical based on MTC-291-MN-TH OR Electronics Practical based on ELC-291-MN-TH		2		4	15	35	50
GE/OE (2P)	OE-251-CS-PR	Web Designing-II		2		4	15	35	50
SEC (2P)	SEC-251-CS-PR / SEC-252-STs-PR	Computer Networking OR Statistical Analysis using R Programming		2		4	15	35	50
AEC (2T)	AEC-254-XXX-TH	From College Basket	2		2		15	35	50
CC (2)	CC-251-TH	From College Basket	2		2		15	35	50
TOTAL			10	12	10	24			550

Exit option:

Award of UG Diploma in Major and Minor with **88 credits and an additional 4 credits** core as per college guidelines OR Continue with Major and Minor.

ATKT Rules:

Minimum number of credits required to take admission to T.Y.B.Sc. (Computer Science) is 44 credits [100%] to be completed from F.Y.B.Sc. (Computer Science) and at least 22 credits from S.Y.B.Sc. (Computer Science)

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-V

Level- 5.5 (Third Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (8T+4P)	CS-301-MJ-TH	Core Java	2		2		15	35	50
	CS-302-MJ-TH	Web-Technology-I	2		2		15	35	50
	CS-303-MJ-TH	Operating Systems	2		2		15	35	50
	CS-304-MJ-TH	Theory of Computer Science	2		2		15	35	50
	CS-305-MJ-PR	Lab Course based on CS-301-MJ-TH		2		4	15	35	50
	CS-306-MJ-PR	Lab Course based on CS-302-MJ-TH		2		4	15	35	50
Major Elective (2T+2P)	CS-310-MJ-TH	Data Science	2		2		15	35	50
	CS-311-MJ-PR	Lab Course based on CS-310-MJ-TH		2		4	15	35	50
	OR								
	CS-312-MJ-TH	Database Technologies	2		2		15	35	50
	CS-313-MJ-PR	Lab Course based on CS-312-MJ-TH		2		4	15	35	50
VSC (2T/P)	CS-321-VSC-PR	Lab Course based on CS-303-MJ-TH		2		4	15	35	50
FP/OJT/ CEP (2FP/CEP)	CS-331-FP	Project		2		4	15	35	50
IKS (2T)	IKS-301-TH	IKS	2		2		15	35	50
TOTAL			12	10	12	20			550

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Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-VI

Level- 5.5 (Third Year)

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (8T+4P)	CS-351-MJ-TH	Advanced Java	2		2		15	35	50
	CS-352-MJ-TH	Web Technology-II	2		2		15	35	50
	CS-353-MJ-TH	Design Framework	2		2		15	35	50
	CS-354-MJ-TH	Compiler Construction	2		2		15	35	50
	CS-355-MJ-PR	Lab Course based on CS-351-MJ-TH		2		4	15	35	50
	CS-356-MJ-PR	Lab Course based on CS-352-MJ-TH		2		4	15	35	50
Major Elective (2T+2P)	CS-360-MJ-TH	Android Programming	2		2		15	35	50
	CS-361-MJ-PR	Lab Course based on CS-360-MJ-TH		2		4	15	35	50
	OR								
	CS-362-MJ-TH	Software Testing Tools	2		2		15	35	50
	CS-363-MJ-PR	Lab Course based on CS-362-MJ-TH		2		4	15	35	50
VSC(2T/P)	CS-371-VSC-PR	Lab Course based on CS-353-MJ-TH		2		4	15	35	50
FP/OJT/ CEP (4 OJT)	CS-381-OJT	On Job Training		4		8	30	70	100
TOTAL			12	10	12	20			550

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-VII

Level- 6 (Fourth Year)

Honors Degree

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (10T+4P)	CS-401-MJ-TH	Advanced Operating System	2		2		15	35	50
	CS-402-MJ-TH	Artificial Intelligence	2		2		15	35	50
	CS-403-MJ-TH	Principles of Programming Language	2		2		15	35	50
	CS-404-MJ-TH	Advanced Networking	2		2		15	35	50
	CS-405-MJ-PR	Lab Course based on CS-401-MJ-TH		2		4	15	35	50
	CS-406-MJ-PR	Lab Course based on CS-402-MJ-TH		2		4	15	35	50
	CS-407-MJ-PR	Lab Course based on CS-402-MJ-TH		2		4	15	35	50
Major Elective (2T+2P)	CS-410-MJ-TH	Advance Databases and Web Technologies	2		2		15	35	50
	CS-411-MJ-PR	Lab Course based on CS-411-MJ-TH		2		4	15	35	50
	OR								
	CS-412-MJ-TH	Cloud Computing	2		2		15	35	50
	CS-413-MJ-PR	Lab Course based on CS-413-MJ-TH		2		4	15	35	50
	OR								
	CS-414-MJ-TH	C# .NET Programming	2		2		15	35	50
	CS-415-MJ-PR	Lab Course based on CS-414-MJ-TH		2		4	15	35	50
RM (4T)	CS-441-RM-TH	Research Methodology	4		4		30	70	100
TOTAL			14	8	14	16			550

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-VIII

Level- 6 (Fourth Year)

Honors Degree

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (10T+4P)	CS-451-MJ-TH	Design and Analysis of Algorithms	2		2		15	35	50
	CS-452-MJ-TH	Mobile App Development Technologies	2		2		15	35	50
	CS-453-MJ-TH	Software Project Management	2		2		15	35	50
	CS-454-MJ-TH	Crypto Currency Technologies	2		2		15	35	50
	CS-455-MJ-TH	Cyber Security	2		2		15	35	50
	CS-456-MJ-PR	Lab Course based on CS-451-MJ-TH		2		4	15	35	50
	CS-457-MJ-PR	Lab Course based on CS-452-MJ-TH		2		4	15	35	50
Major Elective (2T+2P)	CS-460-MJ-TH	Full Stack Development	2		2		15	35	50
	CS-461-MJ-PR	Lab Course based on CS-460-MJ-TH		2		4	15	35	50
	OR								
	CS-462-MJ-TH	Web Services	2		2		15	35	50
	CS-463-MJ-PR	Lab Course based on CS-462-MJ-TH		2		4	15	35	50
	OR								
	CS-464-MJ-TH	ASP DOT Net Programming	2		2		15	35	50
	CS-465-MJ-PR	Lab Course based on CS-464-MJ-TH		2		4	15	35	50
OJT (4 OJT)	CS-481-OJT	On Job Training		4		8	30	70	100
TOTAL			12	10	12	20			550

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-VII

Level- 6 (Fourth Year)

Honors with Research

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (6T+4P)	CS-401-MJ-TH	Advanced Operating System	2		2		15	35	50
	CS-402-MJ-TH	Artificial Intelligence	2		2		15	35	50
	CS-403-MJ-TH	Principles of Programming Language	2		2		15	35	50
	CS-404-MJ-PR	Lab Course based on CS-401-MJ-TH		2		4	15	35	50
	CS-405-MJ-PR	Lab Course based on CS-402-MJ-TH		2		4	15	35	50
Major Elective (2T+2P)	CS-410-MJ-TH	Advance Databases and Web Technologies	2		2		15	35	50
	CS-411-MJ-PR	Lab Course based on CS-410-MJ-TH		2		4	15	35	50
	OR								
	CS-412-MJ-TH	Cloud Computing	2		2		15	35	50
	CS-413-MJ-PR	Lab Course based on CS-412-MJ-TH		2		4	15	35	50
	OR								
	CS-414-MJ-TH	C# .NET Programming	2		2		15	35	50
	CS-415-MJ-PR	Lab Course based on CS-414-MJ-TH		2		4	15	35	50
FP/OJT/CEP/RP (4 RP)	CS-431-RP-PR	Research Project		4		8	30	70	100
RM (4T)	CS-441-RM-TH	Research Methodology	4		4		30	70	100
TOTAL			12	10	12	20			550

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

SEMESTER-VIII

Level- 6 (Fourth Year)

Honors with Research

Course Type	Course Code	Course Title	Credit		Teaching Scheme Hr. / Week		Evaluation Scheme & Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Mandatory (6T+4P)	CS-451-MJ-TH	Design and Analysis of Algorithms	2		2		15	35	50
	CS-452-MJ-TH	Mobile App Development Technologies	2		2		15	35	50
	CS-453-MJ-TH	Software Project Management	2		2		15	35	50
	CS-454-MJ-PR	Lab Course based on CS-451-MJ-TH		2		4	15	35	50
	CS-455-MJ-PR	Lab Course based on CS-452-MJ-TH		2		4	15	35	50
Major Elective (2T+2P)	CS-460-MJ-TH	Full Stack Development	2		2		15	35	50
	CS-461-MJ-PR	Lab Course based on CS-460-MJ-TH		2		4	15	35	50
	OR								
	CS-462-MJ-TH	Web Services	2		2		15	35	50
	CS-463-MJ-PR	Lab Course based on CS-462-MJ-TH		2		4	15	35	50
	OR								
	CS-464-MJ-TH	ASP DOT Net Programming	2		2		15	35	50
	CS-465-MJ-PR	Lab Course based on CS-464-MJ-TH		2		4	15	35	50
FP/OJT/ CEP/RP (8 RP)	CS-481-RP-PR	Research Project		8		16	60	140	200
TOTAL			8	14	8	28			550

SEMESTER-I

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y. B.Sc. (Computer Science) Sem-I Course Type: Subject-1 Code: CS-101-TH Course Title: Problem Solving Using C Programming		
Teaching Scheme 02 Hours/Week	No. of Credits 02	Examination Scheme CIE : 15 Marks SEE : 35 Marks
Prerequisites: • <i>Previous knowledge of any programming concepts is assumed.</i> • <i>Knowledge of mathematical operators.</i> • <i>Student think the out of box i.e. imagination power.</i>		
Course Objectives: • <i>To introduce the foundations of computing, programming and problem- solving using computers.</i> • <i>To develop the ability to analyze a problem and devise an algorithm to solve it.</i> • <i>To formulate algorithms, pseudocodes and flowcharts for arithmetic and logical problems.</i> • <i>To understand structured programming approaches.</i> • <i>To implement algorithms in the 'C' language.</i> • <i>To test, debug and execute programs.</i>		
Course Outcomes: On completion of the course, student will be able to : • <i>Explore algorithmic approaches to problem solving.</i> • <i>Control the sequence of the program and give logical outputs.</i> • <i>Understand and manage Input /Output operations in 'C' program</i> • <i>Develop modular programs using control structures and arrays in 'C'.</i>		
Course Contents:		
Chapter-1	Chapter Name: Problem Solving Aspects	Hours: 05
• Introduction to problem solving using computers. • Problem solving steps. • Algorithms-definition, characteristics, examples, advantages and limitations. • Flowcharts - definition, notations, examples , advantages and limitations, Comparison with algorithms. • Programming Languages as tools, programming paradigms, types of languages • Compilation process (compilers, interpreters), linking and loading, syntax and semantic errors, testing a program • Good Programming Practices (naming conventions, documentation, indentation).		
Chapter-2	Chapter Name: 'C' Fundamentals	Hours: 06

- History of 'C' language. - Application areas. - Structure of a 'C' program. 'C' Program development life cycle. - Function as building blocks. 'C' tokens - Character set, Keywords, Identifiers - Variables, Constants (character, integer, float, string, escape sequences, enumeration constant). - Data Types (Built-in and user defined data types). - Operators, Expressions, types of operators, Operator precedence and Order of evaluation. - Character input and output. - String input and output. - Formatted input and output.		
Chapter-3	Chapter Name: Control Structures	Hours: 06
- Decision making structures: if, if-else, switch and conditional operator. - Loop control structures: while, do while, for. - Use of break and continue. - Nested structures. - Unconditional branching (goto statement).		
Chapter-4	Chapter Name: Arrays	Hours: 06
- Concept of array and also introduction of String. - Types of Arrays – One, Two and Multidimensional array. - Array Operations - declaration, initialization, accessing array elements. - Memory representation of two-dimensional array (row major and column major) - Array applications - Finding maximum and minimum, counting occurrences, Linear search, Sorting an array element, Matrix operations (trace of matrix, addition, multiplication, etc.)		
Chapter-5	Chapter Name: Basics of Function	Hours: 07
- Concept of function (Function Call, Definition and Declaration), Advantages of Modular design. - Standard library functions (math library functions, string library functions, etc.) - Scope of variables and Storage classes.		
Reference Books: - How to Solve it by Computer, R.G. Dromey, Pearson Education. - Problem Solving and Programming Concept, Maureen Sprankle, 7th Edition, Pearson Publication. - C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill - A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India - The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI - Programming in C, A Practical Approach, Ajay Mittal, Pearson - Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill. - Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.		

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune.
(Autonomous)
F.Y. B.Sc. (Computer Science)
Sem-I
Course Type: Subject-1
Code: CS-102-PR
Course Title: Lab Course based on CS-101-TH

Teaching Scheme 04 Hours/Week	No. of Credits 02	Examination Scheme CIE : 15 Marks SEE : 35 Marks
Prerequisites: • <i>Basic understanding of programming concepts.</i> • <i>Familiarity with mathematical operators.</i> • <i>Ability to think creatively and apply imagination.</i>		
Course Objectives: • <i>Develop algorithmic approaches to problem-solving.</i> • <i>Understand and implement modular programming using control structures and arrays in C.</i> • <i>Apply programming logic and effectively test, debug, and execute programs.</i> • <i>Control program flow to produce logical outcomes.</i>		
Course Outcomes: On completion of this course, students will be able to: • <i>Explore and develop the algorithmic approaches to problem solving.</i> • <i>Understand and implement modular programs using control structures and arrays in 'C'.</i> • <i>Implement pro</i> • <i>Programing logic and also test, debug and execute programs.</i> • <i>Implement Control the sequence of the program and give logical outputs.</i>		
Lab Book: The lab book is a hands-on resource and record for assignment submission and completion. It contains a set of assignments that students must complete as part of the course.		
Submission: 1. Problem-Solving Assignments: • Students must submit problem-solving assignments in a journal format, consisting of individual assignment sheets. • Each assignment should include the following details: ▪ Assignment Title ▪ Problem Statement ▪ Date of Submission ▪ Assessment Date ▪ Assessment Grade ▪ Instructor's Signature 2. Programming Assignments:		

- Programming assignments are to be completed individually by each student using their personal login credentials.
- The program code must be uploaded to one of the following platforms:
 - Local Server
 - Moodle
 - GitHub
 - Any Open-Source LMS
- While print-outs of the programs and outputs are not mandatory for assessment, they may be submitted if desired.

Assessment:

- Continuous assessment of laboratory work will be conducted based on the student's overall performance and completion of lab assignments.
- Each lab assignment will be graded based on specific parameters with appropriate weightage.
- Suggested assessment parameters include:
 - Timely completion
 - Performance and accuracy
 - Innovation and creativity
 - Efficient coding practices
 - Adherence to good programming standards

Operating Environment:

- For C Programming:
 - Operating System: Linux
 - Editor: Any Linux-based editor, such as vi, gedit, etc.
 - Compiler: cc or gcc

Course Contents:**Assignment-1****Assignment Name: Problem Solving Aspects**

- Pseudo-code to programs.
- Compilation process (compilers, interpreters), linking and loading, syntax and semantic errors, testing a program
- Practices (naming conventions, documentation, indentation).

Assignment-2**Assignment Name: 'C' Fundamentals**

- 'C' tokens and Character set, Keywords, Identifiers
- character, integer, float, string, escape sequences, enumeration constant.
- Built-in and user defined data types and Operators, Expressions, types of operators, Operator precedence and Order of evaluation.

Assignment-3**Assignment Name: Control Structures - Conditional Structures**

- Use of if, if-else,
- Use of nested if, nested if-else.
- Use of Switch case, nested Switch case
- Use of conditional operator

Assignment-4**Assignment Name: Control Structures - Loop Control Structures**

- Use of While loop
- Use of Do While loop

• Use of for loop • Use of break and continue. • Nested structures and goto statement.	
Assignment-5	Assignment Name: One Dimensional Arrays
• One Dimensional Arrays (1D) Operations - declaration, initialization, accessing array elements.	
Assignment-6	Assignment Name: One Dimensional Arrays - Array Operations
• Finding maximum and minimum, Counting occurrences, Linear search, etc.	
Assignment-7	Assignment Name: One Dimensional Arrays - Sorting and Searching
• Sorting an array (Simple exchange sort, (i.e. arrange the data in ascending and descending order))	
Assignment-8	Assignment Name: Two Dimensional Arrays - Basic Operations
• Two Dimensional Arrays (2D) Operations - declaration, initialization, accessing array elements.	
Assignment-9	Assignment Name: Two Dimensional Arrays - Matrix Operations
• Matrix operations: ▪ Addition, ▪ Subtraction ▪ Multiplication, etc.	
Assignment-10	Assignment Name: Functions
• Use of Standard library functions - function call, value returns. • Use of math library functions, string library functions, etc.	
Assignment-11	Assignment Name: Scope of variables
• Use of Scope of variables • Use of Storage classes.	
Reference Books: 1. How to Solve it by Computer, R.G. Dromey, Pearson Education. 2. Problem Solving and Programming Concept, Maureen Sprankle, 7th Edition, Pearson Publication. 3. C: the Complete Reference, Schildt Herbert, 4th edition, McGraw Hill 4. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India 5. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI 6. Programming in C, A Practical Approach, Ajay Mittal, Pearson 7. Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill. 8. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.	

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: Subject 2 Code: MTC-101-TH Course Title: Matrix Algebra		
Teaching Scheme: 2 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: • A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies • A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning. • A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical		
Course Outcomes: - • Understand the concept of matrix, its types and operations on matrices, problemsolving using LU factorization of matrix. • Understand the concept of determinants of matrices and its properties, solvevarious problems with application by using determinants. • Understand the concept of Inverse of matrices and to find inverse of matrix byusing Row Reduction and Adjoint method. • Understand the concept of matrix, its types and operations on matrices, problem solving. • Construct Systems of linear equations and solve the problems by using Gausselimination method, Cramer's Rule and Application of LU decomposition to solve System of linear equation.		
Course Content		
Unit	Title and Contents	No. of lectures in Clock Hours
1	Matrices 1.1 Matrix Operations 1.2 Elementary Matrices, Elementary Row operations 1.3 Row reduction and echelon forms LU factorization of a matrix	10
2	Determinants 2.1 Introduction to determinants 2.2 Properties of determinants. 2.3 Determinant by Row reduction	05

	Determinant by Cofactor expansion along any row or column.	
3	Invertible matrices 3.1 The inverse of a matrix 3.2 Characterization of invertible matrices 3.3 To find inverse of a matrix by Row reduction. 3.4 To find inverse of a matrix by Adjoint Method	05
4	Linear Equations 4.1 System of Linear equations. 4.2 The matrix equation $Ax=b$. 4.3 Gauss elimination method 4.4 Cramer's Rule 4.5 Application of LU decomposition to solve system $Ax=b$	10
1. Elementary Linear Algebra with supplemental Applications Author : Howard Anton and others Wiley Student Edition 2. Matrix and Linear Algebra (aided with MATLAB) Author: Kanti Bhushan Datta Eastern Economic Edition		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: Subject 2 Code: MTC-102-PR Course Title: Mathematics Practical I		
Teaching Scheme: 4 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: - To understand why Python is a useful scripting language for developers. - To learn how to design and program Python applications. - To learn how to use lists, tuples, and dictionaries in Python programs. - To learn how to identify Python object types. - To learn how to use indexing and slicing to access data in Python programs. - To define the structure and components of a Python program. - To learn how to write loops and decision statements in Python. - To learn how to write functions and pass arguments in Python. - To learn how to build and package Python modules for reusability		
Course Outcomes: - - Install, debug and run a Python program, differentiate between brackets, braces, and parentheses, define variables, identify keywords, Operators and Operands, Expressions, perform type conversion, use if, if-else, for, while loops - Use function calls and definitions, math functions, composition, variables and parameters, , recursion, a string as a sequence, traversal, string slices, searching, string methods, the in operator, string comparison, string operations. - Access elements in lists, traverse a list, delete elements from list, perform concatenation, repetition, In operator, built-in list, tuple and dictionary functions, methods and operators, basic tuples operations, updating, deleting elements from dictionary, dictionary keys, operations, file, directories and exception handling. - Use the sympy module to represent the matrix and create the program to get the solution.		
Course Content		
Practical	Title and Contents	No. of lectures in Clock Hours
1	Practical 1: Introduction to Python - Installation of Python - Values and Types : int , float, str etc - Variables : assignment statements , printing variable values , types of variables - Boolean operators, Logical operators - Mathematical functions from math - cmath, modules.	04
2	Practical 2: Python Strings Accessing values in strings	04

	2. Updating strings 3. String special operators 4. Concatenation 5. Repetition	
3	Practical 3 : Python List and Python Tuple 1. Accessing Values 2. Updating 3. Delete elements 4. Basic operations 5. Indexing, Slicing 6. Built-in Functions	04
4	Practical 4: Python Set 1. To create a set 2. To change a set in Python 3. To remove elements from a set 4. Python Set Operations 5. Built-in Functions with Set.	04
5	Practical 5: Python Dictionary 1. To create a Dictionary 2. To change a Dictionary in Python 3. To remove elements from a Dictionary 4. Python Dictionary Operations 5. Built-in Functions with Dictionary.	04
6	Practical 6: Decision making Statements 1. IF statement 2. IF...ELIF...ELSE Statements: 3. Nested IF statements: 4. While loop 5. For loop	04
7	Practical 7: Use SymPy for basic Operations On Matrices 1. Addition , Subtraction , Multiplication , power etc 2. To Accessing elements, Row, Column of Matrix. 3. To create some standard Matrices.	04
8	Practical 8: Use SymPy for Operations on Matrices 1. To insert an element in any row or column 2. To insert matrix into matrix 3. To delete any row or column	04
9	Practical 9: : Use SymPy for Row Operation on Matrices 1. Elementary row operations	04
10	Practical 10: Use SymPy to obtain	04

	1. The determinants of Matrix 2. The rank of Matrix 3. The transpose Of Matrix 4. The reduced row echelon form of Matrix	
11	Practical 11: Use Sympy to obtain 1. The inverse of a matrix 2. The inverse of a matrix by Row reduction	04
12	Practical 12: Use Sympy to obtain 1. The minor and co factors of matrix 2. The inverse of a matrix by Adjoint Method	04
13	Practical 13: Use Sympy to obtain 1. Lower triangular matrix 2. Upper triangular matrix 3. LU decomposition of matrix	04
14	Practical 14: Use SymPy to solve System of Linear equations-I 1. Cramer's Rule 2. Gauss Elimination Method	04
15	Practical 15: Use SymPy to solve System of Linear equations-II 1. Gauss Jordan Method 2. LU decomposition Method	04
Reference: -		
1. Fundamentals of Python first programs, 2nd Edition, Kenneth A. Lambert 2. Beginning Python from Novice to Professional, Third Edition, Magnus Lie Hetland.		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: Subject 3 Code: ELC-101-TH Course Title: Principle of Analog Electronics		
Teaching Scheme: 2 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: - To study various types of semiconductor devices - To study elementary electronic circuits and systems - To study Instrumentation System - To study various blocks of instrumentation System - To study smart instrumentation system		
Course Outcomes: - - Recall the key concepts related to diodes, BJTs, oscillators, converters, instrumentation, and op-amps. - Understand the principles and characteristics of electronic components and circuits. - Apply knowledge to design and build basic electronic circuits. - Analyze the performance of electronic devices and systems. - Evaluate the practical applications of electronic components.		
Course Content		
Chapter 1	Semiconductor Diodes	05 Hrs
Semiconductor, P and N type semiconductors, Formation of PN junction diode, it's working. Zener diode, LED, Photo diode (Symbol, working principal, list of applications only)		
Chapter 2	Bipolar Junction Transistor (BJT)	05 Hrs
Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α , β and γ , Concept of Biasing (numerical problems not expected).		
Chapter 3	Oscillators	05 Hrs
Barkhausen Criteria, Low frequency Wein-bridge oscillator, High frequency crystal oscillator		
Chapter 4	Data converters	05 Hrs
Need of Digital to Analog converters, parameters, weighted resistive network, R-2R ladder network, need of Analog to Digital converters, parameters, Flash ADC.		
Chapter 5	Introduction to Instrumentation System	05 Hrs
Block diagram of Instrumentation system, Definition of sensor and transducer Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity,		

sensitivity, resolution, reproducibility. Temperature sensor (Thermistor, LM-35), Passive Infrared sensor (PIR), Actuators: DC Motor, stepper motor		
Chapter 6	OPAMP as signal Conditioner	05 Hrs
Concept, block diagram of Op amp, basic parameters (ideal and practical): input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, IC741/ LM324, Concept of virtual ground.		
Reference Books:		
1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition 2. Principles of Analog Electronics - A.P. Malvino 3. Sedha R.S., A Text Book Of Applied Electronics, S. Chand & Company Ltd 4. Sensors and Transducers : D. Patranabis, PHI publication, 2nd Edition 5. Sensors and Transducers : Prof A.D. Shaligram 6. Op Amp and Linear Integrated Circuits: Ramakant Gaikwad		
Examination Scheme		
Internal Evaluation: 15 Marks (Internal Examination, Seminars, Presentation Assignments) External Evaluation: 35 Marks (Final Theory Examination)		

The Poona Gujarati Kelvani Mandal's
Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous)
F.Y.B.Sc. (Computer Science)
Sem – I
Course Type: Subject 3
Code: ELC-102-PR
Course Title: Electronics Practical Course I

Teaching Scheme: 2 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
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Course Objective:

- To study different semiconductor diodes.
- To understand applications of IC 555 as a multivibrator.
- To study different applications of op-amp.
- To understand applications of sensors

Course Outcomes: -

- Use different semiconductor diodes for various applications.
- Understand the different applications of FET, BJT and MOSFET.
- Use of different sensors for parameter measurement

Course Content

Group A (Any 13)

1.	Study of forward and reverse bias characteristics of PN junction diode.
2.	To study the forward characteristics of LED for different colours
3.	Study of Zener diode as a voltage regulator
4.	Study of Optocoupler (mechanism and characteristics, Working principle of Light emitting diode, photo diode)
5.	Study of Transistor as a switch.
6.	Study of IC 555 as astable multivibrator used as square wave generator / clock
7.	Study of Digital to Analog Converter using R-2R ladder network
8.	Study of optical sensor (LDR)
9.	Study of temperature sensor (LM35)
10.	Study of PIR sensor
11.	Study of Op amp as inverting/non-inverting amplifier
12.	Op Amp as a Unity gain follower
13.	Study of Op-amp as adder/subtractor

14.	Study of Flash ADC.
15.	Study of Wein-bridge oscillator.
16.	Study of crystal oscillator
Group B: Activity (Any 1: Equivalent to 2 Practicals)	
1.	Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, Transistor. Amplifier configurations - CB, CC (only concept), CE configuration: input and output characteristics, Definition of α, β and γ, Concept of Biasing (numerical problems not expected), Identification of components (Passive and Active) and study of multimeter - a) Minimum 10 different types of components are expected. b) Identification based on visual inspection / data sheets. c) Measure the various parameters using multimeter.
2.	Technical survey of 5 electronic appliances used in different fields (Home, Hospital, Agriculture, Chemical industry, Automobile industry)
Suggested Readings/Material:	
1. Electronic Devices and Circuits I – T. L. Floyd- PHI Fifth Edition 2. Principles of Analog Electronics - A.P.Malvino 3. Sedha R.S., A Text Book Of Applied Electronics, S.Chand& CompanyLtd 4. Sensors and Transducers : D. Patranabis, PHI publication, 2nd Edition 5. Sensors and Transducers : Prof A.D.Shaligram 6. Op Amp and Linear Integrated Circuits: Ramakant Gaykwad	
Examination Scheme	
Internal Evaluation: 15 Marks (Internal Examination, Journal Completion, Seminars, Projects)	
External Evaluation: 35 Marks (Final Practical Examination)	

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: GE/OE Code : OE-101-CS-PR Course Title : Fundamentals of Computers I		
Teaching Scheme 02 / week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Prerequisites Basic knowledge of Computer concepts is assumed.		
Course Objectives - To converse with basic terminology of computer - To understand basics of Computer and working with Operating System - To develop working skills with productivity enhancing tools - To perform documentation and accounting operations		
Course Outcomes On completion of the course, student will be able to : - Understand the concept of input and output devices of Computers - Learn the functional units and classify types of computers - Understand concept of software and working of operating system - Learn basic Word processing, Spreadsheet and Presentation Graphics Software skills - Study to use the Information Technology safely, legally, and responsibly - Describe various uses of offices automation tools in accounting Operations		
Course Contents		
Chapter-1	Chapter-Name: Introduction to Computers	Hours:15
- Basics of Computers - Definition, Block Diagram, Computer Hierarchy, (Classification), - Characteristics of Computer, Computer Memory Input and Output Devices. - Introduction to Software - Software Types - System Software, Application Software, Types of Operating Systems, Functions of Operating Systems. - Working with Windows Operating System:- Structure of Windows, Windows Explorer, File and Folder Operations, The Search, The Recycle Bin, Adding or Removing New Programs using, Control Panel, Applications in windows (Paint, Notepad, WordPad, and Calculator) Data Processing: Files and Records, File Organization (Sequential, Direct/Random, Index)		
Chapter-2	Chapter-Name: Office Automation Tools	Hours: 15
- Definition of Information Technology (IT) Benefits of Information Technology (IT) Applications of Information Technology (IT) - Office Automation Tools: - MS-Word: Introduction, Starting MS-Word, MS-Word Screen and its Components, Elementary Working with MS-Word - MS-Excel: Introduction, Starting MS-Excel, Basics of Spread sheet, MS-Excel Screen and its Components, Elementary Working with MS-Excel - MS-PowerPoint: Introduction, Starting MS-PowerPoint, Basics of PowerPoint, MS-PowerPoint Screen and Its Components, Elementary Working with MS PowerPoint.		

Reference Books:

1. Computer Fundamentals by: Anita Goel, Pearson Education India ISBN: 9788131742136
2. Connecting with Computer Science, by Greg Anderson, David Ferro, Robert Hilton, Course Technology, Cengage Learning, ISBN: 9781439080351
3. Fundamentals of Computer : For undergraduate courses in commerce and management, ITL Education Solutions Limited, Pearson Education, ISBN: 9788131733349
4. Introduction to Computer Science, 2/e, ITL Education Solutions Limited, Pearson Education, ISBN: 9788131760307
5. Frontiers of Electronic Commerce, Ravi Kalakota, Andrew B. Whinston, Pearson Education, ISBN: 9788177583922
6. Internet: The Complete Reference, Margaret Levine Young, Tata McGraw Hill Education Private Limited, ISBN: 9780070486997
7. On the Way to the Web: The Secret History of the Internet and Its Founders, A. Banks, Apress Publication, ISBN: 9781430208693
8. Computers and Commerce: A Study of Technology and Management at Eckert-Mauchly Computer Company, Engineering Research Associates, and Remington, Arthur L. Norberg, MIT Press (MA), ISBN: 9780262140904
9. Essential of E-commerce technology by V. Rajaraman, Prentice Hall India Learning Private Limited ISBN 9788120339378
10. Fundamentals of Computers by E. Balagurusamy, McGraw Hill
11. Computer Fundamentals by Priti Sinha, Pradeep K. Sinha, BPB Publications

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: GE/OE Code : OE-102-CS -PR Course Title : Office Automation I		
Teaching Scheme 02 / week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Prerequisites • Previous knowledge of Computer concepts is assumed. • Knowledge of Computer as operational tool is required.		
Course Objectives • To introduce the foundations of office automation especially word processing. • To develop the ability to prepare the well formatted word documents. • To prepare the documents using word processing tools such as tables, figures, shapes etc. • To prepare the word documents using advanced automated features.		
Course Outcomes On completion of the course, student will be able to : • Prepare the professional word documents • Explore various tools in the word processing software. • Develop documents using word processing advanced tools.		
Course Contents		
Chapter-1	Chapter-Name: Working with Documents.	Hours:2
• Opening & Saving files, • Editing text documents, Inserting, Deleting, • Cut, Copy, Paste, Undo, Redo, • Find, Search, Replace, • Formatting page & setting Margins, • Converting files to different formats, • Importing & Exporting documents, Sending files to others, • Using Tool bars, Ruler, Using Icons, using help		
Chapter-2	Chapter-Name: Formatting Documents	Hours:2
• Setting Font styles • Font selection- style, size, colour, etc. • Type face - Bold, Italic, Underline, • Case settings, Highlighting, Special symbols. • Setting Paragraph style. • Alignments, Indents, Line Space, Margins, • Bullets & Numbering		
Chapter-3	Chapter-Name: Setting Page Style	Hours:4

• Formatting Page • Page tab : Margins, Layout settings, Paper tray • Border & Shading • Columns • Header & Footer • Setting Footnotes & End notes • Shortcut Keys; Inserting manual page break, Column break and line break • Creating sections & frames • Anchoring & Wrapping • Printing Documents		
Chapter-4	Setting Document Styles	Hours:2
• Table of Contents • Index • Page Numbering • date & Time, Author, etc. • Creating Master Documents • Web page		
Chapter-5	Chapter-Name: Creating Tables	Hours:7
• Table settings and Drawing - Inserting ClipArts, Pictures/Files etc., • Borders, Alignments, • Insertion, deletion, • Merging, Splitting, • Sorting, • Formula		
Chapter-6	Special Features	Hours:6
• Inserting Formula, equation, symbols • Inserting Cliparts, pictures, objects, word art • Drawing: shapes, smart art, etc • Charts • Hyperlinks, bookmarks, cross-references, Digital Signature		
Chapter-7	Chapter-Name: Tools	Hours:7
• Word Completion, Spell Checks, • Mail merge • Templates, • Creating contents for books, Creating Letter/Faxes, Creating Web pages 7.5 Hyperlinks, bookmarks, cross-references • Using Wizards • Tracking Changes, Security,		
Reference Books : 1. Illustrated Microsoft Office 365 & Word 2019 Comprehensive by Jennifer Duffy 2. Microsoft Word 365 2019 by Joan Lambert 3. Microsoft Word 2013 Bible by Lisa A Bucki		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: GE/OE Code: OE-103-CS-PR Course Title: Introduction to Google Apps I		
Teaching Scheme 02 / week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Prerequisites • Basic knowledge of Computer concepts is assumed. • Knowledge of Computer as operational tool is required. • Knowledge of Internet is required		
Course Objectives • To introduce the foundations of various Google tools. • To develop the ability to analyses and use the tools effectively		
Course Outcomes On completion of the course, student will be able to : • Use the google tools for the day to day life • Explore various applications available in the google tools. • Develop the skills to implement the skills available in the google tools.		
Course Contents		
Chapter-1	Chapter-Name: Gmail	Hours:2
• Configuring an E-mail Account • Composing and Sending Mail • Receiving, Replying to and Forwarding Mail • Attachments to email		
Chapter-2	Chapter-Name: Google Drive	Hours:3
• Opening the Drive • Creating folders, google docs, google sheets, google slides • Managing Files and folders • Sharing files and folders and managing permissions • Downloading the files and folders • Uploading files and folders • Printing files		
Chapter-3	Chapter-Name: Google Docs, Sheets and Slides	Hours:8
• Creating Google docs, sheets and slides • Formatting the documents • Managing the document permissions • Uploading/downloading the documents • Special features in the docs, sheets and slides		
Chapter-4	Chapter-Name: Google Forms	Hours:7
• 4.1 Creating a google form		

• Adding various styles of the questions • settings of the google form • Creating the links of the google form and sharing the link • Creating and managing the permissions • Managing the data collected through google form		
Chapter-5	Chapter-Name: Other Google tools	Hours:10
• Google Calendar • Google Meet • Google Chat • Google Contacts • Google Photos • Google Maps		
Reference Books: 1. Complete Beginners guide to Google Apps Script by Daniel Lawrie. 2. Google Apps made easy by James Bernstein - My Google Apps by Sherry Kinkoph Gunter		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: SEC Code: SEC-101-STS-PR Course Title: Statistical Methods for Computer Science-I		
Teaching Scheme 04 / week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Course Outcomes ● Present the complex data in tabular format. ● Use various diagrammatic and graphical techniques to represent statistical data and interpret the data. ● Compute various measures of central tendency, dispersion, skewness, and kurtosis using MS-Excel and interpret the results ● Establish relation between variables and estimate response for given bivariate data using software and interpret the results		
Course Contents		
Sr. No.	Title of the experiment	No. of Experiments
1.	Tabulation and construction of frequency distribution. (Use of at least two data sets more than 50 observations- each for constructing frequency distribution)	01
2.	Diagrammatic representation of statistical data using MS-EXCEL and data interpretation. (simple bar diagram, subdivided bar diagram, multiple bar diagram, percentage bar diagram, pie diagram), Data interpretation from diagrams.	01
3.	Graphical representation of statistical data using MS-EXCEL: Histogram and frequency curve, Ogive curves. Determination of median graphically. Data interpretation from graphs.	01
4.	Summary statistics – I: Computation of measures of central tendency for ungrouped data (AM, Median and Mode) using MS-Excel by regular formula method and using direct command. (Discuss use of an appropriate measure)	01
5.	Summary statistics – II: Computation of measures of central tendency for grouped data (AM, Median and Mode) using MS-Excel by regular formula method. (Discuss use of an appropriate measure).	01
6.	Summary statistics – III: Computation of measures of dispersion for ungrouped data (Range, quartiles, variance, standard deviation, coefficient of variation) using MS-Excel by regular formula method and by direct command. Use of an appropriate measure and interpretation of results.	01
7.	Summary statistics – IV: Computation of measures of dispersion for grouped data (Range, quartiles, variance, standard deviation, coefficient of variation) using MS-Excel by regular formula method. Use of an appropriate measure of dispersion and interpretation of results.	01

8.	Computations of raw and central moments (not using the relation formula), measures of skewness and kurtosis (using Karl Pearson's formula and moments) using MS-Excel by regular formula method and by direct command. Interpretation of results.	01
9.	Measures of Attributes	01
10.	Scatter diagram, computation of covariance and Karl Pearson's correlation coefficient using MS-EXCEL by regular formula method and by direct command. Interpretation of results.	01
11.	Fitting of line of regression $Y = a + bX$, using MS-Excel by regular formula method and by direct command (use scatter plot for explaining the linear relationship).	01
12.	Data Collection, its condensation and representation using MS-Excel.	01

Note:

1. Every practical is equivalent to four theory lectures per batch per week.
2. One hour is reserved for theory explanation of corresponding practical.
3. For project, a group of maximum 8 students be made. All the students in a group are given equal marks for project. Different data sets from primary or secondary sources may be collected.

Reference: -

1. Brase C. H., Brase C. P (2016). Understandable Statistics, Concepts and Methods, 12th Edition, Cengage Learning.
2. Freedman D., Pisani R., Purves R. (2007). Statistics, 4th Edition, W. W. Norton and Company.
3. Freund J. E. (1977). Modern Elementary Statistics. 4th Edition, Prentice Hall of India Private Limited, New Delhi.
4. G.W. Snedecor, W.G. Cochran (1989), Statistical Methods, John Wiley & sons.
5. Goon A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1. 6th Revised Edition, The World Press Pvt. Ltd., Calcutta.
6. Gupta S. C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics. 8th Edition, Chand and Sons Publishers, New Delhi.

SEMESTER-II

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: Subject-1 Code : CS-151-TH Course Title : Advanced C Programming		
Teaching Scheme	No. of Credits	Examination Scheme
02 Hours/Week	02	CIE : 15 Marks SEE : 35 Marks
Prerequisites: • Problem Solving tools like algorithms, flowcharts and pseudocodes. • Basic knowledge of 'C' language.		
Course Objectives: • To study advanced concepts of programming using the 'C' language. • To understand code organization with complex data types and structures. • To work with files.		
Course Outcomes: <i>On completion of the course, student will be able to :</i> • Develop modular programs using control structures, function ,pointers, arrays, strings and structures • Design and develop solutions to real world problems using C. • Understand and repeat the sequence of instructions and points for a memory location. • Identification, analyzation, development, verify and document the requirements for a computing environment.		
Course Contents:		
Chapter-1	Chapter Name: Pointers	Hours: 06
• Introduction to Pointers. • Declaration, definition, initialization, dereferencing. • Pointer arithmetic. • Relationship between Arrays & Pointers- Pointer to array, Array of pointers. • Multiple indirection (pointer to pointer). • Dynamic memory management- Allocation(malloc(), calloc()), Resizing(realloc()), Releasing(free()),. • Memory leak, dangling pointers. • Types of pointers.		
Chapter-2	Chapter Name : Functions	Hours: 05
• Concept of function, Advantages of Modular design. • User defined functions:- declaration , definition, function call, parameter passing (by value , by reference), return statement. • Recursive functions.		

● Passing arrays to function. ● Functions and pointers- Passing pointer to function, Returning pointer from function, Function pointer.		
Chapter-3	Chapter Name: Strings	Hours: 04
● String Literals, string variables, declaration, definition, initialization. ● Array of strings. ● Strings and Pointers ● Command line arguments.		
Chapter-4	Chapter Name: Structures And Unions	Hours: 08
● Concept of structure, definition and initialization, use of typedef. ● Accessing structure members. ● Nested Structures ● Arrays of Structures ● Structures and functions- Passing each member of structure as a separate argument, Passing structure by value / address. ● Pointers and structures. ● Concept of Union, declaration, definition, accessing union members. ● Difference between structures and union.		
Chapter-5	Chapter Name: File Handling	Hours: 05
● Introduction to streams. ● Types of files. ● Operations on text files. ● Standard library input/output functions. ● Random access to files.		
Chapter-6	Chapter Name: Preprocessor	Hours: 02
● Role of Preprocessor ● Format of preprocessor directive ● File inclusion directives (#include) ● Macro substitution directive, argumented and nested macro ● Macros versus functions		
Reference Books: 1. The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill 2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard 3. Gilberg, Cengage Learning India 4. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI R4. Programming in C ,A Practical Approach, Ajay Mittal , Pearson 5. Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill. 6. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: Subject-1 Code: CS-151-PR Course Title : Lab Course based on CS-151-TH		
Teaching Scheme 04 Hours/Week	No. of Credits 02	Examination Scheme CIE : 15 Marks SEE : 35 Marks
Prerequisites: • <i>Problem Solving tools like algorithms, flowcharts and pseudocodes.</i> • <i>Basic knowledge of 'C' language.</i>		
Course Objectives: • <i>To study advanced concepts of programming using the 'C' language.</i> • <i>To understand code organization with complex data types and programming structures.</i> • <i>To work with files and its types.</i>		
Course Outcomes: <i>On completion of the course, student will be able to:</i> • <i>Develop modular programs using control structures, function, pointers, arrays, strings and structures</i> • <i>Design and develop solutions to real world problems using Advanced C programming.</i>		
Practical Guidelines: LabBook: The lab book is to be used as a hands-on resource, reference and record of assignment submission and completion by the student. The lab book contains the set of assignments which the student must complete as a part of this course. Submission: Problem Solving Assignments: The problem-solving assignments are to be submitted by the student in the form of a journal containing individual assignment sheets. Each assignment includes the Assignment Title, Problem statement, Date of submission, Assessment date, Assessment grade and instructor sign. Programming Assignments: Programs should be done individually by the student in the respective login. The codes should be uploaded on either the local server, Moodle, GitHub or any open source LMS. Print-outs of the programs and output may be taken but not mandatory for assessment. Assessment: Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will be assigned grade/marks		

based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, innovation, efficient codes and good programming practices.

Operating Environment:

For Advanced 'C' Programming:

Operating system: Linux

Editor: Any linux based editor like vi, edit etc.

Compiler: cc or gcc

Course Contents:

Advance C Programming

Assignment-1	Assignment Name: Pointers : Operations on pointers
- Pointers - Declaration, - definition, initialization, dereferencing - Pointer arithmetic.	
Assignment-2	Assignment Name: Pointers : Pointers and arrays
- Pointer to array - Array of pointers - pointer to pointer	
Assignment-3	Assignment Name: Pointers :Dynamic Memory allocation and dangling pointers and free
- Dynamic memory management (Allocation) - malloc(), calloc(), Resizing(realloc()) - Releasing (free ()), - dangling pointers.	
Assignment-4	Assignment Name: Functions
- User defined functions:- declaration , definition, function call, - parameter passing (by value), return statement.	
Assignment-5	Assignment Name: Passing Array to function (1D array and 2D array)
- Passing 1D arrays to function - Passing 2D arrays to function.	
Assignment-6	Assignment Name: Recursive Functions
Use of Recursive functions	

Assignment-7	Assignment Name: Pointers and Functions
• Passing pointer to function • Returning pointer from function • Function pointer	
Assignment-8	Assignment Name: Strings : basic operations, array of strings & pointers and Command line arguments
• String Literals, string variables, declaration, definition, initialization and Syntax and use of user defined functions (e.g. – strlen, strcmp, strcpy, strcat) • Array of strings and Pointers • To access command-line arguments • Functions - atoi(), atol() and atof()	
Assignment-9	Assignment Name: Structures : Basics
• Structure, definition and initialization, use of typedef. • Accessing structure members and Nested Structures	
Assignment-10	Assignment Name: Arrays of Structures, Structure and Functions, Pointers and Structures
• Arrays of Structures and functions- Passing each member of structure as a separate argument, • Use of Pointers and Structures • Passing structure by value / address.	
Assignment-11	Assignment Name: Unions
• Concept of Union, declaration, definition, accessing union members	
Assignment-12	Assignment Name: File Handling
• Streams and Types of files. • Operations on text files. • Standard library input/output functions and Random access to files. • Accessing string and file using command line arguments	
Assignment-13	Assignment Name: Preprocessor
• Preprocessor and Format of preprocessor directive • File inclusion directives (#include) • Macro substitution directive, arguments and nested macro and macros versus functions	
Reference Books: 1. The Complete Reference, Schildt Herbert, 4th edition, McGraw Hill 2. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India 3. The 'C' programming language, Brian Kernighan, Dennis Ritchie, PHI	

4. Programming in C, A Practical Approach, Ajay Mittal , Pearson
5. Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill.
6. Programming in ANSI C, E. Balagurusamy, 7th Edition, McGraw Hill.

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: Subject 2 Code: MTC-151-TH Course Title: Graph Theory		
Teaching Scheme: 2 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: - A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies. - A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning. - A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical.		
Course Outcomes: - After successful completion of this course, students are expected to: - Convert real life problems into graph theoretical models. - Check whether two graphs are isomorphic or not. - Apply basic operations on graphs and connected graphs. - Identify Eulerian and Hamiltonian graphs. - Applying Fleury's algorithm to construct Eulerian graph and Applying Kruskal's algorithm to construct minimum spanning tree. - Applying Dijkstra's algorithm to find Shortest path.		
Course Content		
Unit	Title and Contents	No. of lectures in Clock Hours
1	An Introduction to graph 1.1 Definitions, Basic terminologies and properties of graph. 1.2 Special types of graphs, some applications of special types of graph. 1.3 Matrix representation and elementary results, Isomorphism of graphs 1.4 Subgraphs, Induced subgraphs, Vertex deletion, Edge deletion 1.5 Complement of a graph and self-complementary graphs 1.6 Union, Intersection and Ring sum and Product of graphs.	10
2	Connected graph 2.1 Walk, trail, path, cycle, more definitions and elementary properties of connectedness.	07

	2.2 Cut edge (Bridge), Cut vertex, cut set, vertex connectivity, edge connectivity, definitions and properties. 2.3 Shortest path problem, Dijkstra's algorithm.	
3	Euler and Hamilton path 3.1 The Konigsberg bridge problem, Euler trail, path, circuit and tour, elementary properties and examples, Fleury's algorithm 3.2 Hamilton path, circuit, definitions, elementary properties and examples	05
4	Tree 4.1 Definitions, basic terminologies, properties and applications of trees. 4.2 Weighted graph, definition and properties of spanning tree, shortest spanning tree, Kruskal's algorithm, Prim's algorithm 4.3 Binary tree, definitions and properties, tree traversal: preorder, inorder, postorder, infix, prefix, and postfix notations and examples.	08
Reference Books:		
1. John Clark and Derek Holton, A first look at Graph theory, (Allied Publishers) 2. Narsingh Deo, Graph Theory with applications to computer science and engineering. (PrenticeHall) 3. C.L. Liu, Elements of Discrete Mathematics, (Tata McGraw Hill) Douglas B. West, Introduction to Graph Theory, second edition.(Pearson Education)		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: Subject 2 Code: MTC-152-PR Course Title: Mathematics Practical II		
Teaching Scheme: 2 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: To solve problems depending on contents in Graph theory		
Course Outcomes: - On completion of the course, student will be able to - Understand the theoretical concepts in Graph theory. - Apply this knowledge in various courses of Computer Science.		
Course Content		
Practical	Title and Contents	No. of lectures in Clock Hours
1	Practical 1: Using network from python do the following - Generate graph G with vertex(node) set {1,2,3,4,5} and the edge set {(1,5), (1,3),(1,2),(2,3),(2,4), (3,4), (4,5)} . Draw graph - Generate graph G1 with vertex set { 'a','b','c','d' } and the edge set {x=('a','d'), y=('b','c'), z=('b',' d'), w =('a','c')}. Draw graph G1 showing labeled vertices and edges. - Generate graph G2 with vertex set {1,2,3,4,5} and edge set {(4,5),(5,3), (2, 2),(2,3),(2,4), (3,4), (1,5)} . Draw graph G2 with vertices in red color and edges in green. - Find the number of vertices, number of edges and degrees of all vertices in above graphs. Verify Hand shaking lemma for above graphs.	04
2	Practical 2: Using networks from python do the following - Draw a regular graph on 4 vertices with degree 2. - Draw a regular graph on 5 vertices with degree 3. - Draw the star graphs on 4, 7 and 8 vertices	04

	4. Draw the Petersen graph. 5. Determine whether G is regular. Is it 3_regular graph	
3	Practical 3: Using networks from python do the following 1. Find adjacency matrix and incidence matrix of each of above graphs. 2. Find the number of vertices, number of edges and degrees of all vertices of 3. Graphs (Practical No 2)	04
4	Practical 4: Using network from python do the following 1. Draw the null graphs different number of vertices for example N_7 , N_{17} , N_{12} etc. 2. Draw the complete graphs for example K_5 , K_{30} , K_{45} etc. 3. Draw the cycle graphs such as C_8 , C_{12} , C_{20} , C_{35} etc. 4. Draw the wheel graphs for such as W_5 , W_{10} , W_{21} , W_{30} Draw the complete bipartite graphs $K_{4,3}$, $K_{1,8}$, $K_{5,9}$ etc.	04
5	Practical 5: Using networks from python do the following Draw a directed graph D1 with vertex set $V = \{1, 2, 3, 4, 5\}$ and directed edge set $E = \{(1,4), (2,3), (1,2), (5,3), (5,1), (4,1), (3,2), (5,2), (5,4)\}$. Draw underlying graph of D1, Find in degrees and out degrees of all vertices in D1. 2. Draw a directed graph D2 with vertex set $V = \{1, 2, 3, 4\}$ and directed edge set $E = \{(2,4), (2,3), (1,3), (4,1), (3,2), (1,2)\}$. Draw underlying graph of D2, Find indegrees and out degrees of all vertices in D2 Draw a directed graph D2 with vertex set $V = \{1, 2, 3, 4\}$ and directed edge set $E = \{(1,2), (1,3), (2,4), (3,2), (3,4), (4,2), (4,1)\}$. Draw underlying graph of D2, Find indegrees and out degrees of all vertices in D2	04
6	Practical 6: Using networks from python do the following 1. Draw any symmetric directed graph on given number of vertices 2. Draw any asymmetric directed graph on given number of vertices	04

	3. Draw any complete symmetric directed graph on given number of vertices Draw any complete asymmetric directed graph on given number of vertices	
7	Practical 7: Using networks from python do the following 1. Create a simple graph G. Draw graph G with nodes and edges in colors of your choice 2. Create and draw complement of above G. Determine whether the complement is simple graph 3. Determine whether G is bipartite. 4. Find the number of components in the graph G Determine whether G is connected. Determine whether the complement of G is connected	04
8	Practical 8: Using networks from python do the following 1. Draw $K =$ Complete graph K_5, $H =$ complement of N_5. Determine whether K is isomorphic to H 2. Generate and draw any 2 graphs with names G1 and G2. Determine whether G1 is isomorphic to G2 3. Generate and draw any 2 graphs with names G1 and G2. Determine whether G1 is isomorphic to G2 4. Generate and draw any 2 graphs with names G1 and G2. Determine whether G1 is isomorphic to G2	04
9	Practical 9: Using networks from python do the following 1. Draw union of graphs G1 and G2 2. Draw intersection of graphs G1 and G2 3. Draw product of graphs G1 and G2	04
10	Practical 10: Using networks from python do the following 1. Draw any graph G 2. In the graph G add some vertices and add some edges 3. From the graph G delete some vertices and delete some edges 4. Determine whether G is connected graph Find the vertex connectivity and edge connectivity of the graph G	04
11	Practical 11: Using networks from python do the following	04

	1. Draw any connected graph G 2. Find all bridges, all cut vertices (articulation points) and cut set in G 3. Find the vertex connectivity and edge connectivity of G 4. Find the eccentricity of every vertex in G Find center, radius and diameter of graph G	
12	Practical 12: Using networks from python do the following 1. Draw any connected graph G. 2. Find all paths in G and all trails in G. 3. Draw paths of some given lengths from G. 4. Find all cycles in graph G. Is it Hamiltonian graph? Determine whether G is Eulerian graph, whether it is Semi Eulerian graph.	
13	Practical 13: Using networks from python do the following 1. Draw any connected graph G Determine whether G is a tree 2. Draw spanning tree T in G 3. Find the number of vertices in spanning tree of G 4. Find the number of edges in spanning tree of G. Determine whether spanning tree T of G is a binary tree	04
14	Practical 14: Using network from python do the following 1. Draw any graph T containing n number of vertices and $n - 1$ edges. 2. Determine whether T is a tree. 3. Determine whether T is a binary tree. 4. Determine whether T is a bipartite graph. Find center, radius and diameter of graph T.	04
15	Practical 15: Using networks from python do the following 1. Draw balanced binary trees of heights 2, 4, and 5 etc. 2. Draw ternary trees of heights 1 and 3 etc. 3. Draw any n-ary tree of height h for given n and h . 4. Find the number of vertices and edges in given trees, Verify the relation between them. Find centre, radius and diameter of above trees.	04

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: Subject 3 Code: ELC-151-TH Course Title: Principle of Digital Electronics		
Teaching Scheme: 2 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: - To learn different number systems and their inter conversion - To understand logic gates and their applications, - To study rules and laws of Boolean algebra - To understand the design of combination circuits and their different types. - To introduce flip flop and their role in sequential circuit.		
Course Outcomes: - - Remember key concepts of number systems, digital codes, logic gates, Boolean algebra, and combinational circuits. - Understand the principles and characteristics of logic gates, digital components and systems. - Apply knowledge to conversions, logic circuit design, and Boolean simplification. - Evaluate the functionality and applications of digital components or circuits.		
Course Content		
Chapter 1	Number Systems and Digital Codes	07 Hrs
Introduction to decimal, binary, octal and hexadecimal number system and their inter-conversions, the concept of 1's and 2's complements, binary addition, binary subtraction using 1's and 2's complements, BCD code, Excess-3 code, Gray code and ASCII code.		
Chapter 2	Logic gates and Logic families	06 Hrs
Logic gates: Basic and derived (symbol, Boolean equation and truth table), concept of universal gates. Concept parity and application Ex-OR gate as parity generator and Checker.		
Logic Families: Introduction of CMOS and TTL logic families. Parameters of logic families: voltage levels, propagation delay, noise margin, fan in, fan out, power dissipation. Comparison between CMOS and TTL logic families.		
Chapter 3	Boolean Algebra and K-Map	06 Hrs
Laws of Boolean Algebra, De-Morgan's theorems, simplification of logic equations using Boolean algebra, minterms, maxterms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form. Introduction of K-Map (Only Concept).		
Chapter 4	Combinational Circuits	06 Hrs
Introduction to Arithmetic Circuits, half adder, full adder, half subtractor, full subtractor, four-bit parallel adder, universal adder / subtractor, digital comparator, introduction to ALU. Introduction, Multiplexer (2:1,		

4:1), demultiplexer (1:2, 1:4) and their applications. Encoders: decimal to BCD/binary, 3x4 matrix keyboard encoder and priority encoder. Decoders: BCD to decimal and BCD to seven segment decoders.		
Chapter 5	Flip-flops	05 Hrs
RS Flip Flop using NAND gate, clocked RS Flip Flop, D Latch, J K Flip Flop, T Flip Flop		
Reference Books:		
1. Digital Design - M. Morris Mano, PHI, New Delhi. 2. Digital Systems Principles and Applications - Ronald J. Tocci. 3. Digital electronics - G. K. Kharate, Oxford University Press. 4. Fundamentals of Digital Circuits - Anand Kumar. 5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.		
Examination Scheme		
Internal Evaluation: 15 Marks (Internal Examination, Seminars, Presentation Assignments)		
External Evaluation: 35 Marks (Final Theory Examination)		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: Subject 3 Code: ELC-152-PR Course Title: Electronics Practical Course II		
Teaching Scheme: 4 Hours /Week	No. of Credits: 2 Credits	Examination Scheme IE: 15 Marks EE: 35 Marks
Course Objective: - To understand logic gates ICs and their applications in Digital Design. - To design different digital circuits using logic gates. - To study different combinational circuits.		
Course Outcomes: - - Understand the design and build of digital circuits using logic gates. - Use breadboard / tag-board for building small electronic circuits. - Design digital circuits for different applications. - Validate observed outputs with expected theoretical outputs.		
Course Content		
Group A (Any 13)		
1.	Verification of logic gates by using digital ICs.	
2.	Realization of basic gates using discrete components	
3.	Realization of basic gates using universal logic gates.	
4.	Verification of De Morgan's theorems.	
5.	Study of half adder and full adder using logic gates.	
6.	Study of half subtractor and full subtractor using logic gates.	
7.	4-bit binary parallel adder and subtractor using IC7483.	
8.	3-bit binary to Gray conversion using logic gates.	
9.	3-bit Gray to Binary conversion using logic gates.	
10.	Study of EX-OR gate as a 4-bit parity generator.	
11.	Study of EX-OR gate as a 4-bit parity checker.	
12.	Study of 1-bit digital comparator.	
13.	Study of ALU using IC 74181.	
14.	Study of multiplexer and demultiplexer.	

15.	Study of Decimal to BCD/Binary encoder.
16.	Study of Priority Encoder IC 74148
17.	Study of BCD to seven segment decoder using IC 7447
18.	Study JK Flip Flop
19.	Study D and T Flip Flop
Group B: Activity (Any 1: Equivalent to 2 Practicals)	
1.	Perform any 2 experiments from Group A using circuit simulation software LTSPICE / Circuit Mod / Proteus etc. (Give preference to not performed experiments)
2.	Technical survey of 5 electronic appliances used in different fields (Home, Hospital, Agriculture, Chemical industry, Automobile industry)
Suggested Readings/Material:	
1. Digital Design - M. Morris Mano, PHI, New Delhi. 2. Digital Systems Principles and Applications - Ronald J. Tocci. 3. Digital electronics - G. K. Kharate, Oxford University Press. 4. Fundamentals of Digital Circuits - Anand Kumar. 5. Digital Principles and Applications - Malvino and Leach, TMG Hill Edition.	
Examination Scheme	
Internal Evaluation: 15 Marks (Internal Examination, Journal Completion, Seminars, Projects)	
External Evaluation: 35 Marks (Final Practical Examination)	

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: GE/OE Code: OE-151-CS-PR Course Title: Fundamentals of Computers II		
Teaching Scheme 02 Hours:/ week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Prerequisites Basic knowledge of Computer concepts is assumed.		
Course Objectives - To build an understanding of the fundamental concepts of computer networking. - To familiarize the student with the basic terminology of the computer networking area. - To understand computer network technology with various devices independently. - To identify the different types of network topologies and protocols.		
Course Outcomes On completion of the course, student will be able to : - Understand the basic concepts of Networking and Cyber Security. - Describe Cyber Security Laws and concepts of Digital Signature - Identify the different types of Network devices and their functions within a Network. - Elaborate the Internet Services and related terms of Internet. - Evaluate information security threats.		
Course Contents		
Chapter 1	Chapter-Name: Introduction to Computers Network and E-Commerce:	Hours: 15
- Introduction Importance of Networking Computer Network (LAN, WAN, MAN) Network Components (Hub, Switch, Bridge, Gateway, Router, Modem). - Network Topology, Wireless Network Internet and Internet application Introduction, Internet evolution, Working of Internet, Use of Internet, Overview of World Wide Web (Web Server and Client). 1.3 IEEE802.11 -Wi-Fi: Types of Wi-Fi, Uses of Wi-Fi Near by Share : Applications of Nearby share		
Chapter 2	Chapter-Name: Introduction to Internet & Cyber Security	Hours: 15
- Concept of Internet, Internet Service Providers(ISP), Services Provided by the Internet: E-mail, Search Engine - Information security overview – Background and current scenario Types of Attacks, Goals of security: - Overview of security threats, Weak / Strong passwords and password cracking, Insecure Network connections, Digital Signature. - Cyber Security: Cybersecurity definition, Cybercrime: Classification of Cybercrime: a)Email spoofing b) Spamming c) Identity Theft d) Online Fraud e) ATM Skimming f) Credit Card Fraud - Overview of Indian Information Technology Act 2002		

Reference Books:

1. Computer Fundamentals by: Anita Goel, Pearson Education India ISBN: 9788131742136
2. Connecting with Computer Science, by Greg Anderson, David Ferro, Robert Hilton, Course Technology, Cengage Learning, ISBN: 9781439080351
3. Fundamentals of Computer : For undergraduate courses in commerce and management, ITL Education Solutions Limited, Pearson Education, ISBN: 9788131733349
4. Introduction to Computer Science, 2/e, ITL Education Solutions Limited, Pearson Education, ISBN: 9788131760307
5. Frontiers of Electronic Commerce, Ravi Kalakota, Andrew B. Whinston, Pearson Education, ISBN: 9788177583922
6. Internet: The Complete Reference, Margaret Levine Young, Tata McGraw Hill Education Private Limited, ISBN: 9780070486997
7. On the Way to the Web: The Secret History of the Internet and Its Founders, A. Banks, Apress Publication, ISBN: 9781430208693
8. Computers and Commerce: A Study of Technology and Management at Eckert-Mauchly Computer Company, Engineering Research Associates, and Remington, Arthur L. Norberg, MIT Press (MA), ISBN: 9780262140904
9. Essential of E-commerce technology by V.Rajaraman, Prentice Hall India Learning Private Limited ISBN 9788120339378
10. Fundamentals of Computers by E. Balagurusamy, McGraw Hill
11. Computer Fundamentals by Priti Sinha, Pradeep K. Sinha, BPB Publications
12. Computer Networks - Andrew Tanenbaum (III Edition)
13. Complete Guide to Networking - Peter Norton
14. Data Communications & Networking - Behrouz Ferouzan (III Edition)
15. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives – Nina Godbole, SunitBelapure, Wiley: April 2011 India Publications Released.
16. Cyber Security Essentials- James Graham Richard Howard Ryan Olson

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: GE/OE Code: OE-152-CS-PR Course Title: Office Automation II		
Teaching Scheme 02 Hours:/ week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Prerequisites • Previous knowledge of Computer concepts is assumed. • Knowledge of Computer as operational tool is required.		
Course Objectives • To introduce the foundations of office automation especially Presentation Skills. • To develop the ability to prepare the well formatted powerpoint presentations. • To prepare the presentations using powerpoint presentation tools such as tables, figures, shapes, images, audio, video etc. • To prepare the presentations using advanced automated features such as animation, slide shows, etc.		
Course Outcomes On completion of the course, student will be able to : • Prepare the professional presentations • Explore various tools in the powerpoint presentation software. • Develop documents using powerpoint advanced tools.		
Course Contents		
Chapter 1	Chapter-Name: Introduction to Presentation.	Hours: 05
• Opening new presentation, • Different presentation templates, • Setting backgrounds, • Selecting presentation layouts		
Chapter 2	Chapter-Name: Creating and Formatting Presentation	Hours: 08
• Presentation style, • Adding text to the Presentation. • Adding style • Colour, gradient fills • Arranging objects • Adding Header & Footer • Slide Background, Slide layout		
Chapter 3	Chapter-Name: Adding Graphics and effects to Presentation	Hours: 12
• Inserting pictures, movies, tables etc into presentation, • Drawing Pictures using Draw • Setting Animation • Transition Effect		

Chapter 4	Chapter-Name: Printing and showing a presentation	Hours: 05
● Printing Handouts ● Generating Standalone Presentation viewer ● Presenting the presentation using various styles		
Reference Books : 1. Microsoft Powerpoint by James Holler 2. Powerpoint for dummies, office 2021 Edition Doug Lowe 3. Learn Microsoft Office 2019 by Linda Foulkes		

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – II Course Type: GE/OE Code: OE-153-CS-PR Course Title: Introduction to Google Apps II		
Teaching Scheme 02 Hours:/ week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Prerequisites • Basic knowledge of Computer concepts is assumed. • Knowledge of Computer as operational tool is required. • Knowledge of Internet is required		
Course Objectives • To introduce the specialized Google tools. • To develop the ability to analyses and use the tools effectively and skillfully		
Course Outcomes On completion of the course, student will be able to : • Use the google tools for the day to day life • Explore various applications available in the google tools. • Develop the skills to implement the skills available in the google tools.		
Course Contents		
Chapter 1	Chapter-Name: Creating You Tube Channel	Hours: 10
• Creating a you tube channel • Managing the channel, permissions, playlists, etc • Uploading the videos on the channel • Live Streaming		
Chapter 2	Chapter-Name: Creating a website	Hours: 10
• Creating a website • Managing home page • Creating Menus on the website • Adding pages to the site • Setting up themes • Adding tools such as tables, placeholders, hyperlinking, buttons, maps, etc • Publishing a site		
Chapter 3	Chapter-Name: Google Classroom	Hours: 10
• Creating Google classroom • Creating a class • Streaming a class • Adding students to class • Adding class work : assignments, quiz, question, material, etc • Giving grades to the assignments • joining a class (from student side)		

Reference Books:

1. Complete Beginners guide to Google Apps Script by Daniel Lawrie.
2. Google Apps made easy by James Bernstein
3. My Google Apps by Sherry Kinkoph Gunter

The Poona Gujarati Kelvani Mandal's Haribhai V. Desai College of Arts, Science and Commerce, Pune. (Autonomous) F.Y.B.Sc. (Computer Science) Sem – I Course Type: SEC Code: SEC-151-STS-PR Course Title: Statistical Methods for Computer Science-II		
Teaching Scheme 04 / week	No. of Credits 2	Examination Scheme IE : 15 marks UE: 35 marks
Course Objective At the end of this course students are expected to be able: 1. To fit second-degree curve, and exponential curves. 2. To estimate trend by using time series data. 3. To understand concept of probability. 4. To estimate probabilities of standard probability distributions 5. To perform tests based on normal, Chi-Square, t and F distributions.		
Course Contents		
Sr. No.	Title of the experiment	No. of Experiments
1.	Fitting of second-degree curve $Y = a + bX + cX^2$ using MS-Excel. (Use of scatter plot for explaining the nonlinear relationship between two variables)	01
2.	Fitting of exponential curve of type $Y = abx$, $Y = aXb$ using MS-Excel. (Use of scatter plot for explaining the nonlinear relationship between two variables)	01
3.	Time Series- Estimation of trend by using the method of moving averages using MS-Excel by using regular formula method and by direct command.	01
4.	Time Series- Estimation of trend by using exponential smoothing using MS-Excel by regular formula and by direct command.	01
5.	Problems on probability theory ($P(A \cup B)$, $P(A' \cup B')$, $P(A' \cap B)$, $P(A \cap B')$). Use Venn diagram whenever possible.	01
6.	Computation of probability values for Normal distribution and Chi-square distribution using MS Excel command.	01
7.	Computation of probability values for t distribution and F distribution using MS Excel command.	01
8.	Test for means: i) $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0$, $H_1: \mu > \mu_0$, $H_1: \mu < \mu_0$ when σ is known. ii) $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2$, $H_1: \mu_1 > \mu_2$, $H_1: \mu_1 < \mu_2$ when σ is known Test for proportion:	01

	i) $H_0: P = P_0$ against $H_1: P \neq P_0, H_1: P > P_0, H_1: P < P_0$. ii) $H_0: P_1 = P_2$ against $H_1: P_1 \neq P_2, H_1: P_1 > P_2, H_1: P_1 < P_2$	
9.	Test based on students t-distribution: i) $H_0: \mu = \mu_0$ against $H_1: \mu \neq \mu_0, H_1: \mu > \mu_0, H_1: \mu < \mu_0$ when σ is unknown. ii) $H_0: \mu_1 = \mu_2$ against $H_1: \mu_1 \neq \mu_2, H_1: \mu_1 > \mu_2, H_1: \mu_1 < \mu_2$ when σ is unknown iii) Paired t-test	01
10.	Test based on χ^2 distribution: i) Goodness of fit ii) Independence of attributes (2 x 2). iii) Independence of attributes (2 x 3 or 3 x 2 or 3 x 3)	01
11.	Tests based on F-distribution: i) $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 \neq \sigma_2^2, H_1: \sigma_1^2 > \sigma_2^2, H_1: \sigma_1^2 < \sigma_2^2$, known means ii) $H_0: \sigma_1^2 = \sigma_2^2$ against $H_1: \sigma_1^2 \neq \sigma_2^2, H_1: \sigma_1^2 > \sigma_2^2, H_1: \sigma_1^2 < \sigma_2^2$, unknown means	01
12.	Project (Part-II) - Analysis of data collected in semester-I	01

Note:

1. Every practical is equivalent to four theory lectures per batch per week
2. One hour is reserved for theory explanation of corresponding practical.
3. For project, a group of maximum 8 students be made. All the students in a group are given equal marks for project. Different data sets from primary or secondary sources may be collected.

Reference:-

1. Agarwal B. L. (2003). Programmed Statistics, 2nd edition, New Age International Publishers, New Delhi.
2. Brase C. H., Brase C. P (2016). Understandable Statistics, Concepts and Methods, 12th Edition, Cengage Learning.
3. Freedman D., Pisani R., Purves R. (2007). Statistics, 4th Edition, W. W. Norton and Company.
4. Gupta S.C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics, 8th Edition, Sultan Chand and Sons Publishers, New Delhi.
5. Hoel P. G. (1971). Introduction to Mathematical Statistics, John Wiley and Sons, NewYork.
6. Frag Curtis (2013). Step by Step Microsoft Excel 2013, MS Press.
7. Frye Curtis D. (2007). Step by step Microsoft Office Excel 2007, Microsoft Press.
8. John Walkenbach (2013). 101 Excel 2013 Tips, Tricks and Time savers, Wiley.
9. Kumar Bittu (2013). Microsoft Office 2010, V & S Publishers .Dorling Kindersley Publishing, Inc.

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

Eligibility:

H.S.C. (10 + 2) Science stream with Mathematics.

OR

Three years diploma course after S.S.C. (10th std.) of Board of Technical Education conducted by Government of Maharashtra or its equivalent.

Objectives:

- To develop problem solving abilities using a computer.
- To build the necessary skillset and analytical abilities for developing computer-based solutions for real life problems.
- To train students in professional skills related to the Software Industry.
- To prepare the necessary knowledge base for research and development in Computer Science.
- To help student's build up a successful career in Computer Science and to produce entrepreneurs who can
- Innovate and develop software products.

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Workload

1. Each theory credit is equivalent to 15 clock hours of teaching (i.e. for 2 Credits – 30 Clock Hours) and each practical credit is equivalent to 30 clock hours (i.e. for 2 Credits – 60 Clock Hours) of teaching in a semester.
2. There is 15 weeks of teacher-student interaction during the semester.
3. The 15 week is divided into 12 weeks teaching and 3 weeks for continuous assessment including preparation time to students during the semester.
4. The workload will be calculated based on 12 weeks teaching only.
5. For the purpose of computation of work-load the following mechanism may be adopted as per UGC guidelines.
6. Workload as per credit is as follows:
 - i. 1 Credit = 1 Theory period of one hour duration per week.
 - ii. 1 Credit = 1 Tutorial period of one hour duration per week.
 - iii. 1 Credit = 1 Practical period of two-hour duration per week.
7. Each theory Lecture time for FY, SY, TY is 60 min. (3 Lectures per week for 2 credit courses)
8. Each practical session time for FY/ SY /TY is 4 hours i.e. 240 min.

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Structure of UG Program as per NEP-2020**Program Name: - B.Sc. (Computer Science)****Major Course: - Computer Science****Credit Framework**

Level /Difficulty	Sem	Subject- 1				Subject- 2	Subject- 3	GE/ OE	SEC	IKS	AEC	VEC	CC	Total
4.5/100	I	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(T)	2(T/P)	2(T) Generic	2(T)	2	-	22
	II	2(T)+2(P)				2(T)+2(P)	2(T)+2(P)	2(P)	2(T/P)	-	2(T)	2	2	22
Exit Option: Award of UG <i>Certificate</i> in Major with 44 credits and an additional 4 credits core NSQF Course/Internship OR Continue with Major and Minor Continue Option: Student will select one subject among the (Subject-1, Subject-2, and Subject-3) as major and another as minor and third subject will be dropped.														
Level /Difficulty	Sem	Credits related to major				Minor		GE/ OE	SEC	IKS	AEC	VEC	CC	Total
		Discipline Specific Core (DSC) Major Core	Discipline Specific Elective (DSE) Major Elective	VSC	FP/ OJT /CEP									
5.0/200	III	4(T)+2(P)	-	2(T/P)	2 (FP)	4(T)+2(P)	-	2(T)	-	-	2(T)	-	2	22
	IV	4(T)+2(P)	-	2(T/P)	2(CEP)	2(T)+2(P)	-	2(P)	2(T/P)	-	2(T)	-	2	22
Exit Option: Award of UG <i>Diploma</i> in Major and Minor with 88 credits and an additional 4 credits core NSQF Course/Internship OR Continue with Major and Minor.														
5.5/300	V	8(T)+4(P)	2(T)+2(P)	2(T/P)	(FP/ CEP)	-	-	-	-	2(T)	-	-	-	22
	VI	8(T)+4(P)	2(T)+2(P)	2(T/P)	4(OJT)	-	-	-	-	-	-	-	-	22
Total 3 Years		44	8	8	10	18	8	8	6	4	8	4	6	132
Exit Option: Award of UG <i>degree</i> in Major with 132 credits OR Continue with Major and Minor.														
6.0/400	VII	6(T)+4(P)	2(T)+2(P)	-	4(RP)	4(T)(RM)	-	-	-	-	-	-	-	22
	VIII	6(T)+4(P)	2(T)+2(P)	-	8(RP)	-	-	-	-	-	-	-	-	22
Total 4 Years		64	16	8	22	22	8	8	6	4	8	4	6	176
Exit Option: Award of UG <i>Honors with Research</i> Degree in Major and Minor with 176 credits. -OR-														
6.0/400	VII	10(T)+4(P)	2(T)+2(P)	-	-	4(T)(RM)	-	-	-	-	-	-	-	22
	VIII	10(T)+4(P)	2(T)+2(P)	-	4(OJT)	-	-	-	-	-	-	-	-	22
Total 4 Years		72	16	8	14	22	8	8	6	4	8	4	6	132
Exit Option: Award of UG <i>Honors Degree</i> in Major and Minor with 176 credits.														

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Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

Reference Books

1. Computer

1. How to Solve it by Computer – R.G. Dromey, Pearson Education
2. Problem Solving and Programming Concept – Maureen Sprankle, 7th Edition, Pearson Publication
3. C: The Complete Reference – Schildt Herbert, 4th Edition, McGraw Hill
4. A Structured Programming Approach Using C – Behrouz A. Forouzan, Richard F. Gilberg, Cengage Learning India
5. The 'C' Programming Language – Brian Kernighan, Dennis Ritchie, PHI
6. Programming in C: A Practical Approach – Ajay Mittal, Pearson
7. Programming with C – B. Gottfried, 3rd Edition, Schaum's Outline Series, Tata McGraw Hill
8. Programming in ANSI C – E. Balagurusamy, 7th Edition, McGraw Hill

2. Mathematics:

1. Elementary Linear Algebra with Supplemental Applications – Howard Anton & Others, Wiley Student Edition
2. Matrix and Linear Algebra (Aided with MATLAB) – Kanti Bhushan Datta, Eastern Economic Edition
3. Fundamentals of Python First Programs – Kenneth A. Lambert, 2nd Edition
4. Beginning Python from Novice to Professional – Magnus Lie Hetland, 3rd Edition
5. A First Look at Graph Theory – John Clark & Derek Holton, Allied Publishers
6. Graph Theory with Applications to Computer Science and Engineering – Narsingh Deo, Prentice Hall
7. Elements of Discrete Mathematics – C.L. Liu, Tata McGraw Hill

3. Electronics:

1. Electronic Devices and Circuits I – T.L. Floyd, PHI, 5th Edition
2. Principles of Analog Electronics – A.P. Malvino
3. A Textbook of Applied Electronics – R.S. Sedha, S. Chand & Company Ltd
4. Sensors and Transducers – D. Patranabis, PHI, 2nd Edition
5. Sensors and Transducers – Prof. A.D. Shaligram
6. Op-Amp and Linear Integrated Circuits – Ramakant Gaikwad
7. Digital Design – M. Morris Mano, PHI

8. Digital Systems: Principles and Applications – Ronald J. Tocci
9. Digital Electronics – G.K. Kharate, Oxford University Press
10. Fundamentals of Digital Circuits – Anand Kumar
11. Digital Principles and Applications – Malvino & Leach, Tata McGraw Hill

4. Open Elective/ General Elective

1. Computer Fundamentals – Anita Goel, Pearson Education India
2. Connecting with Computer Science – Greg Anderson, David Ferro, Robert Hilton, Cengage Learning
3. Fundamentals of Computer (For Undergraduate Courses) – ITL Education Solutions Limited, Pearson
4. Introduction to Computer Science – ITL Education Solutions Limited, Pearson
5. Frontiers of Electronic Commerce – Ravi Kalakota, Andrew B. Whinston, Pearson
6. Internet: The Complete Reference – Margaret Levine Young, Tata McGraw Hill
7. On the Way to the Web – A. Banks, Apress Publication
8. Computers and Commerce – Arthur L. Norberg, MIT Press
9. Essentials of E-commerce Technology – V. Rajaraman, Prentice Hall India
10. Fundamentals of Computers – E. Balagurusamy, McGraw Hill
11. Computer Fundamentals – Priti Sinha, Pradeep K. Sinha, BPB Publications
12. Illustrated Microsoft Office 365 & Word 2019 Comprehensive – Jennifer Duffy
13. Microsoft Word 365 2019 – Joan Lambert
14. Microsoft Word 2013 Bible – Lisa A. Bucki
15. Complete Beginners Guide to Google Apps Script – Daniel Lawrie
16. Google Apps Made Easy – James Bernstein
17. My Google Apps – Sherry Kinkoph Gunter
18. Computer Networks – Andrew Tanenbaum (III Edition)
19. Complete Guide to Networking – Peter Norton
20. Data Communications & Networking – Behrouz Ferouzan (III Edition)
21. Cyber Security: Understanding Cyber Crimes, Computer Forensics & Legal Perspectives – Nina Godbole, Sunit Belapure, Wiley
22. Cyber Security Essentials – James Graham, Richard Howard, Ryan Olson
23. Microsoft PowerPoint – James Holler
24. PowerPoint for Dummies, Office 2021 Edition – Doug Lowe
25. Learn Microsoft Office 2019 – Linda Foulkes

5. Statistics:

1. Understandable Statistics: Concepts and Methods – C.H. Brase, C.P. Brase, 12th Edition, Cengage Learning
2. Statistics – Freedman D., Pisani R., Purves R., 4th Edition, W.W. Norton & Company
3. Modern Elementary Statistics – J.E. Freund, 4th Edition, Prentice Hall India
4. Statistical Methods – G.W. Snedecor, W.G. Cochran, John Wiley & Sons
5. Fundamentals of Statistics (Vol. 1) – A.M. Goon, M.K. Gupta, B. Dasgupta, 6th Revised Edition, The World Press Pvt. Ltd.

6. Fundamentals of Mathematical Statistics – S.C. Gupta, V.K. Kapoor, 8th Edition, Sultan Chand & Sons
7. Programmed Statistics – B.L. Agarwal, 2nd Edition, New Age International Publishers
8. Introduction to Mathematical Statistics – P.G. Hoel, John Wiley & Sons
9. Step by Step Microsoft Excel 2013 – Curtis D. Frye, Microsoft Press
10. Step by Step Microsoft Office Excel 2007 – Curtis D. Frye, Microsoft Press
11. 101 Excel 2013 Tips, Tricks & Time Savers – John Walkenbach, Wiley
12. Microsoft Office 2010 – Bittu Kumar, V&S Publishers

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Structure of UG Program as per NEP-2020

Program Name: - B.Sc. (Computer Science)

Major Course: - Computer Science

Examination Pattern

1. Examination pattern is 70-30 i.e. Semester End Examination (SEE) is of 70 % and Continuous Internal Assessment is of 30 %.

Theory, Practical/Project: -

Continuous Internal Assessment (CIA): 30 % [15 Marks]

1. Written Test- 33.33 % [5 Marks]
2. Presentation/Assignment: - 33.33 % [5 Marks]
3. Project/Activity Oriented Learning: -33.34 % [5 Marks]

Semester End Examination (SEE): - 70 % [35 Marks]

2. For Internal examination, written test should be conducted of 15 marks for 2 credits.

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Paper Pattern

Internal Examination

(15 Marks Examination converted into 5 Marks for final assessment)

Que-1: Choose correct option (MCQs) (10-MCQs with Multiple Options) – **5 Marks.**

Que-2: Answer the following questions (Short answer questions) (any 3 out of 5)- **6 Marks**

Que-3: Answer the following questions (Short answer Definition/Problems/Diagram) (any 1 out of 2)– **4 Marks.**

External Examination

Que-1: [5 Marks]

Answer the following questions (Short answer/Definition/Problems/Diagram, etc.) (Any 5 out of 7)

Que-2: [10 Marks]

A] Answer the following questions (Short answer questions- 2 Que out of 3) [6 Marks]

B] Answer the following questions (Long answer questions/Problems- 1 Que out of 2) [4 Marks]

Que-3: [10 Marks]

A] Answer the following questions (Short answer questions- 2 Que out of 3) [6 Marks]

B] Answer the following questions (Long answer questions/Problems- 1 Que out of 2) [4 Marks]

Que-4: [10 Marks]

Write a short notes on following (4 out of 6)

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Completion of Degree

1. A student who earns 44 credits at First year with additional 4 credits core NSQF Course/Internship shall be eligible for the award of UG Certificate in Major subject. OR May continues with Major and Minor.
2. A student who earns 88 credits at Second year with additional 4 credits core NSQF Course/Internship shall be eligible for the award of UG Diploma in Major subject with Minor (Selected at SY). OR May continues with Major and Minor.
3. A student who earns 132 credits at Third year shall be eligible for the award of UG Degree in Major subject with Minor (Selected at SY). OR May continues with Major and Minor.
4. A student who earns 176 credits in Four years shall be eligible for the award of UG Honors or Honors with Research in Major subject with Minor (Selected at SY).

Award of Degree:

CGPA will be calculated for students who completed 132/176 credits, grades are given as per the following table.

Sr. No.	Grade Letter	Grade Point	Marks
1.	O (Outstanding)	10	90<= Marks <= 100
2.	A+ (Excellent)	9	75<= Marks <= 89
3.	A (Very Good)	8	60<= Marks <= 74
4.	B+ (Good)	7	55<= Marks <= 59
5.	B (Above Average)	6	50<= Marks <= 54
6.	C (Average)	5	45<= Marks <= 49
7.	D (Pass)	4	40<= Marks <= 40
8.	F (Fail)	0	Marks <40
9.	AB (Absent)	0	-
