Karmaveer Bhaurao Patil University,

Satara

Syllabus for

B. Sc. I Computer Science

Under

Faculty of Science and Technology

(As per NEP 2020)

With effect from Academic Year 2024-2025

Department of Computer Science

Syllabus for Bachelor of Science (Computer Science) Part I

1. **TITLE:** COMPUTER SCIENCE

2. **YEAR OF IMPLEMENTATION:** New Syllabi for the B.Sc. I Computer Science will be implemented from June 2024 onwards.

3. **PREAMBLE:**

Bachelor of Science is an integrated academic degree in the faculty of science. The revision of existing syllabus of Computer Science subject in Science Faculty is essential. This is a humble endeavor to initiate the process towards an era of knowledge. The students from science faculty should also be competent for this change in the technology. In this year, a student will able to handle computers, develop the programs in languages and other peripherals with confidence. In the subject, the student will also get a basic and proper knowledge in the field of Programming skills.

4. **GENERAL OBJEVTIVES OF THE COURSE:**
   1) To learn basics of Computer, hardware, software, networking.
   2) To inculcate the software development attitude and generate interest in the field of Technology.
   3) To develop programming skills, management skills, writing skills, Project Analysis skill among students.
   4) To inculcate research attitude among students.

5. **DURATION:**
   - The course shall be a full-time course.

6. **PATTERN:** Semester Examination

7. **MEDIUM OF INSTRUCTION:** English

Karmaveer Bhaurao Patil University, Satara
NEP 2020 (2.0) Programme Structure 2024-25

Name of the Department: Computer Science (Opt)
Course level: - Under Graduate (UG) B.Sc. I

B. Sc. (Computer Science) Part-I

Semester: I				
Sr. No.	**Components**	**Course Code**	**Name of the Paper**	**Credits**
1	DSC -I	BCST 111	C- Programming I	2
	DSC -II	BCST 112	Database Management Systems	2
	DSC **(P)** -I	BCSP 113	Lab Based on BCST 111 and BCST 112	2
2	DSC -I	BCST 114	Fundamental of Electronics and Network Analysis	2
	DSC -II	BCST 115	Digital Electronics-I	2
	DSC **(P)** -I	BCSP 116	Lab Based on BCST 114 and BCST 115	2
3	DSC -I	BCST 117	Discrete Mathematics	2
	DSC -II	BCST 118	Descriptive Statistics	2
	DSC **(P)** -I	BCSP 119	Lab Based on BCST 117 and BCST 118	2
4	Open Elective	BCSTOE 1	Public Administration-I	2
5	Generic	BCSTIKS 1	Introduction to Indian knowledge System	2
			Total	**22**

Semester: II				
Sr. No.	**Components**	**Course Code**	**Name of the Paper**	**Credits**
1	DSC –III	BCST 121	C- Programming II	2
	DSC –IV	BCST 122	Relational Database Management Systems	2
	DSC **(P)** -II	BCSP 123	Lab Based on BCST 121 and BCST 122	2
2	DSC –III	BCST 124	Semiconductor Devices	2
	DSC –IV	BCST 125	Digital Electronics-II	2
	DSC **(P)** -II	BCST 126	Lab Based BCST 124 and BCST 125	2
3	DSC –III	BCST 127	Graph Theory	2
	DSC –IV	BCST 128	Probability and probability distribution	2
	DSC **(P)** -II	BCSP 129	Lab Based on BCST 127 and BCST 128	2
4	Open Elective	BCSTOE2	Public Administration-II	2
5	VEC I	BCSTVEC 1	Democracy, Election and Indian Constitution	2
			Total	**22**

Syllabus – DSC I

B.Sc. I- Semester-I

Theory: Course I: Paper I: BCST111: C Programming-I

Course Objectives: Students should be able to…

1. learn adequate knowledge on the need of programming languages.
2. understand the need of problem-solving techniques.
3. identify programming skills using the fundamentals and basics of C Language.
4. define algorithms and flowchart of programs in C and to solve the problems.

Credits=2	**SEMESTER-I** **Paper I: BCST111: C Programming-I**	**No. of hours perunit/ Credits (30)**
UNIT I	**Computer fundamentals and Introduction to 'C' language**	(8)
	1.1 Types of Computers, Basic Organization of a Digital Computer; Number Systems, Input and Output Devices: Keyboard, mouse, touchscreen, joystick, scanner, web camera, MICR, OCR, OMR, bar-code reader, monitor, printer, plotter. 1.2 Memory: Primary, secondary, auxiliary memory; RAM, ROM, cache memory, magnetic tape, Algorithm, Characteristics, Flowcharts, Definition, Symbol, features. 1.3 History of 'C' language, Structure of 'C' programs, 'C' Tokens, Character set and keywords, Constant and its type. 1.4 Variable and its type, Data types, Operators and its types, Input/output using standard functions.	
UNIT II	**Branching and Looping**	(8)
	2.1 Conditional branching, if, if else, else if ladder, switch, Nested statements. 2.2 Looping – for, while, do-while statements. 2.3 Unconditionalcontrol statements- go to, break and continue.	
UNIT III	**Functions in C**	(7)
	3.1 Definition, types & parts of functions, Local and global variable. 3.2 Library functions and User defined functions, passing arguments to afunction, return statement, recursion, Scope and lifetime of variables. 3.3 Storage classes-Auto, Extern, Register, Static.	
UNIT IV	**Arrays in C**	(7)
	4.1 Array definition and declaration, initialization of arrays. 4.2 Types of arrays. 4.3 String handling functions. 4.4 Arrays and functions.	

Course Outcomes: Students will be able to…

1. analyze algorithm writing and flowchart drawing.
2. apply the compilation process and execution of any C Program.
3. explore the use of Functions and Arrays to solve in real life applications.
4. compute the use of Arrays to solve in real life applications.

Reference Books:

1. Yashwant Kanetkar (2018) Let Us C, BPB Publications, Edition 18
2. Peter Prinz and Tony Crawford (2016) C in a Nutshell (2nd Ed.)
3. Jeri R. Hanly and Elliot B. Koffman (2009)Problem Solving and Program Design in C (6th Edition)
4. E. Balagurusamy (2008) Programming in ANSI C, McGraw Hill Education Edition 6
5. Peter van der Linden (1994)Expert C Programming: Deep C Secrets
6. Brian Kernighan and Dennis Ritchie (1988) The C Programming Language –, Pearson Education India, Edition 2

B.Sc. I

Theory: Course I: BCST112: Database Management Systems

Course Objectives: Students should be able to…

1. learn fundamental concepts of data.
2. understand principles of databases.
3. identify the database management operation.
4. discuss the concept of procedure oriented, object-oriented programming languages, Database Management.

Credits=2	**SEMESTER-II** **Paper II: BCST112: Database Management Systems**	**No. of hours perunit/ Credits (30)**
UNIT I	**Introduction to Database Management Systems**	(8)
	1.1 Definition of Database. 1.2 Characteristics of database approach. 1.3 Data models, Importance of data models, ER Model, Relational Model, Network Model, Hierarchical Model, Object Oriented Model. 1.4 Concept of DBMS, DBMS architecture. 1.5 Data independence	
UNIT II	**Entity Relationship Modeling and Relational Data Model**	(7)
	2.1 Entities, Attributes and Entity Sets. 2.2 Relation and Relationships sets. 2.3 Features of E-R Model Relational Model - Basic concepts. 2.4 Types of constraints (relational constraints). 2.5 DFD and its Types, ERD and types of relationship.	
UNIT III	**Relational Algebra and Relational Calculus**	(7)
	3.1 Preliminaries, Relational algebra operators. 3.2 Operations on Relational Algebra Select, Project, Union, Set different, Cartesian product, Rename. 3.3 Operations on Relational Calculus- Tuple Relational Calculus, Domain Relational Calculus	
UNIT IV	**Basics of Structured Query Language**	(8)
	4.1 Basic SQL Queries – DDL (Create, Alter, Drop) Commands. 4.2 DML (Insert, Update, Delete) Commands, Select Statement. 4.3 Constraints (Primary Key, Foreign Key, Unique Key, Null, Check, Default, Super Key, Candidate Key). 4.4 Datatypes, Operators, Functions.	

Course Outcomes: - students will able to…

1. apply the basics of data, information, system and Database.
2. evaluate basics of different database models for software development.
3. design the basics of Relational algebra operations and Relational Calculus.
4. demonstrate SQL basics and write queries to perform different operations on real world data.

Reference Books:

1. R. Elmasri, S.B. Navathe, (2010), Fundamentals of Database Systems 6th Edition,Pearson Education.
2. R. Ramakrishanan, J. Gehrke, (2002), Database Management Systems 3rd Edition, McGraw-Hill.
3. Silberschatz, H.F. Korth, S. Sudarshan, (2010), Database System Concepts 6th Edition, McGraw Hill SQL, PL/SQL
4. The Programming Language of ORACLE – Ivan Bayross. BPB publication 4thEdition

Lab Course I: BCSP113: Lab (based on BCST111 and BCST112)

Course Objectives: students should be able to…

1. learn basic concepts of C language.
2. understand skills for writing complex programs using 'C'.
3. study of concept of normalization, Transaction Processing and to learn File Structure and Indexing.
4. identify the different types of SQL queries performed on data.

Credits=2	SEMESTER-I **BCSP113: Lab (based on BCST111 and BCST112)**	No. of hours per unit/ Credits (30)
Part A:	**C Programming- I**	
	1. Write a program to accept 5 subject marks and calculate total marks, percentage and grade of student. 2. Write program to perform arithmetic operations. 3. Write a program to input n numbers and find the Odd and Even numbers. 4. Write a program to check number is positive and negative. 5. Write a program to find an age of a person (Input birth date and today date). 6. Write a program to find the sum of first n natural numbers. 7. Write a program to accept the range and generate Fibonacci Series. 8. Write a program to find prime numbers between given range. 9. Write a program to calculate sum of numbers using simple function. 10. a program to find prime number using function. 11. Write a program to calculate factorial of number using Recursion. 12. Write a program to enter array elements and perform arithmetic operations 13. Write a program to sort the numbers in ascending and descending order using array. 14. Write a program to find the product of given two matrices. 15. Write a program to create a function to find the given number is Armstrong or not.	

Part B:	Database Management Systems	
	16. Create table Student, Teacher, Book_dtls, Product and perform all DDL and DML Commands. 17. Perform calculations on above created tables Condition specification using Boolean and comparison operators (and, or, not, =, <>,>, <,>=, <=) 18. Use Aggregate functions and String handling functions. 19. Create table and apply all constraints. a. Create tables with relevant foreign key constraints b. Populate the tables with data c. Display all the details of all employees working in the company and solve the following queries. d. Display ssn, lname, fname, address of employees who workin department no 7. e. Retrieve the birthdate and address of the employee whose name is 'Franklin T. Wong' f. Retrieve the name and salary of every employee g. Retrieve all distinct salary values h. Retrieve all employee names whose address is in 'Bellaire' i. Retrieve all employees who were born during the 1950s 20. Retrieve all employees in department 5 whose salary is between 50,000 and 60,000(inclusive)	

Course Outcomes: - Students will be able to…

1. evaluate software's available for C programming and use the editor for writing Program.
2. explain and write algorithms, flowcharts and programs on operators, conditional branching, looping, functions and arrays.
3. create and write queries for any application software and able to handle database.
4. acquire the database commands and management skills

Reference Books:

1. Yashwant Kanetkar (2018) Let Us C, BPB Publications, Edition 18
2. Peter Prinz and Tony Crawford (2016) C in a Nutshell (2nd Ed.)
3. Ivan Bayross, (2012) SQL, PL/SQL The Programming Language of ORACLE BPBpublication 4th Edition.
4. R. Elmasri, S.B. Navathe, (2010), Fundamentals of Database Systems 6thEdition, Pearson Education
5. A. Silberschatz, H.F. Korth, S. Sudarshan, (2010), Database System Concepts 6th Edition,McGraw Hill.
6. Jeri R. Hanly and Elliot B. Koffman (2009)Problem Solving and Program Design in C (6th Edition)
7. R. Ramakrishanan, J. Gehrke, (2002), Database Management Systems 3rd Edition,McGraw-Hill.

Syllabus – DSC II

B.Sc. I- Semester-I

Theory: BCST114: Fundamental of Electronics and Network Analysis Course

Objectives: Students should be able to …

1. Learn the fundamentals of electronic circuits.
2. Study and verify different and theorems
3. Summarize Two Port Networks.
4. Understand dc and ac circuits

(Total Credits 2)	**SEMESTER-I** **Fundamental of Electronics and Network Analysis**	**No. of Lectures per unit (30)**
UNIT – I	**Circuit Elements**	**(08)**
	● Introduction, Classification ● Resistors, Capacitor, Inductor: Introduction, Classification, Application's, Color coding, series and parallel Connections, Numerical problems. ● Transformer and Relays: Principle and construction, Types, Applications ● Switches: SPDT, DPDT etc. (Explanation using Symbols) ● Introduction to SMD component.	
UNIT – II	**Network Theorems**	**(07)**
	● Ohm's Law, Kirchhoff's Laws (KCL and KVL), and Numerical problems. ● Theorems: Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum Power Transfer Theorem, Numerical problems based on these network theorems and Numerical problems.	
UNIT - III	**Network Analysis**	**(08)**
	● Two Port Networks: z, y and h parameters and their conversion, Numerical problems ● Star and Delta network, Star to Delta Conversion, and Delta to Star Conversion, Numerical problems,	
UNIT - IV	**Fundamental of AC Circuits**	**(07)**
	● Introduction AC, DC Sources, Voltage and Current Sources, Direction of current and voltage, Comparison AC and DC Sources ● Concept of Power, Instantaneous value, Peak, Peak to Peak, Root Mean Square and Average Values, Phase Difference, ● Voltage-Current Relationship: Resistor, Inductor and Capacitor, Sinusoidal Circuit Analysis for RC circuit. ● Resonance: Series and Parallel RLC Circuits, Frequency Response, Quality (Q) Factor and Bandwidth	

Course Outcome: Students will be able to…

1 Identify active and passive components and understand basic circuit theory
2 Evaluate mesh and nodal analysis of ac and dc circuits.
3 Solve & minimize complex electronic circuits.
4 Design a resonance circuit.

Reference Books:

1. R. S. Sedha, A Textbook of applied electronics, S. Chand Publication, (2003).
2. Sudhkar and S. P. Shyammohan, Circuits and Networks Analysis and Synthesis, Tata McGraw-Hill Publishing Company Limited, 3rd Edition, (2006).
3. B. L. Thereja, Basic Electronics Solid State, S. Chand & Company LTD, 4th Edition,(2004)
4. M. L. Soni & J. C. Gupta, A course in Electrical Circuits Analysis, Delhi Dhanpat Rai & Sons, (1979)
5. Charles K. Alexander, Matthew N. O. Sadiku, Fundamentals of Electric Circuits, McGraw-Hill Education (INDIA) PVT. LTD, (2008)
6. B. L.Thereja, A. K. Thereja, A Textbook of Electrical Technology Volume 1 Basic Electrical Engineering, S. Chand & Company LTD,1st Multicolor Edition, (2005)
7. M. Nahvi and J. Edminister, Theory and Problems of Electric Circuits, Schaum's outline series, McGraw-Hill Book Company,1st Edition, (2005)

B.Sc. I- Semester-I

Theory: BCST115: Digital Electronics-I

Course Objectives: Students should be able to…

1. Learn and verify various number systems.
2. Study logic gates and Boolean algebra.
3. Classify different logic families.
4. Understand the concept of combinational logic circuits.

(Total Credits 2)	**Digital Electronics-I**	**No. of Lectures per unit**
UNIT - I	**Number System and Binary Codes**	**(07)**
	● Number System: Introduction, Decimal, Binary, Octal and Hexadecimal number systems, and there interconversion, One's and two's complements, Rules of Binary Addition, Subtraction. Signed and Unsigned numbers, ● Binary Codes: BCD, Excess-3 Code, Gray, ASCII code, Parity Code, Hamming Code.	
UNIT - II	**Logic Gates and Boolean Algebra**	**(07)**
	● Study of Basic Gates, Study of Derived Gates, Universal gates (NOR and NAND), De-Morgan's Theorems ● Boolean algebra and Logic Gates: Introduction to Boolean Algebra and Boolean operators, Standard representation of logic functions (SOP and POS), simplification of logic equation using Boolean algebra. ● Karnaugh map Techniques	
UNIT - III	**Digital Logic Families**	**(08)**
	● Bipolar and MOS Integrated circuits: Characteristics, limitations and applications. ● Analysis of digital logic families: TTL, MOS, CMOS Inverters. ● Interfacing between logic families; various logic functions and their implementation. ● Comparison of CMOS and TTL logic families.	

UNIT - IV	Combinational Logic Design	(08)
	• Multiplexers: Introduction, 4 to 1, 8 to1, Study of IC 74151/74153, Application • Demultiplexer: Introduction, 1 to 4, 1 to 8, Study of IC 74139, Application • Code Convertor: Introduction, Encoder, Decimal to Binary/BCD encoder, Octal to Binary/BCD encoder, Decoder, BCD to 7 Segment decoder, Study of IC 7446/47 Application • Arithmetic Circuits: Adder, Subtractor, ALU.	

Course Outcomes: The students will be able to…

1 Solve the problems related to interconversion of number system and design
2 Develop logic circuits using logic gates and Boolean algebra.
3 Analyze different logic families.
4 Design combinational logic circuits

Reference Books:

1. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)
2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)
3. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
4. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Practical I: BCSP 116

Objectives: Students should be able to…

1. Identify basic electronics components and circuits.
2. Verify different laws and theorem for solving complex circuit to simplified circuit
3. Simplify the expressions using Boolean algebra and Learn logic gates.
4. Construct sequential and combinational logic circuits.

Total Credits 2	Semester I Practical I: BCSP117 (based on BCST115 and BCST116)		No. of Lectures (30)
Group A			
	1	Study of Electronics components and tools.	
	2	Study of Voltage sources in series and parallel	
	3	Study of Voltage and Current dividers.	
	4	Study of CRO: Measurement of Amplitude, frequency, and phase difference.	
	5	To verify Kirchhoff's Voltage and Current law.	
	6	To study and verification Thevenin's Theorem.	
	7	To study and verification Superposition Theorem.	
	8	To study and verification Norton's Theorem.	
Group B			
	1	To Study Code converters Binary to Gray and Gray to Binary.	
	2	To Study Logic gates. (IC 7400,7402,7404,7408,7432,7486)	
	3	To Verify the NAND and NOR gates as universal logic gates.	
	4	To Study Demorgan's theorem using gates.	

	5	To Design and verification of the truth tables of Half and Full adder circuits	
	6	Verification of the truth table of the Multiplexer 74150.	
	7	Verification of the truth table of the De-Multiplexer 74154.	
	8	Study of BCD to 7 Segment Decoder.	

Course Outcome: Students will be able to…

1 Utilize basic electronics components and circuits.
2 Apply the basic theory & mathematical relationships in electronic circuits.
3 Design, construct and verify logic circuits.
4 Develop combinational and sequential logic circuits

Reference Books:

1. R. S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley India edition, 2nd Edition, (2002)
3. Ben G Streetman and S. Banerjee, Solid State Electronic Devices, Pearson Education, 6th Edition, (2006).
4. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition, (2001)
5. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia, 5th Edition, (1994)
6. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
7. S. Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Syllabus – DSC III
Theory: BCST 117: Discrete Mathematics

Course Objectives: Students will be able to

1. develop a foundational understanding of key mathematical concepts including logic, divisibility in integers, counting principles, and relations.
2. apply logical reasoning, solve problems related to integer divisibility, utilize counting techniques.
3. analyze and solve combinatorial problems.
4. understand and apply various types of relations in mathematical contexts.

Credits=2	**BCST 117: Discrete Mathematics**	**No. of hours per unit/ credits (30)**
UNIT I	**Logic**	(6)
	1.1 Propositions and Logical connectives: Definition, Types of Propositions 1.2 Truth values and Truth Tables, Tautology and Contradiction 1.3 Logical equivalence, Rules of inferences 1.4 Valid arguments and proofs 1.5 Methods of Proofs: Direct and indirect Examples	
UNIT II	**UNIT II: Divisibility of integers**	(10)
	2.1 Introduction. 2.2 Divisibility: Division algorithm (Statement only), Greatest Common Divisor (GCD), Least Common Multiple (LCM). 2.3 Euclidean algorithm (Statement only), Prime numbers, Euclides Lemma Fundamental theorem of Arithmetic (without proof). 2.4 Congruence relation and its properties, Fermat's Theorem (Statement only). Examples. 2.5 Residue Classes: Definition, Examples, addition modulo n, multiplication modulo n.	

UNIT III	**UNIT III: Counting Principles**	(7)
	3.1 Functions: Definition, Types of mapping, Injective, Surjective & Bijective functions, Inverse function, Composition of functions. 3.2 Counting: Addition & Multiplication principle, Permutation and Combination. 3.3 Cardinality of finite set, Cardinality of union of sets (Addition principle). 3.4 Principle of Inclusion and Exclusion, Examples. 3.5Combinatorial Arguments, Pigeonhole Principle (Statement only), Examples.	
UNIT IV	**UNIT IV: Relations**	(7)
	4.1 Relations, Ordered pairs, Cartesian product. 4.2Types of relations, Equivalence relation, Partial ordering relation, Examples. 4.3 Digraphs of relations. 4.4 Matrix representation and composition of Relations, Examples. 4.5 Transitive closure, Warshall's algorithm, Examples. 4.6 Equivalence class, Partition of a set.	

Course Outcomes: At the end of this course, students should be able to:

1. understand Logic.
2. to solve the Divisibility Rules, govern by Integers.
3. choose and apply Counting Principles.
4. impart Relations and their Types.

Reference Books:

1. Elements of Discrete Mathematics by C.L. Liu
2. Discrete Mathematics by Olympia Nicodemi
3. Discrete Mathematical Structure for Computer Science by Alan Doer and K. Levasicur.
4. Discrete and Combinatorial Mathematics by R. m. Grassl
5. Algebra by S.R. Patil and Others Nirali Prakashan.
6. Algebra by Bhopatkar, Nimbkar, Joglekar, VISION Publication.
7. Algebra by Naik and Patil, PHADAKE Prakashan

Syllabus – DSC III

B. Sc. I – Semester – I

Theory: Paper VI: BCST 118: Descriptive Statistics I

Course Objectives: Students will be able to

1. introduce the technique of data collection & its presentation.
2. compute various measures of central tendencies, dispersion, moments, skewness, kurtosis and to interpret them.
3. introduce concept of correction coefficient and how to interpret its value.
4. establish relationship between two or more variables and predict the value by Regression analysis.

Credits=2	**Paper VI: BCST 118: Descriptive Statistics I**	**No. of hours per unit/ credits (30)**
UNIT I	**Data condensation and Measure of central Tendency**	(7)
	1.1 Definition and scope of Statistics, concept of statistical population sample, qualitative & quantitative data, variables. Scales of measurements: Nominal, Ordinal, Interval &Ratio. Collection and Summarization of univariate data and frequency distribution.	

	1.2 Data Presentation: Diagrammatic & graphical presentation with real applications- Pie diagram, line diagram. Simple, multiple & partial bar diagram, histogram, ogive curves 1.3 Mathematical and positional averages: Data Presentation: M, G.M, H.M, relation between them and their properties. Median, mode, partition values	
UNIT II	**Measures of Dispersion and moments, skewness and kurtosis**	(7)
	2.1 Measures of Dispersion: Range, Quartile deviation, Mean deviation, standard deviation, coefficient of variation. Various properties of these measures and their utility. 2.2 Raw and central moments, factorial moments, central moments in terms of raw moment's up to 4th order. 2.3 Definition of Measures of skewness: Bowley's coefficient, Karl Pearson's coefficient, measure of skewness based on moment Kurtosis: Definition, measures of kurtosis, Sheppard's correction	
UNIT III	**Correlation and Regression**	(8)
	3.1 Correlation: Bivariate data, Need of analysis of bivariate data, Concept of correlation between two variables, Types of correlation. Methods of studying correlation: 1) Scatter diagram, its utility, Covariance: Definition, Effect of change of origin and scale, 2) Karl Pearson's coefficient of correlation (r): Definition, Computation for ungrouped and grouped data. Properties: i) Interpretation for different values of r, ii) Effect of change of origin and scale, 3) Spearman's rank correlation coefficient: Definition, Computation (with and without ties). Derivation of the formula for without ties and modification of the formula for with ties. Illustrative examples. 3.2 Regression: Concept of regression, Lines of regression of Y on X ($Y=a + bX + \varepsilon$) and X on Y, fitting of lines of regression by the least square method, Regression coefficients and their geometric interpretations Properties, Derivation of acute angle between the two lines of regression.	
UNIT IV	**Multiple Correlation and Regression**	(8)
	4.1 Concept of multiple correlations. Definition of multiple correlation coefficient, derivation of formula for multiple correlation coefficient. Properties of multiple correlation coefficient, coefficient of multiple determination R1.23. 4.2 Concept of multiple linear regression, Plane of regression, Yule's notation, correlation matrix. Fitting of regression plane by method of least squares, definition of partial regression coefficients and their interpretation. Residual: definition, order, properties, derivation of mean and variance, Covariance between residuals. Illustrative Examples	

Course Outcomes: At the end of this course, students should be able to:

1. Learn data condensation and visualization.
2. Compute Measure of central tendency and Measure of Dispersion.
3. Acquire Knowledge about the correlation.
4. Understand Linear regression analysis

Reference Books:

1. A. M. Goon, M. K. Gupta and B. Dasgupta, Fundamentals of Statistics Vol. I and II (Calcutta: World Press, 2016)
2. D. N. Elhance, Fundamentals of Statistics, (Kitab Mahal, 1978), Unit- III: P. No. 236-249.
3. S.P. Gupta, Statistical methods (New Delhi: Sultan Chand & Son's, 2002
4. B. L. Agarwal, Basic Statistics (New Age International (P) Ltd., 2015), Unit-I: 98-121.
5. S. Saxena, J. N. Kapoor, Mathematical Statistics (S Chand & Company, 2010), Unit-I, II: P. No. 377-

Practical

Lab Course II: BCSP 119 (Based on BCST 117 and BCST 118)

Course Objectives: students will be able to:

1. solve and analyze recurrence relations and combinatorial arguments, validate logical arguments using truth tables and laws of inference and demonstrate equivalence relations through practical examples.
2. implement Euclid's algorithm and the division algorithm to solve problems in number theory, apply Fermat's theorem for arithmetic problems and use Warshall's algorithms to shortest paths in graphs
3. represent statistical data and evaluate various measures of central tendency.
4. Compute Dispersion, moments, Skewness, kurtosis, correlation and predict the value using Regression

Credits=2	**SEMESTER – I** **BCSP 119: Lab (Based on BCST 117 and BCST 118)**	**No. of hours per unit/ credits (30)**
Part A: Mathematics		
	1. Recurrence relation. 2. Combinatorial arguments. 3. Proofs of valid arguments using truth table. 4. Proofs of valid arguments using laws of inferences. 5. Examples on equivalence relation. 6. Euclid's algorithm. 7. Division algorithm. 8. Fermat's theorem on remainder. 9. Warshall's algorithm I. 10. Warshall's algorithm II.	
Part B: Statistics		
	1. Graphical representation 2. Measure of central tendency I. 3. Measure central tendency II 4. Measure of dispersion I 5. Measure of dispersion II 6. Correlation coefficient (ungrouped data and grouped data) 7. Spearman's Rank correlation coefficient 8. Regression (ungrouped data). 9. Multiple Correlation coefficient. 10. Multiple Regression.	

Course Outcomes: Students are able to

1. understanding Recurrence Relations, Euclid's Algorithm and Division Algorithm.
2. perform Fermat's Algorithm and Warshall's Algorithm.
3. learn data condensation and visualization and compute measure of central tendency and measure of dispersion.
4. Acquire Knowledge about the correlation and understand Linear regression analysis.

Reference Books:

1. Elements of Discrete Mathematics by C.L. Liu
2. Discrete Mathematics by Olympia Nicodemi
3. Discrete Mathematical Structure for Computer Science by Alan Doer and K. Levasicur.
4. Discrete and Combinatorial Mathematics by R. m. Grassl
5. A. M. Goon, M. K. Gupta and B. Dasgupta, Fundamentals of Statistics Vol. I and II (Calcutta: World Press, 2016)
6. D. N. Elhance, Fundamentals of Statistics, (Kitab Mahal, 1978), Unit- III: P. No. 236-249.
7. S.P. Gupta, Statistical methods (New Delhi: Sultan Chand & Son's, 2002
8. B. L. Agarwal, Basic Statistics (New Age International (P) Ltd., 2015), Unit-I: 98-121.

Syllabus DSC – I
B.Sc. I - Semester-II
Theory: Course I: BCST121: C Programming-II

Course Objectives: - Students should be able to…

1. define a programming logic.
2. learn advanced concepts of c language.
3. understand skills for writing complex programs using 'C'.
4. describe and develop well-structured programs using C language

Credits=2	**SEMESTER-II** **Course I: BCST121: C Programming-II**	**No. of hours per unit/ Credits (30)**
UNIT I	**Pointers**	(8)
	1.1 Understanding the pointers. 1.2 Definition and declaration. 1.3 Operations on inter. 1.4 Pointer initialization. 1.5 Pointer and function. 1.6 Pointer and array. 1.7 Callby value and Call by reference. 1.8 Pointer and Character Strings. 1.9 Dynamic memory allocation and deallocation.	
UNIT II	**Structure and Union**	(8)
	2.1 Definition and declaration. 2.2 Structure initialization. 2.3 Difference between structure and union. 2.4 Array of structures. 2.5 Arrays within Structures. 2.6 structure and function. 2.7 Nested structure. 2.8 Pointer to structure. 2.9 self-referential structure.	
UNIT III	**C Preprocessor**	(6)
	3.1 Preprocessor directives – file inclusion. 3.2 Macro substitution – simple, nested, argumented.	
UNIT IV	**File Handling**	(8)
	4.1 Defining and opening a file. 4.2 File opening modes- read, write, append, Closing a file. 4.3 Input/Output Operations on file. 4.4 Random access to files. 4.5 Command line arguments.	

Course Outcomes: - Students will be able to…

1. interpret the concept of pointers, declarations, initialization, operations on pointers and their usage.
2. evaluate union and enumeration user defined data types.
3. apply functional hierarchical code organization.
4. analyze File handling mechanism, functions and create files at runtime.

Reference Books:

1. Yashwant Kanetkar (2018) Let Us C, BPB Publications, Edition 18
2. Peter Prinz and Tony Crawford (2016) C in a Nutshell (2nd Ed.)
3. Jeri R. Hanly and Elliot B. Koffman (2009)Problem Solving and Program Design in C (6thEdition)
4. E. Balagurusamy (2008) Programming in ANSI C, McGraw Hill Education Edition 6
5. Peter van der Linden (1994)Expert C Programming: Deep C Secrets

B. Sc. I - Semester-II

Theory: Course II: BCST122: Relational Database Management Systems

Course Objectives: - Students should be able to…

1. remember the concept of normalization.
2. learn the transaction processing.
3. understand File Structure and Indexing.
4. identify the knowledge of RDBMS into real life data and to learn the different types of SQL queries performed on data.

Credits=2	**SEMESTER-II** **Course II: BCST122: Relational Database Management Systems**	**No. of hours per unit/ Credits (30)**
UNIT I	**Database design**	(8)
	1.1 Database Schema. 1.2 Data Dictionary. 1.3 ER and EER to relational mapping. 1.4 functional dependencies-properties and types. 1.5 Normalization (Upto BCNF)	
UNIT II	**File Structure and Indexing**	(8)
	2.1 Definition of file. 2.2 Operations on files. 2.3 File of Unordered and ordered records. 2.4 Overview of File organizations. 2.5 Indexing structures for files (Primary index, secondary index, clustering index). 2.6 Multilevel indexing using B and B+ trees.	
UNIT III	**Structured Query Language**	(6)
	3.1 SQL Clauses (Order By, Group By, Having, Where). 3.2 Concept of Subquery – rules. 3.3 Subquery with (select,insert ,update and delete statements),Join (Inner, Outer,Cross). 3.4 View and types. 3.5 Indexing and types. 3.6 PLSQL,Cursor and its types. 3.7 Trigger and its types.	
UNIT IV	**Transaction management and Concurrency control**	(8)
	4.1 Transaction management: ACID properties, serializability and concurrency control. 4.2 Lock based concurrency control (2PL, Deadlocks). 4.3 Time stamping methods, optimistic methods, database recovery management. 4.4 Recovery manager component – concept of log, recovery algorithms (deferred and immediate, shadow paging) Security	

Course Outcomes: - Students will be able to…

1. explain concepts of database Schema, Normalization and relational mapping.
2. evaluate database concepts and file structures and query language.
3. write the SQL queries for joining tables, sub query, PL/SQL Programs, Cursor Triggers etc.
4. evaluate the concept of Transaction management, deadlocks and concurrency control.

Reference Books:

1. R. Elmasri, S.B. Navathe, (2010), Fundamentals of Database Systems 6th Edition, Pearson Education.
2. R. Ramakrishanan, J. Gehrke, (2002), Database Management Systems 3rd Edition, McGraw-Hill.
3. Silberschatz, H.F. Korth, S. Sudarshan, (2010), Database System Concepts 6th Edition, McGraw Hill SQL, PL/SQL
4. The Programming Language of ORACLE – Ivan Bayross. BPB publication 4th Edition

Lab Course II: BCSP123: (based on Lab BCST121 And BCST122)

Course Objectives: - Students should be able to…

1. learn advanced concepts of c language.
2. identify skills for writing complex programs using 'C'.
3. understand well-structured programs using C language
4. learn concept of normalization, Transaction Processing and to learn File Structure and Indexing.

Credits=2	SEMESTER-I **BCSP113: Lab (based on BCST111 and BCST112)**	No. of hours per unit/ Credits (30)
Part A:	**C Programming- II**	
	1. Write a program to create, initialize and access a pointer variable. 2. Write a program to swap two numbers using pointers. 3. Write a program to calculate Fibonacci series using pointers. 4. Create a structure program to input employee info (empno, name, salary) and display it on the screen. 5. Create a structure which stores item information and calculate the amount using formula amount = price * quantity. 6. Write a program to create a structure of marks of 3 subjects and total for three students. Find the total of each student. 7. Write a program to create union to input student info and display it. 8. Write a program to create union to input student info and display it. 9. Write a program to create union to input Employee info and display it. 10. Write a C program to find current time using predefined Macros. 11. Write a C program to Calculate area of circle using #define preprocessor. 12. Write a program to read a file and count number of lines, number of characters and number of words in a given file. 13. Write a program which writes book information into disk file and display book information on the screen.	
Part B:	**Relational Database Management System**	
	14. Programs on SQL Clauses Create a table Employee, Department and apply order by, Group by, where, having clause. 15. Programs on Sub query a. Select the names of employees whose salary is greater than the average salary of all employees in department 10. b. For each department, retrieve the department number, the number of employees in the department, and their average salary. c. For each project, retrieve the project number, the project name, and the number of employees who work on that project. d. Change the location and controlling department number for all projects having more than 5 employees to 'Bellaire' and 6 respectively. e. For each department having more than 10 employees, retrieve the department no, no of employees drawing more than 40,000 as salary. 16. Programs on Join –	

	a. Create a table student and subject and course and apply cross, equip/inner, outer (left, right) Join. b. Create a table Employee, Product and perform join operation. 17. Programs on View Create a table student, Book and Create view (Read Only View and Updatable View) 18. Programs on Index Create a table student, Book and Create all types of Indexes (Simple, Composite, Duplicate, Unique) 19. PLSQL a. Program to write PL SQL code to perform DML operation on table Area. b. Program to write PLSQL code to calculate even odd number. c. Program to write PLSQL code to calculate factorial of number. 20. Cursor and Trigger Create table Student and create cursor (implicit and explicit) on it. Create trigger on table Employee.	

Course Outcomes: - Students will be able to…

1. Solve programs on basics of pointer, Structure and Union, File Handling, C Preprocessor.
2. Write student will acquire the program writing skill, technical skill.
3. demonstrate the PLSQL programming logic.
4. implement practical knowledge of SQL queries.

Reference Books:

1. Yashwant Kanetkar (2018) Let Us C, BPB Publications, Edition 18
2. Peter Prinz and Tony Crawford (2016) C in a Nutshell (2nd Ed.)
3. Ivan Bayross, (2012) SQL, PL/SQL The Programming Language of ORACLE BPB publication 4th Edition.
4. R. Elmasri, S.B. Navathe, (2010), Fundamentals of Database Systems 6thEdition, Pearson Education
5. A. Silberschatz, H.F. Korth, S. Sudarshan, (2010), Database System Concepts 6th Edition, McGraw Hill.
6. Jeri R. Hanly and Elliot B. Koffman (2009)Problem Solving and Program Design in C(6th Edition)
7. R. Ramakrishanan, J. Gehrke, (2002), Database Management Systems 3rd Edition, McGraw-Hill.

B. Sc. I - Semester-II

Theory: Course II: BCST124: Semiconductor Devices

Course Objectives: Students should be able to ….

1. Learn the basics of a semiconductor materials
2. Interpret rectifiers and regulators.
3. Understand the basics of transistors and various configurations.
4. Explain the field effect transistor.

(Total Credits 2)	Semester II Semiconductor Devices	No. of Lectures per unit
UNIT - I	**Fundamentals of Semiconductor**	**(08)**
	● Introduction, Types of material, Energy Band diagram, Fermi Level, Types of Semiconductors, Intrinsic & Extrinsic Semiconductors, ● Constructions and working of PN junction diode, Formation of Depletion Layer, I-V characteristics, Applications ● Zener and avalanche breakdown mechanism, Zener diode ● I-V characteristics, Applications ● Photo diode. Light Emitting Diode (LED), 7-segment display, Organic LED. Applications	
UNIT - II	**Unit II: Rectifiers and Regulators**	**(08)**
	● Half wave rectifier, Full wave rectifiers (center tapped and bridge), circuit diagrams, working and waveforms, ripple factor and efficiency. ● Filters: Types, C, L, LC, RC filters (Qualitative analysis) ● Fixed and variable regulators: Zener diode as voltage regulator, IC 78xx and IC 79xx, IC LM 317, Transistor as Regulator	
UNIT - III	**Bipolar Junction Transistors (BJT)**	**(07)**
	● Introduction, Types, Transistor working, CE, CB, CC configurations, Characteristics of CB and CE configurations, Regions of operation (active, cut off and saturation) ● Current gains α and β. Relations between α and β. dc load line and Q point. ● Applications: Transistor as Amplifier, Transistor as a switch.	
UNIT - IV	**Field Effect Transistors**	**(07)**
	● JFET: Type of FET, Symbol, Construction, working and I-V characteristics (output and transfer), Pinch-Off and Saturation Voltage ● MOSFET: Terminals, Symbol, Basic operation, characteristics and MOSFET as switch	

Course Outcome: Students will be able to…

1 Verify and interpret basics of semiconductor materials

2 Inspect rectifiers and regulators.

3 Analyze and interpret the characteristics of transistors

4 Determine characteristics and performance of field effect transistor.

Reference Books:

1. R.S. Sedha, Textbook of Applied Electronics, S. Chand Publication, (2003)
2. Robert Boylestad and Louis Nashelsky, Electronics Devices and Circuits Theory, PHI 9th Edition, (2013)
3. Allen Mottershead, Electronic Devices and Circuits, Goodyear Publishing Corporation, (1973)
4. Donald Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill, 3rd Edition, (2002)
5. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, (2001)

Semester II

Course II: BCST 122: Digital Electronics-II

Course Objectives: Students should be able to …

1. Learn sequential logic circuits.
2. Study counter circuits.
3. Understand the concept of Shift register and Programmable Logic Device.
4. Explain computer memory organization.

(Total Credits 2)	**Semester II** **Course II: Digital Electronics-II**	**No. of Lectures per unit**
UNIT - I	**Sequential Logic Design**	**(07)**
	● Latches and Flip flops, Edge triggered and Level triggered Flip flops, ● S-R Flip flop, J-K Flip flop, J-K Master Slave flip flop, T and D type Flip flop,	
UNIT - II	**Counters**	**(08)**
	● Introduction, Classification, ● Synchronous and Asynchronous Counter, Up/down counter, Decade Counter, Ring Counter, Johnson Counter, Modulo-N Counter, ● Study of IC 7490, Application of counter	
UNIT - III	**Shift Register**	**(07)**
	● Introduction of Shift registers, Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel- in-Parallel-out Shift Registers, ● Study of IC 7495.Applications of Shift Register	
UNIT - IV	**Computer Memory Organization**	**(08)**
	● Introduction, Classification of Memory, Memory Characteristics ● RAM, SRAM, DRAM, ROM, PROM, EPROM, UV-EPROM, EEPROM, FLASH, ● Introduction to cache memory, Memory Hierarchy	

Course Outcomes: The students will be able to…

1 Design sequential logic circuits
2 Develop a counter circuit.
3 Demonstrate shift register circuit.
4 Describe computer memory organization.

Reference Books:

1. M. Morris Mano, Digital System Design, Pearson Education Asia, 4th Edition,(2001)
2. Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia ,5th Edition,(1994)
3. W. H. Gothmann,Digital Electronics: An Introduction to Theory and Practice, Prentice Hall of India, (2000).
4. S Salivahan, S Arivazhagan, Digital Circuit and Design, Vikas publishing house PVT Limited, (2000)

Semester II
BCSP 123: (Based on BET121 & BET122)

Course Objectives: Students should be able to…

1. Learn half wave and full wave rectifier circuits.
2. Study fixed and variable IC regulators.
3. Understand Flip-flop circuits.
4. Contrast the counter and shift register circuit.

Total Credits 2	**Semester II** **Practical II: BEP123: (Based on BET121 & BET122)** **Semiconductor Devices and Digital Electronics Lab-II**		**No. of Lectures (30)**
	Group A		
	1	Study of I-V Characteristics of PN Junction Diode	
	2	Study of I-V Characteristics of Zener Diode.	
	3	Transistor as a switch (LED ON/OFF)	
	4	Study of Three terminal voltage regulators.	
	5	Study of Half Wave Rectifier with and without capacitor filter.	
	6	Study of Full Wave Rectifier with and without capacitor filter.	
	7	Study of input and output I-V Characteristics of BJT in Common Emitter configuration.	
	8	Study of input and output I-V Characteristics of BJT in Common Base configuration.	
	Group B		
	1	Design and test of an S-R flip-flop using NOR/NAND gates.	
	2	Verify the truth table of a J-K flip-flop (7476)	
	3	Verify the truth table of a D flip-flop (7474)	
	4	Study of Divide by 2/5/10 counter using IC 7490.	
	5	Study of asynchronous counter. (4-bit / 8 bit)	
	6	Study of shift register. (4-bit / 8 bit)	
	7	Study of Ring Counter using IC 7495.	
	8	Study of computer architecture.	

Course Outcome: Students will be able to…

1 Design and verify half wave and full wave rectifier circuit.

2 Develop fixed and variable ic regulators.

3 Construct flip flop circuits.

4 Utilize the counter and shift register circuit.

Reference Books:

1. Robert Boylestad and Louis Nashelsky,Electronic Devices and Circuit Theory, PHI,9th Edition, (2013)
2. L. Schilling and C. Belove, Electronic Circuits: Discrete and Integrated, Tata McGraw Hill, (2002).
3. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw Hill,3rdEdition, (2002)
4. J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill, (2001)

5. R. C. Jaegar and T. N. Blalock, Microelectronic Circuit Design, Tata McGraw Hill 4th Edition, (2010)
6. J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, TataMcGraw Hill, (1991)

Syllabus – DSC III

B. Sc. I – Semester – II

Theory: BCST 127: Graph Theory

Course Objectives: Students will be able to

1. Provide a comprehensive understanding of graph theory.
2. Study of graphs, operations on graphs, connected graphs, and trees.
3. Analyze and manipulate various types of graphs, understand the properties and applications of connected graphs.
4. Explore the fundamental concepts of trees in graph theory.

Credits=2	**SEMESTER – II** **BCST 127: Graph Theory**	**No. of hours per unit/ credits (30)**
UNIT I	**UNIT I: Graphs**	(7)
	1.1 Definition, Elementary terminologies and results, Graphs as Models. 1.2 Special types of graphs. 1.3 Isomorphism. 1.4 Adjacency and Incidence Matrix of a Graph.	
UNIT II	**UNIT II: Operations on Graphs**	(7)
	2.1 Subgraphs, induced subgraphs, Vertex delition, Edge delition. 2.2 Complement of a graph and self-complementary graphs. 2.3 Union, Intersection and Product of graphs. 2.4 Fusion of vertices.	
UNIT III	**UNIT III: Connected Graphs.**	(10)
	3.1 Walk, Trail, Path, Cycle: Definitions and elementary properties. 3.2 Connected Graphs: definition and properties. 3.3 Distance between two vertices, eccentricity, center, radius and diameter of a graph. 3.4 Isthmus, Cutvetex: Definition and properties. 3.5 Cutset, edge-connectivity, vertex connectivity. 3.6 Weighted Graph and Dijkstra's Algorithm.	
UNIT IV	**UNIT IV: Trees**	(6)
	4.1 Definition, Properties of trees. 4.2 Center of a tree. 4.3 Binary Tree: Definition and properties. 4.4 Tree Traversal: Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation. 4.5 Spanning Tree: Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm.	

Course Outcomes: At the end of this course, students should be able to:

1. Understanding Graph, Subgraph and Operation on Graphs.
2. Analyze concepts of Connected graph and Trees.
3. Learn to apply concepts of algorithms of graphs.
4. Performing algorithms like Dijkstra, Kruskal.

Reference Books:

1. Elements of Discrete Mathematics by C.L. Liu
2. Discrete Mathematical Structure for Computer Science by Alan Doer & K. Levasicur.
3. Discrete Mathematics by Kenneth Rosen, Tata McGraw Hill
4. Graph Theory with Applications to Computer Sc.& Engg. By Narsing Deo, PHI

Syllabus – DSC III

B. Sc. I – Semester – II

Theory: BCST 128: Probability and Probability Distribution

Course Objectives: Students will be able to …….

1. To introduce students to concept of probability, univariate probability distribution.
2. To compute probabilities of different events, conditional distribution.
3. To introduce students with standard discrete probability distributions and bivariate probability distributions.
4. To understand use of discrete probability distributions in different situations

Credits=2	**SEMESTER – I** **BCST 128: Probability and Probability Distribution**	**No. of hours per unit/ credits (30)**
UNIT I	**Probability and Conditional Probability**	7
	1.1 Concepts of experiments and random experiments. Definitions: Sample space, Discrete sample space Event and types of events. Power set |P(Ω) Illustrative examples. Equally likely outcomes (events). 1.2 Apriori (classical) definition of probability of an event. Axiomatic definition of probability with reference to a finite and countably infinite sample space. Proof of the results. 1.3 Definition of conditional probability of an event. Multiplication theorem for two events. Partition of sample space. Idea of Posteriori probability, Statement and proof of Baye's theorem and Elementary examples on probability and conditional probability. 1.4 Concept of Independence of two events. Pairwise and Mutual Independence for three events. Elementary examples	
UNIT II	**Univariate Probability Distributions**	7
	2.1 Definition of discrete random variable. Probability mass function (p.m.f.) and cumulative distribution function (c.d.f.) of a discrete random variable 2.2 Properties of c.d.f. (statements only). Probability distribution of function of random variable. 2.3 Median and Mode of a univariate discrete probability distribution.	
UNIT III	**Mathematical expectation**	8
	3.1 Definition of expectation of a random variable, expectation of a function of a random variable. Results on expectation. 3.2 Definitions of mean, variance of uni variate distributions. Effect of change of origin and scale on mean and variance. Definition of probability generating function (p.g.f.) of a random variable. 3.3 Effect of change of origin and scale on p.g.f. Definition of mean and variance by using p.g.f. Examples	

UNIT IV	Some Standard Discrete Probability Distribution	8
	4.1 Bernoulli Distribution: p.m.f., mean, variance, distribution of sum of independent and identically distributed Bernoulli variables. 4.2 Discrete Uniform Distribution: p.m.f., mean and variance 4.3 Binomial Distribution: Binomial random variable, p.m.f. with parameters (n, p), Recurrence relation for successive probabilities, Computation of probabilities of different events, mean and variance, mode, skewness, p.g.f., Additive property of binomial variates, examples. 4.4 Poisson Distribution: Definition of Poisson with parameter λ. 4.5 Mean, variance, probability generating function (p.g.f.). Recurrence relation for successive Probabilities, Additive property of Poisson distribution. Poisson distribution as a limiting case of Binomial distribution, examples. 4.6 Normal Distribution: Probability density function, mean and variance, properties of normal curve, standard normal distribution, numerical problem.	

Course Outcomes: At the end of this course, students should be able to….

1. Know probability, types of events and conditional probability.
2. Understand probability mass function, cumulative distribution function.
3. Evaluate expectation of random variable.
4. Understand various univariate probability distribution.

Reference Books:

1. A. M. Goon, M. K. Gupta and B. Dasgupta, Fundamentals of Statistics Vol. I and II (Calcutta: World Press, 2016)
2. D. N. Elhance, Fundamentals of Statistics, (Kitab Mahal, 1978), Unit- III: P. No. 236-249.
3. S.P. Gupta, Statistical methods (New Delhi: Sultan Chand & Son's, 2002
4. B. L. Agarwal, Basic Statistics (New Age International (P) Ltd., 2015), Unit-I: 98-121.
5. S. Saxena, J. N. Kapoor, Mathematical Statistics (S Chand & Company, 2010), Unit-I, II: P. No. 377-383.

Syllabus – DSC III

Lab Course II: BCSP 129: (Based on BCST 127 and BCST 128)

Course Objectives: students will be able to:

1. Explore graphs and isomorphisms, perform operations on graphs such as union, intersection, complement, and self-complement and utilize matrix representations of graphs.
2. Calculate key graph properties, implement Dijkstra's shortest path algorithm to find optimal paths and apply Kruskal's algorithm to find minimum spanning trees.
3. Compute probabilities of different events, conditional distribution.
4. Understand use of discrete probability distributions in different situations.

Credits=2	SEMESTER – II BCSP 129: Lab (Based on BCST 127 and BCST 128)	No. of hours per unit/ credits (30)
Part A: Mathematics		
	1. Graphs and Isomorphism of Graph. 2. Operations on Graphs: Union, Intersection. 3. Complement and Self Complement of Graphs. 4. Matrix Representation of Graph: Adjacency Matrix. 5. Matrix Representation of Graph: Incidence Matrix. 6. Distance between two vertices, eccentricity, center, radius and diameter of a graph. 7. Dijkstra's shortest path Algorithm	

	1. Ring sum of two graphs. 2. Fundamental circuit and fundamental cut set. 3. Kruskal's Algorithm.	
Part B: Statistics		
	1. Application of Probability – I 2. Application of Probability – II 3. Application on Bayes theorem 4. independence probability 5. Application of Bernoulli distribution 6. Application of discrete uniform distribution. 7. Application of binomial distribution 8. Application of Poisson distribution. 9. Application of normal distribution. 10. Model sampling from discrete uniform distribution, binomial distribution, Poisson distribution	

Course Outcomes: Students are able to...

1. Learn various types of graphs, operations on graph and matrix representation of graphs.
2. Understanding Network Algorithm like Kruskal's, Dijkstra.
3. Evaluate probability and conditional probability
4. Understand applications of various univariate probability distribution.

Reference Books:

1. Elements of Discrete Mathematics by C.L. Liu
2. Discrete Mathematical Structure for Computer Science by Alan Doer & K. Levasicur.
3. Discrete Mathematics by Kenneth Rosen, Tata McGraw Hill
4. Graph Theory with Applications to Computer Sc.& Engg. By Narsing Deo, PHI
5. D. N. Elhance, Fundamentals of Statistics, (Kitab Mahal, 1978), Unit- III: P. No. 236-249.
6. S.P. Gupta, Statistical methods (New Delhi: Sultan Chand & Son's, 2002

Chairman
BOS in Computer Science