

Bachelor of Science in Data Science Course Curriculum

Batch: 2023-2024

Academic Year: 2023-'24

W.E.F. July 2023



**GSFC University, Vigyan Bhavan, P. O.
Fertilizernagar, Vadodara - 391750, Gujarat, India**



Teaching Scheme

Semester – I

Sr. No.	Course Code	Course Name	Teaching Scheme (Hours/week)				Teaching Credit				Evaluation Scheme					
			L	P	T	Total	L	P	T	Total	Theory : MS Marks	Theory : CEC Marks	Theory : ES Marks	Theory Marks	Practical Marks	Total Marks
1.	BSDS101	Database Management Systems	3	2	0	5	3	1	0	4	20	40	40	100	50	150
2.	BSDS102	Computer Organization & Architecture-I	4	0	0	4	4	0	0	4	20	40	40	100	0	100
3.	BSDS103	Programming using C Language	3	2	0	5	3	1	0	4	20	40	40	100	50	150
4.	BSDS104	Statistics-I	3	0	1	4	3	0	1	4	20	40	40	100	0	100
5.	BSDS105	Numerical Methods & Analysis using MATLAB	2	2	0	5	2	1	0	3	20	40	40	100	50	150
6.	AECC101	Fundamentals of English	2	0	0	2	2	0	0	2	20	40	40	100	0	100
7.	CBCS1*	CBCS	2	0	0	2	2	0	0	2	20	40	40	100	0	100
8.	SECC101	Internship	0	0	0	2	0	0	0	2	0	0	0	0	50	50
9.	VACC101	Foundation Course	0	0	0	2	0	0	0	2	0	0	0	0	50	50
Total			19	10	1	31	19	7	1	27	140	280	280	700	250	950

Note: L = Lecture, P = Practice, T = Tutorial, MS - MiProgram Coordinator

Associate Dean

Deand Semester, CEC - Continuous Evaluation Component, ES - End Semester



COURSE CODE BSDS101	COURSE NAME DATABASE MANAGEMENT SYSTEM	SEMESTER I
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	15	0	60	3	1	0	4

Course Pre-requisites	Fundamental knowledge of any basic programming language.
Course Category	Major Course
Course focus	Employability
Rationale	The present course will equip students with the skills related to data categorization, data classification and formation of databases using SQL. This will help students to design and build a simple database system and demonstrate competence with the fundamental tasks involved with modeling, designing, and implementing a DBMS. It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems in information technology applications.
Course Revision/ Approval Date:	July 30, 2023
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> 1: Understand basic principles of classification and categorization of data and databases. 2: Understand the basic elements of a relational database management system. 3: Understand & Remember the fundamentals of a database of collected data & apply the data models for relevant problems. 4: Understand the entity relationship and convert the entity relationship diagrams into RDBMS and apply SQL queries on the respective data into RDBMS and apply SQL queries on the data. 5: Understand the basic understanding related to query evaluation and optimization techniques.



Course Content (Theory)	Weightage	Contact hours
Unit 1: Basic Concepts - Purpose of database systems-Components of DBMS – DBMS Architecture and Data Independence- Data modeling - Entity Relationship Model, Relational – Network- Hierarchical and object-oriented models, Data modeling using the Entity Relationship Model.	25%	12
Unit 2: Relational databases, Structure of relational databases — relational algebra- tuple relational calculus, Data definition with SQL, insert, delete and update statements in SQL– data manipulation with SQL, –Introduction to views, joins and types of queries.	15%	6
Unit 3: Introduction to Transaction Processing- Transaction and System, Concepts Desirable properties of Transactions- Schedules and Recoverability- Serializability of Schedules-Query processing and Optimization-Concurrency Control - assertions – triggers.	15%	6
Unit 4: Database Design– Design guidelines– Relational database design – Integrity Constraints – Domain Constraints-Referential integrity, ACID properties, Functional Dependency Normalization using Functional Dependencies, Normal forms based on primary keys- general definitions of Second and Third Normal Forms. Boyce Codd Normal Form– Multivalued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form – Pitfalls in Relational Database Design.	25%	12
Unit 5: Distributed databases: Distributed Database Concepts-Data Fragmentation, Replication and Allocation Techniques-Different Types- Query Processing – semi-join - Concurrency Control and Recovery.	20%	9

List of Practical	Weightage	Contact hours
1: Demonstrate various SQL based software.	9%	2
2: Understand the working of ER Model.	7%	1
3: Demonstrate creation of database and table.	7%	1
4: Working of insert, update, delete queries.	7%	1
5: Create a view for the SQL table.	7%	1
6: Demonstrate working of different view manipulation.	7%	1
7: Demonstrate working of Oracle.	7%	1
8: Demonstrate the working of PL/SQL.	7%	1
9: Demonstrate advanced database concepts.	7%	1
10: Demonstrate working of different join operations.	7%	1
11: Creation of primary key and foreign key.	7%	1
12: Demonstrate working of relational databases in real time applications.	7%	1
13: Demonstration of distributed databases.	7%	1



14: Understand the working of semi-join.	7%	1
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Instructional Method and Pedagogy: (Max. 100 words)

Utilizing models, Powerpoint Presentations, Chalk-Board demonstration, videos on various topics, group discussions and seminars are some of the methods adopted to improve the student ability to grasp the fundamental knowledge related to database management systems. The discussion during the theoretical sessions and hands-on sessions during the practical laboratory sessions will enable students to apply the knowledge gained.

Course Outcome:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Demonstrate the basic elements of a relational database management system.	Understand & Apply	Define, Describe & Demonstrate
CO2: Describe the fundamental elements of relational database management systems.	Understand & Apply	Define, Describe & Demonstrate
CO3: Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respective data into RDBMS and formulate SQL queries on the data.	Evaluate & Create	Analyze & Design
CO4: Demonstrate the fundamental understanding related to query evaluation and optimization techniques.	Understand	Describe
CO5: Extend normalization for the development of application softwares.	Understand & Remember	Define, Describe & Demonstrate

Learning Resources	
1.	Reference Books: <ol style="list-style-type: none"> Elmasri and Navathe, Fundamentals of Database System, (4th Edition), Pearson Education Asia (2008). Henry F Korth, Abraham Silbershatz, Database System Concepts, McGraw Hill 2nd edition. (2005).



	<ol style="list-style-type: none"> 3. C.J.Date, An Introduction to Database Systems, (7th Edition) Pearson Education Asia (2006). 4. Bibin C. Desai, An Introduction to Database Systems, Galgotia Publications, (2000).
2.	<p>Other Electronic Resources:</p> <ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc22_cs91/preview 2. https://www.coursera.org/learn/database-structures-and-management-with-mysql

Evaluation Scheme	Total Marks												
Theory: Mid semester Marks	20 marks												
Theory: End Semester Marks	40 marks												
Theory: Continuous Evaluation Component Marks (CEC)	<table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review</td> <td>10 marks</td> </tr> <tr> <td>Total</td> <td>40 Marks</td> </tr> </table>	Attendance	05 marks	MCQs	10 marks	Open Book Assignment	15 marks	Article Review	10 marks	Total	40 Marks		
Attendance	05 marks												
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Attendance	05 marks												
Practical Exam	20 marks												
Viva	10 marks												
Journal	10 marks												
Discipline	05 marks												
Total	50 Marks												



COURSE CODE BSDS102	COURSE NAME Computer Organization & Architecture-I	SEMESTER I
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
60	0	0	60	4	0	0	4

Course Prerequisites	Fundamental knowledge of semiconductor materials and components of a computer.
Course Category	Major Course
Course focus	Employability
Rationale	To equip students with the fundamental knowledge related to different parts of the computer, the organization and function.
Course Revision/ Approval Date:	July 30, 2023
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> Understand & remember basic knowledge related to the semiconductors and their properties. Understand & remember the arithmetic operations performed in computers. Understand the computer organization and design. Understand the types of memory and memory operations. Understand the I/O operations and communication protocols in computers.

Course Content (Theory)	Weightage	Contact hours
Unit 1: Boolean Algebra Number system and interconversion (binary, octal, decimal, hexadecimal), complements of a number, Boolean Algebra, Sum of products (SOP) and product of sums (POS), Minterms and Maxterms, Karnaugh Map.	10%	8
Unit 2: Digital Electronics	20%	12



<p>Overview of semiconductors, PN junction diode, transistor, diode as a switch, transistor as a switch, advance application of diodes and transistors.</p> <p>Logic gates, flip-flops, registers, counters, multiplexer, demultiplexer, decoder, and encoder, Combinational and Sequential Circuits, Registers & Counters.</p>		
<p>Unit 3: Organization & Design</p> <p>Instruction codes, stored program organization, computer registers, Common bus system, Computer instructions, timing & control, Instruction cycle, memory reference instructions, input output & interrupt, complete design of basic computer.</p>	20%	10
<p>Unit 4: Memory</p> <p>Detailed classification and types of memory, Basic concept and hierarchy, Semiconductor memory, 2D and 2 1/2D memory organization, ROM memories, PAL, PLA, memory decoding, error detection & correction, Cache memory: concept, design issues & performance, address mapping and replacement auxiliary memories: magnetic disk, magnetic tape & optical disk. Virtual memory: concept & implementation.</p>	25%	15
<p>Unit 5: I/P & O/P Organization</p> <p>Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts & exceptions.</p> <p>Modes of data transfer: Programmed I/O, interrupt initiated I/O and direct memory access. I/O channels & processors.</p> <p>Serial Communication: Synchronous & Asynchronous communication, standard communication interface.</p>	25%	15

Instructional Method and Pedagogy: (Max. 100 words)

Utilizing models, Powerpoint Presentations, Chalk-Board demonstration, videos on various topics, group discussions and seminars are some of the methods adopted to improve the student ability to grasp the principle, design and functioning of computers. The discussion during the theoretical sessions will enable students to understand and apply the knowledge gained.

Course Outcome:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		



CO1: Demonstrate the basic knowledge related to semiconductors and their applications.	Understand, Remember & Analyze	Define, Illustrate & Deduce
CO2: Describe & apply basic arithmetic operations & solve circuits related to logic gates.	Understand, Analyze & Apply	Define, Analyze & Apply
CO3: Explain fundamentals of computer organization & design.	Understand & Remember	Define & Demonstrate
CO4: Define & Explain the types of memory & memory operations.	Understand & Remember	Define & Demonstrate
CO5: Describe the I/O operations and communication protocols.	Understand & Remember	Define & Demonstrate

Learning Resources	
1.	Reference Books: <ol style="list-style-type: none"> John L. Hennessy & David A. Patterson, Computer Architecture: A Quantitative Approach (5th Edition), Elsevier, (2012). T. Radhakrishnan, & V. Rajaraman, Computer Organization and Architecture. New Delhi :Rajkamal Electric Press (2007). A. P. Godse, & D. A. Godse, Digital Electronics (3rd ed.), Technical Publications, (2008).
3.	Other Electronic Resources: <ol style="list-style-type: none"> https://faraday.physics.utoronto.ca/IYearLab/digital.pdf https://onlinecourses.nptel.ac.in/noc22_cs88/preview

Evaluation Scheme	Total Marks
Theory: Mid semester Marks	20 marks
Theory: End Semester Marks	40 marks



Theory: Continuous Evaluation Component Marks (CEC)	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment	15 marks
	Article Review	10 marks
	Total	40 Marks



COURSE CODE BSDS103	COURSE NAME Programming using C Language	SEMESTER I
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	30	0	75	3	1	0	4

Course Prerequisites	None
Course Category	Major Course
Course focus	Skill Enhancement & Employability
Rationale	Programming skills are necessary for accessing computers and other programmed machines either for modifying their core functioning and/or getting a task automated. Learning C programming can be a foundation stone for students opting for computer-based degree programs. It is essential due to its versatility, efficiency, and portability. It provides low-level control and high-level abstraction, making it suitable for a wide range of applications. C offers access to system-level functions, enabling interaction with hardware and development of performance-critical software.
Course Revision/ Approval Date:	July 30, 2023
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> 1: Understand & remember the basics of programming components. 2: Develop insights for designing logic for arrays and strings which will help them to create applications in C. 3: Get familiar with fundamentals and applications of functions and pointers. 4: Get brief idea about structures in C programming 5: Gain knowledge about file handling using C language.



Course Content (Theory)	Weightage	Contact hours
Unit 1: Introduction to Programming: Overview of programming, the C programming language, and basic programming concepts. Variables and Data Types: Understanding variables and data types in C, and how to declare and use them.	20%	9
Unit 2: Operators and Expressions: Understanding operators and expressions in C, and how to use them to perform arithmetic and logical operations. Control Statements: Understanding control statements such as if-else, switch, for, while, and do-while statements, and how to use them in C programming.	20%	9
Unit 3: Functions: Understanding functions in C, how to create them, pass parameters, and return values. Arrays: Understanding arrays in C, how to declare and use them, and how to work with multi-dimensional arrays.	20%	9
Unit 4: Pointers: Understanding pointers in C, how to declare and use them, and how to work with arrays and strings using pointers. Strings: Understanding strings in C, how to declare and use them, and how to manipulate strings using string handling functions.	20%	9
Unit 5: Structures: Understanding structures in C, how to declare and use them, and how to work with structures and pointers. File Handling: Understanding file handling in C, how to open, read, write, and close files, and how to work with file handling functions.	20%	9



List of Practical	Weightage	Contact hours
<p>1:</p> <p>(1) Program to print “Hello GSFC University”.</p> <p>(2) Program to find the sum of the 2 numbers.</p> <p>(3) Program to find area and circumference of the circle.</p> <p>(4) Program to find simple interest.</p> <p>(5) Program to convert degree centigrade to Fahrenheit.</p> <p>(5) Program to calculate sum of 5 objects and print average.</p> <p>(6) Program to show swapping of 2 numbers without using the third variable.</p> <p>(7) Program to show swapping of 2 numbers using a third variable. B. Control Structures: IF, Switch, Loops</p> <p>(8) Program to show reverse of given number.</p> <p>(9) Program to find greatest among 3 numbers.</p> <p>(10) Repeat program10 with conditional operator.</p> <p>(11) Program to find out if the entered year is Leap year or not.</p> <p>(12) Program to find the given number is even or odd.</p> <p>(13) Program to use Switch statement, Display percentage of student.</p> <p>(14) Program to display arithmetic operations using Switch.</p> <p>(15) Program to display first 15 natural numbers and their sum using For Loop.</p> <p>(16) Program to print Patterns.</p> <p>(17) Program to print Fibonacci series till 40.</p> <p>(18) Program to find factorial of given number.</p> <p>(19) Program to find whether a given number is prime or not.</p>	20%	6



<p>2:</p> <p>(20) Program to create an array of 10 elements. Show the sum and average of 10 elements entered by the user.</p> <p>(21) Program to find the maximum number in a given Array.</p> <p>(22) Program to display matrix.</p> <p>(23) Program to find sum of two Matrices.</p> <p>(24) Program to find subtraction of two matrices.</p> <p>(25) Program to find multiplication of two matrices.</p>	20%	6
<p>3:</p> <p>(26) Program to find factorial of given number using function.</p> <p>(27) Program to show table of given number using function.</p> <p>(28) Program to show call by value.</p> <p>(29) Program to show call by reference. 36. Program to find the largest among two using functions.</p> <p>(30) Write a program to show how similar name variables can be used in different functions.</p> <p>(31) Write a program to return more than one value from a function.</p> <p>(32) Program for passing array from main function to display function.</p> <p>(33) Write a program in C to show the basic declaration of a pointer.</p> <p>(34) Write a program in C to demonstrate how to handle the pointers in the program.</p> <p>(35) Write a program in C to demonstrate the use of &(address of) and *(value at address) operator.</p> <p>(36) Write a program in C to add two numbers using pointers.</p> <p>(37) Write a program in C to add numbers using call by reference.</p> <p>(38) Write a program in C to store n elements in an array and print the elements using a pointer.</p>	20%	6



<p>4:</p> <p>(38) Write a program to demonstrate declaration of structures.</p> <p>(39) Write a program to store student information using Structure.</p> <p>(40) Write a program to add two distances.</p> <p>(41) Write a program to store 10 student’s information using structures.</p> <p>(42) Write a program to demonstrate nested structures.</p> <p>(43) Write a program to demonstrate how pointers will be used to create and access structure.</p>	<p>20%</p>	<p>6</p>
<p>5:</p> <p>(44) Write a program to create a file and store information.</p> <p>(45) Write a program to read contents from a file.</p> <p>(46) Write a program to append content at the end of file.</p>	<p>20%</p>	<p>6</p>

Instructional Method and Pedagogy: (Max. 100 words)

Visual Aids and Demonstrations, Hands-On Approach, Active Learning Strategies, Real-World Examples, Project-Based Learning, Continuous Assessment

Course Outcome:	Blooms’ Taxonomy Domain	Blooms’ Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Gain basic understanding of basic components of programming language.	Cognitive	Understand
CO2: Understand any other programming language with the knowledge of array and string.		Understand
CO3: Apply function concepts in real time applications.		Apply
CO4: Analyse working of structure in C or other programming language programs.		Analyse
CO5: Students will be able to develop applications using C Programming.		Apply



Learning Resources	
1.	Reference/Text Books: 1. "The C Programming Language" by Brian W. Kernighan and Dennis M. Ritchie. 2. "C Programming Absolute Beginner's Guide" by Greg Perry and Dean Miller. 3. "C The complete Reference" (4th Ed) by Herbert Schildt.
2.	Journals & Periodicals: 1. ACM Transactions on Programming Languages and Systems 2. IEEE Transactions on Software Engineering
3.	Other Electronic Resources: 1. https://onlinecourses.nptel.ac.in/noc22_cs40/preview 2. https://www.edx.org/learn/c-programming 3. https://www.gnu.org/software/libc/manual/ 4. https://www.learn-c.org/

Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks (CEC)	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment	15 marks
	Article Review	10 marks
	Total	40 Marks
	Practical Marks	Attendance
Practical Exam		20 marks
Viva		10 marks
Journal		10 marks
Discipline		05 marks
Total		50 Marks



COURSE CODE BSDS104	COURSE NAME Statistics-I	SEMESTER I
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	0	15	60	3	0	1	4

Course Prerequisites	Fundamental knowledge of information and data
Course Category	Minor Course
Course focus	Employability
Rationale	The present course will focus on introduction to statistics. It also provides the comprehensive knowledge of descriptive statistics and data collection and representation.
Course Revision/ Approval Date:	July 30, 2023
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> Understand & Remember the meaning and scope of Statistical Applications. Understand, use/apply & analyse the applications of statistics in real-life problems. Understand & remember methodology of data collection, data representation. Understand, remember, apply & analyse the concepts of measures of central tendency, measures of dispersion, control charts, correlation, regression, probability, estimation. Understand, remember & apply the knowledge related to probability distribution functions and their statistics.

Course Content (Theory)	Weightage	Contact hours
Unit 1: Introduction to Statistics and Data Collection: Importance of statistics, concepts of statistical population and a sample - Methods of Random and Non -Random Sampling - quantitative and qualitative data - Measurement scales - nominal,	25%	10



ordinal, interval and ratio - Primary and secondary data-Classification and tabulation of data. Diagrammatic and graphical representation of data-Histograms and Frequency Polygons.		
Unit 2: Descriptive Statistics Measures of Central tendency- Mean, median and mode-Measures of Dispersion, Range, Quartile deviation, Mean Deviation, Standard Deviation-The coefficient of Variation, Skewness and Kurtosis	20%	8
Unit 3: Correlation and Regression analysis The Scatter Plot- Correlation-Types-Karl Pearsons Coefficient of Correlation-Spearmans Rank Correlation –Regression lines and coefficients- the coefficient of Determination- Residuals-the standard error of Estimate.	15%	7
Unit 4: Theory of Probability Probability, Random experiments, trial, sample space, events. Approaches to probability - classical, empirical, subjective and axiomatic. Theorems on probabilities of events. Addition rule of probability. Conditional probability, independence of events and multiplication rule of probability. Bayes theorem and its applications.	20%	10
Unit 5: Random Variables and Distribution functions Types of Random variables, probability distribution functions, statistics for random variables, Binomial, Poisson and Normal distribution functions.	20%	10

List of Tutorial	Weightage	Contact hours
Unit 1: Practice Examples based on sampling and data representation.	12%	2
Unit 2: Practice Examples based on measurement of central tendency and dispersion.	12%	2
Unit 3: Practice Examples on Coefficient of correlation, Rank correlation and Linear regression.	30%	4
Unit 4: Practice examples on Basic probability concepts, conditional probability and Bays’ theorem.	30%	4
Unit 5: Practice examples on statistics of Random variables and Probability distribution.	16%	3

Instructional Method and Pedagogy: (Max. 100 words)
Chalk-board, Discussion, Exercise/Practice sessions, Tutorials, Quiz, Numerical Practice



Course Objectives:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Organize, present and interpret statistical data, both numerically and graphically.	Understand & Apply	Demonstrate & Examine, Find
CO2: Measure the central tendency and dispersion for given data.	Apply	Evaluate, Examine, Find
CO3: Perform regression analysis, and compute and interpret the coefficient of correlation.	Understand & Apply	Define, Classify, Describe, Demonstrate & Examine
CO4: Use various methods to compute the probabilities of events.	Understand, Remember, Apply & Analyse	Define, Classify, Describe, Demonstrate & Examine
CO5: Calculate the probabilistic value using appropriate distribution.	Understand, Remember, Apply & Analyse	Define, Classify, Describe, Demonstrate & Examine

Learning Resources	
1.	<p>Text Books:</p> <ol style="list-style-type: none"> S. P. Gupta, 2014, Business Statistics and Statistical Methods, S. Chand Publication, New Delhi Goon, Gupta and Dasgupta – Fundamentals of Statistics, Vol. 1 (2005), The world press Pvt. Ltd, Kolkata Rohatgi V.K. (2001): An introduction to probability theory and mathematical statistics. – A wiley inter science publications Feller : An introduction to probability theory and its applications, vol-I – Asia Publishing house <p>Reference Books:</p> <ol style="list-style-type: none"> Gould et al (2017): Essential Statistics – Exploring the world through data, 2e, Pearson. L. Mayes & Keying, (2005), Probability Statistics for Engineers and Scientists, Pearson Education. Nolan and Speed (2000): Stat Labs – Mathematical Statistics through



	Applications, Springer 4. Gangoolli and Ylvisaker: Discrete Probability – Harcourt Brace Jovanorich Inc
3.	Other Electronic Resources: 1. https://online.iima.ac.in/course/course-v1:IIMA+PQM101x+1/ 2. https://www.shiksha.com/online-courses/pre-mba-statistics-course-course-id5747 3. www.onlinestatbook.com

Evaluation Scheme	Total Marks										
Theory: Mid semester Marks	20 marks										
Theory: End Semester Marks	40 marks										
Theory: Continuous Evaluation Component Marks (CEC)	<table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Article Review</td> <td>10 marks</td> </tr> <tr> <td>Total</td> <td>40 Marks</td> </tr> </table>	Attendance	05 marks	MCQs	10 marks	Open Book Assignment	15 marks	Article Review	10 marks	Total	40 Marks
Attendance	05 marks										
MCQs	10 marks										
Open Book Assignment	15 marks										
Article Review	10 marks										
Total	40 Marks										



COURSE CODE BSDS105	COURSE NAME Numerical Methods and Analysis using MATLAB	SEMESTER I
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	30	0	75	3	0	1	4

Course Pre-requisites	Basic knowledge of algebra and calculus. Basic knowledge of derivatives and integration.
Course Category	Minor Course
Course focus	Skill Enhancement
Rationale	This course involves solving the system of linear equations, approximation of the root of nonlinear equations. Students also learn interpolation methods for equi-distant and non equi-distant data. Also they develop the skill to find numerical integration and differentiation and techniques to solve IVP.
Course Revision/ Approval Date:	30 July, 2023
Course Objectives (As per Blooms' Taxonomy)	<p>1: Solve: Make the students familiarize with the ways of solving complicated mathematical problems numerically</p> <p>2:Understand: To help them become familiar with MATLAB and other convenient numerical software such as Microsoft Excel and with simple programming</p> <p>3: Recognize, Find: Obtain numerical solutions to non-algebraic equations and systems of linear equations.</p> <p>4: Understand: Describe and understand of the several errors and approximation in numerical methods</p> <p>5: Understand, Find: Understanding of several available Solution techniques for differential Equations in One Variable. Study of Curve Fitting and Interpolation.</p>



Course Content (Theory)	Weightage	Contact hours
Unit 1: Errors: Notions of round off, truncation and other errors, Errors in numerical computations Solution of Algebraic and Transcendental Equations: Bisection, False position, Iterative Method, Newton Raphson Method, Secant Method. Solution using Matlab	20%	9
Unit 2: Solution of system of Linear Equations: Gauss Elimination method, Gauss Jordan Method, LU decomposition method, Gauss Jacobi Method, Gauss Seidel method. Solution using Matlab	20%	9
Unit 3: Interpolation: Newton’s forward and backward interpolation, Newton’s divided difference interpolating polynomials, Lagrange Interpolating polynomials. Solution using Matlab.	20%	9
Unit 4: Numerical Differentiation: First and second order differentiation Equations of Equally Spaced Data. Solution using Matlab. Numerical Integration: Trapezoidal rule, Simpson’s one third and 3/8th rule. Solution using Matlab	20%	9
Unit 5: Numerical methods for Solution of ordinary differential equations: Taylor’s series method, Euler’s method, Modified Euler’s method, Runge Kutta forth order method, Milne’s Predictor Corrector Method. Finite element method to solve second order ODE. Solution using Matlab. Curve Fittings: General Linear Least Squares, Fitting of quadratic and exponential curves. Solution using Matlab.	20%	9

List Of Practical	Weightage	Contact hours
1: Introduction to MATLAB, Matrix algebra, functions	7%	2
2: Loops: For, if else , while Programme for Bisection Method	7%	2
3: Programme for Regula-falsi and Secant Method	7%	2
4: Programme for Newton-Raphson’s Method	7%	2
5: Programme for Difference Table	7%	2
6. Programme for Newtons’s Forward and Backward Interpolation	8%	3
7. Programme for Newton's Divided Difference Interpolation Method	7%	2
8. Programme for Lagrange’s Method	7%	2
9. Use of Curve fitting Toolbox	7%	2
10. Programme for Numerical integrations (Trapezoidal and simpson’s rules)	8%	3
11. Solving system of linear equations	7%	2
12. Plotting 2D and 3D graphs	7%	2
13. Programme for Euler’s Method	7%	2
14. Practive test and Revision	7%	2



List of Practicals	Weightage	Contact hours
Unit 1: Introduction to MATLAB, Programming using MATLAB, Programs for Bisection, Regula-falsi, Secant and Newton-Raphson Method.	20%	3
Unit 2: Arrays and Matrices in MATLAB, solving systems of linear equations using MATLAB.	20%	3
Unit 3: Difference table, Newton's forward and Backward difference interpolation, Newton's divided difference table, program for Lagrange's interpolation Method.	20%	3
Unit 4: Programs on Trapezoidal rule, Simpson's one third and 3/8th rule.	20%	3
Unit 5: Programming for Euler's Method and 2D and 3D plots.	20%	3

Instructional Method and Pedagogy: (Max. 100 words) Chalk-board, Presentation, Use of Mathlab, Excel and Geogebra. Group Discussion, Case Study, Quizziz application.

Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to: CO1: Apply, solve: Apply numerical methods to find out solutions of non-algebraic equations using different methods under different conditions, and numerical solutions of systems of algebraic equations.	Apply	Describe, Find
CO2: Demonstrate, find: Apply various interpolation methods and finite difference concepts	Understand, Remember	Demonstrate & Examine, Find
CO3: Demonstrate: Work out numerical differentiation and integration whenever and wherever routine methods are not applicable	Understand, Remember	Demonstrate & Examine, Find
CO4: Solve: Work numerically on the ordinary differential equations using different methods through the theory of finite differences.	Evaluate	Examine, Find
CO5: Understand: Work numerically on the partial differential equations using different methods through the theory of finite differences.	Understand, Remember, Apply & Analyse	Define, Classify, Describe, Demonstrate & Examine



Learning Resources	
1.	Reference Books: 1 S. S. Sastry, .Introductory methods of Numerical Analysis, 5th Edition, Prentice-Hall India, 2012. 2. G. Shankar Rao, Numerical Analysis, New Age International Pvt. Ltd., 2006. 3. P.C. Biswal, Numerical Analysis, Prentice-Hall India, 2008.
2.	Journals & Periodicals: Mathematics Open
3.	Other Electronic Resources: MATLAB, Microsoft Excel, Geogebra Toolbox

Evaluation Scheme	Total Marks												
Theory: Mid semester Marks	20 marks												
Theory: End Semester Marks	40 marks												
Theory: Continuous Evaluation Component Marks	<table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>15 marks</td> </tr> <tr> <td>Open Book Assignment</td> <td>10 marks</td> </tr> <tr> <td>Total</td> <td>40 Marks</td> </tr> </table>	Attendance	05 marks	MCQs	10 marks	Open Book Assignment	15 marks	Open Book Assignment	10 marks	Total	40 Marks		
	Attendance	05 marks											
	MCQs	10 marks											
	Open Book Assignment	15 marks											
	Open Book Assignment	10 marks											
	Total	40 Marks											
Practical Marks	<table border="1"> <tr> <td>Attendance</td> <td>05 marks</td> </tr> <tr> <td>Practical Exam</td> <td>20 marks</td> </tr> <tr> <td>Viva</td> <td>10 marks</td> </tr> <tr> <td>Journal</td> <td>10 marks</td> </tr> <tr> <td>Discipline</td> <td>05 marks</td> </tr> <tr> <td>Total</td> <td>50 Marks</td> </tr> </table>	Attendance	05 marks	Practical Exam	20 marks	Viva	10 marks	Journal	10 marks	Discipline	05 marks	Total	50 Marks
	Attendance	05 marks											
	Practical Exam	20 marks											
	Viva	10 marks											
	Journal	10 marks											
	Discipline	05 marks											
Total	50 Marks												



COURSE CODE AECC101	COURSE NAME Fundamentals of English	SEMESTER I
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
30	0	0	30	30	0	0	2

Course Pre-requisites	Fundamental knowledge of English Language at 10+2 level
Course Category	Ability Enhancement Compulsory Course
Course focus	Skills Development
Rationale	It enables humanity to experience the benefits of chemistry when we apply it in the exploitation of materials and energy.
Course Revision/ Approval Date:	14/03/2023
Course Objectives (As per Blooms' Taxonomy)	<p>1 To emphasize the development of listening and reading skills among learners</p> <p>2 To equip them with writing skills needed for academic as well as workplace context</p> <p>3 To enable learners of Engineering and Technology develop their basic communication skills in English</p> <p>4 To strengthen the fundamentals in English Language.</p> <p>5 To build up the confidence to communicate with the world.</p>

Course Content (Theory)	Weightage	Contact hours
Unit 1: Language Basics Parts of speech, word formation, prefix-suffix, synonyms, antonyms, homophones and standard abbreviations	20%	6
Unit 2: Elementary Reading/Writing Skills Types of the sentences, structures of the sentences, use of phrases and clauses, punctuation, creative writing and coherence, comprehension, essay, paragraph writing, creative writing	30%	9
Unit 3: Elementary Spoken Skills	30%	9



Greetings, farewell and introduction, making an apology, accepting an apology, making an appointment, JAM, group discussion, debate, public speaking		
Unit 4: Practicing and Identifying the Common Error Tense, subject-verb agreement, noun-pronoun agreement, articles, prepositions, modal auxiliaries, voice, reported speech	20%	6

Instructional Method and Pedagogy:

Classroom Lecture, Case Studies, Quizzes, Presentations, Role Play, Expert Lecture (Consultant)

Course Objectives:

After successful completion of the above course, students will be able to:

CO1: To emphasize the development of listening and reading skills among learners

CO2: To equip them with writing skills needed for academic as well as workplace context

CO3: To enable learners of Engineering and Technology develop their basic communication skills in English

CO4: To strengthen the fundamentals in English Language.

CO5: To build up the confidence to communicate with the world.



Learning Resources												
1.	Textbook											
2.	Reference books <ol style="list-style-type: none"> 1. Murphy, Raymond “Murphy’s English Grammar with CD” Cambridge University Press, 2004. . 2. Thorpe, Edgar and Showick Thorpe “Basic Vocabulary” Pearson Education India, 2012. 3. Green, David. “Contemporary English Grammar Structures and Composition” MacMillan Publishers, New Delhi, 2010. Wren & Martin (2001), English Grammar & Composition, New York											
3.	Journal											
Evaluation Scheme		Total Marks										
Theory: Mid semester Marks	20 marks											
Theory: End Semester Marks	40 marks											
Theory: Continuous Evaluation Component Marks	<table border="1"> <tbody> <tr> <td>Attendance</td> <td>10 marks</td> </tr> <tr> <td>MCQs</td> <td>10 marks</td> </tr> <tr> <td>Skill enhancement activities / case study</td> <td>10 marks</td> </tr> <tr> <td>Presentation/ miscellaneous activities</td> <td>10 marks</td> </tr> <tr> <td>Total</td> <td>40 Marks</td> </tr> </tbody> </table>		Attendance	10 marks	MCQs	10 marks	Skill enhancement activities / case study	10 marks	Presentation/ miscellaneous activities	10 marks	Total	40 Marks
Attendance	10 marks											
MCQs	10 marks											
Skill enhancement activities / case study	10 marks											
Presentation/ miscellaneous activities	10 marks											
Total	40 Marks											

Bachelor of Science in Data Science Course Curriculum

Batch: 2023-2024

Academic Year: 2023-'24

W.E.F. July 2023



GSFC
UNIVERSITY
EDUCATION RE-ENVISIONED

**GSFC University, Vigyan Bhavan, P. O.
Fertilizernagar, Vadodara - 391750, Gujarat, India**



Teaching Scheme Semester – II

Sr. No.	Course Code	Course Name	Teaching Scheme (Hours/week)				Teaching Credit				Evaluation Scheme					
			L	P	T	Total	L	P	T	Total	Theory: MS Marks	Theory: CEC Marks	Theory: ES Marks	Theory Marks	Practical Marks	Total Marks
1.	BSDS201	Programming using Python	3	2	0	5	3	1	0	4	20	40	40	100	50	150
2.	BSDS202	Object Oriented Programming using C++	3	2	0	5	3	1	0	4	20	40	40	100	50	150
3.	BSDS203	Fundamentals of Data Structures	3	2	0	5	3	1	0	4	20	40	40	100	50	150
4.	BSDS204	Mathematical Foundation for Data Science	3	0	1	4	3	0	1	4	20	40	40	100	0	100
5.	BSDS205	Statistics - II	3	2	0	5	3	1	0	4	20	40	40	100	50	150
6.	AECC201	Communication Skills in English	2	0	0	2	2	0	0	2	20	40	40	100	0	100
7.	AECC203	Working with Spreadsheets	1	2	0	3	1	1	0	2	20	40	40	100	50	150
8.	CBCS2*	CBCS Courses	2	0	0	2	2	0	0	2	20	40	40	100	0	100
9.	SECC201	Internship	0	4	0	4	0	2	0	2	0	0	0	0	50	50
10.	VACC2*	Value Added Courses	2	0	0	2	2	0	0	2	20	40	40	100	0	100
Total			22	14	1	37	22	7	1	30	180	360	360	900	300	1200

Note: L = Lecture, P = Practice, T= Tutorial, MS - Mid Semester, CEC - Continuous Evaluation Component, ES - End Semester

Program Coordinator

Associate Dean



COURSE CODE BSDS201	COURSE NAME Programming using Python	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial I	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	30	0	75	3	1	0	4

Course Pre-requisites	Fundamental knowledge of any basic programming language.
Course Category	Major Course
Course focus	Employability
Rationale	The present course will equip students with the skills related to python programming and its applications. Detailed knowledge of libraries and their utility will help students to apply the gained knowledge for performing solution oriented tasks related to data analysis, data cleaning, and, more rigorous tasks like application development can also be done. Small project based learning can equip students with utmost important skill-sets.
Course Revision/ Approval Date:	
Course Objectives (As per Blooms’ Taxonomy)	To enable the student to: 1: Understand the fundamental components of the programming process. 2: Inculcate the knowledge related to the control structures of procedural programming languages. 3: Provide in-depth knowledge about List, Tuple & Dictionaries. 4: Be aware of the utility of python programming and basic functions. 5: Be familiar with different libraries and their utility in advanced technologies.



Course Content (Theory)	Weightage	Contact hours
<p>Unit 1: Introduction & Control Statements Installation and Working with Python, Essentials of a Python program, Program Structure of Python, Basic Syntax, Variables and Identifiers, Built- In Data Types. Variable definition, Operators And Expressions, Constants And Literals, Basic Input/output Statement. Control Loops and Array Decision Making - Conditions, Relational, Operators, Logical Connectives, If-Else , Nested If-Else Statement, Replacement of switch case Loops: While loop, Do-while, For loop, Nested loops , Break, Continue and pass Statement</p>	20%	9
<p>Unit 2: Python Data Types Arrays – One dimensional and multidimensional array, Array processing. String Manipulation - accessing Strings, Basic Operations, String slices and Function and Methods, Lists: Introduction, accessing list, Operations, Working with lists, Function and Methods. Tuple: Introduction, accessing tuples, Operations,. Dictionaries: Introduction, Accessing values in dictionaries, Working with dictionaries, Properties</p>	20%	9
<p>Unit 3: Functions in python Dates and Time: Basic date and time classes, Different time formats, Converting between formats, Formatting dates and times, Parsing date/time information, Binary Data: What is Binary Data? , Binary vs. text, Using the Struct module. Defining a function, Python Built-in Functions , Calling a function, Types of functions, Function Arguments, Default Argument, Anonymous functions, Global and local variables, Custom Functions vs. Standard Functions, Refactoring, Making Functions Reusable, Functions as Data</p>	20%	9
<p>Unit 4: Python Library Overview & Introduction to Tinker An Introduction to libraries used for AI & ML, IoT & Cyber Security: numpy, matplotlib, pandas, opencv, tinker, tensorflow, keras, tensorflow, Theano, Sci-kit learn, PyTorch , mraa, sockets, mysqldb, requests, paho-mqtt, Scapy, Requests, IMPacket, pwntools, Cryptography, python-nmap, Faker, Twisted, pylibnet, RawSocketpy. Reading from a file – Writing to a file – Other Operations on Files. GUI Programming: Tkinter and its widgets – Overview of other GUIs</p>	20%	9
<p>Unit 5: OOP Concepts & Introduction to Django Classes and Object-Oriented Programming, Abstract Data Types and Classes, Inheritance, Encapsulation and Information Hiding. Features of Django , Django web server, Understanding Django environment, Django architecture, MVC and MTVA , view that displays a hyperlink , Mapping the views to URLs, Improving the views using templates, Template inheritance, Sending data from url to</p>	20%	9



view, Sending data from view to template, Create & Activating the app, Adding background color for web pages, Adding banner, background image to the web site		
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List of Practical	Weightage	Contact hours
1: a. Demonstrate installation of python. b. Working of variables and identifiers with simple programs. c. Create different variables to show different types of data, operators and expressions. d. Demonstrate working of constants. e. Usage of input output statements.	20%	6
2: a. Demonstrate practicals based on conditional statements. b. Working of decision statements. c. Show replacement of switch statements. d. Demonstrate working of different loops. e. Usage of break , continue and pass. f. Show working of arrays. g. Show different string manipulations.	20%	6
3: a. Demonstrate List and accessing of list. b. Working of tuples. c. Show working of dictionaries.	20%	6
4: a. Demonstrate date and time functions. b. Working of conversion of different date format manipulations. c. Create functions and its types.	20%	6
5: a. Demonstrate working of listed libraries for real time applications.	20%	6

Instructional Method and Pedagogy: (Max. 100 words)

Utilizing Powerpoint Presentations, Chalk-Board demonstration, videos on various topics, group discussions and seminars are some of the methods adopted to improve the student ability to grasp the fundamental knowledge related to the subject. The discussion during the theoretical sessions and hands-on sessions during the practical laboratory sessions will enable students to apply the knowledge gained on real-life problems. Additional activities like minor projects on the said subject will work as a stepping stone in enhancing the student's performance.



Course Outcome:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Understand basics of python programming.	Cognitive	Understand
CO2: Understand the concepts of loops and control structures for different purposes.		Understand
CO3: Comprehend about working of list and dictionaries.		Comprehend
CO4: Design python application with the use of date-time and other functions.		Design
CO5: Apply in development of real time applications.		Apply

Learning Resources	
1.	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Python Crash Course: A Hands-On, Project-Based Introduction to Programming (2nd Edition) 2. John V Guttag. "Introduction to Computation and Programming Using Python", Prentice Hall of India 3. R. Nageswara Rao, "Core Python Programming", dreamtech 4. Wesley J. Chun. "Core Python Programming - Second Edition", Prentice Hall 5. Kenneth A. Lambert, "Fundamentals of Python – FirstPrograms", CENGAGE Publication 6. Luke Sneeringer, "Professional Python", Wrox 7. John Paul Mueller, Luca Massaron, Python for Data Science For Dummies , WILEY 8. Wes McKinney, Python for Data Analysis Data Wrangling with Pandas, NumPy, and IPython, 2nd Edition , O'REILLY
2.	<p>Other Electronic Resources:</p> <ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc22_cs32/preview 2. https://onlinecourses.swayam2.ac.in/aic20_sp33/preview



Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks (CEC)	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment / Skill enhancement activities / case study / Assignment	15 marks
	Article Review /Presentation/ miscellaneous activities / Projects	10 marks
	Total	40 Marks
Practical Marks	Attendance	05 marks
	Practical Exam	20 marks
	Viva	10 marks
	Journal	10 marks
	Discipline	05 marks
	Total	50 Marks



COURSE CODE BSDS202	COURSE NAME Object Oriented Programming using C++	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial I	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	30	0	75	3	1	0	4

Course Pre-requisites	Fundamentals of any programming language
Course Category	Major
Course focus	Employability
Rationale	The present course will focus on fundamentals of programming concepts of C++.
Course Revision/ Approval Date:	
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> 1: Understand the basic concepts of Object Oriented Programming using C++. 2: Understand the fundamentals of input/output, arrays 3: Understand the fundamentals of working with classes. 4: Define and create the functions, and understand the function overloading and inheritance. 5: Understand the concepts of operator overloading, pointers and files.

Course Content (Theory)	Weightage	Contact hours
Unit 1: Object Oriented Programming (OOP) Concepts and Introduction to C++ – Structured programming vs. object oriented programming – Basic OOP concepts : objects, classes, encapsulation, data hiding, inheritance, polymorphism	15%	6



<ul style="list-style-type: none"> - Introduction to C++: structure of a C++ program, data types, variables, constants, expressions, statements and operators - Usage of header files - Control flow statements: if else, for loop, while loop, do while loop, switch, break and continue 		
<p>Unit 2: Input/Output, Arrays, Strings</p> <ul style="list-style-type: none"> - Basic I/O in C++ - Arrays in C++ : introduction, declaration, initialization of one , two and multi-dimensional arrays, operations on arrays - Working with strings : introduction, declaration, string manipulation and arrays of strings 	18%	12
<p>Unit 3: Classes</p> <ul style="list-style-type: none"> - Classes and objects in C++ - Constructors : default, parameterized, copy, constructor overloading and destructors - Access specifiers, implementing and accessing class members - Working with objects : constant objects, nameless objects, live objects, arrays of objects 	23%	15
<p>Unit 4: Functions, Function Overloading and Inheritance</p> <ul style="list-style-type: none"> - Introduction to functions, library and user-defined functions, parameters passing, default arguments - Functions overloading, inline functions, friend functions - Inheritance: Introduction, derived class declaration, types of inheritance and member access ability, constructor and destructor in derived class, construction invocation and data member initialization. - virtual functions 	22%	15
<p>Unit 5: Operator Overloading, Pointers and Files</p> <ul style="list-style-type: none"> - Operator overloading : Introduction, overloaded operators, unary operator overloading, operator keyword, operator return values, binary operators overloading, overloading with friend function - Usages of Pointers in C++ : basic overview Dynamic memory allocation - Files : introduction and applications - File operations : open, read, write, seek and close 	22%	12



List of Practical	Weightage	Contact hours
1. Create a class representing a student with attributes like name, roll number, and marks. Implement member functions to set and get the values of these attributes.	10%	3
2. Implement a class representing a bank account with attributes like account number, account holder name, and balance. Include member functions to deposit and withdraw money from the account.	10%	3
3. Create a class called "Rectangle" with attributes length and width. Implement member functions to calculate the area and perimeter of the rectangle.	10%	3
4. Design a class called "Date" that represents a calendar date. Include member functions to set the date, display the date in different formats (e.g., DD/MM/YYYY, Month DD, YYYY), and calculate the number of days between two dates.	10%	3
5. Create a class called "Car" with attributes like make, model, and year. Implement member functions to start the car, accelerate, and brake.	10%	3
6. Develop a class called "Employee" with attributes like name, employee ID, and salary. Include member functions to calculate the annual salary and give a raise to an employee.	10%	3
7. Implement a class called "Stack" using an array to simulate a stack data structure. Include member functions to push elements onto the stack, pop elements from the stack, and check if the stack is empty.	10%	3
8. Create a class called "Fraction" to represent a fraction (numerator and denominator). Implement member functions to add, subtract, multiply, and divide fractions.	10%	3
9. Design a class called "Person" with attributes like name, age, and address. Include member functions to display the person's details and update their address.	10%	3
10. Implement a class called "Bank" that manages a collection of bank accounts. Include member functions to add a new account, remove an account, and find the account with the highest balance.	10%	3

Instructional Method and Pedagogy: Chalk board, Powerpoint presentations, demonstrations, Hands-on sessions, discussion, Quiz, online materials, Small projects, etc.



Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: understand Object Oriented Programming concepts using C++.	Remember Understand	Define List Explain Use
CO2: understand concepts of Input/output, arrays and working with strings	Remember Understand	Define List Explain Use
CO3: understand the concepts of class structure and designing and implementing the class	Remember Understand	Define List Explain Use
CO4: use functions, function overloading and inheritance to develop the programs.	Remember Understand Analyze Apply Create	Define List Explain Use Design
CO5: use operator overloading, pointers and files to develop the programs.	Remember Understand Analyze Apply Create	Define List Explain Use Design

Learning Resources	
1.	<p>Reference Books:</p> <ol style="list-style-type: none"> Robert Lafore : Object Oriented Programming in Turbo C++, Guide, Galgotia Pub. John R. Hubbard : Programming with C++ (Schaum's Outlines), McGraw Hill, Second Edition, 2000. <p>Text Books:</p> <ol style="list-style-type: none"> E Balagurusamy : Object Oriented Programming in C++, Tata McGraw-Hill Publishing Co. Ltd. Barkakati N. : Object Oriented Programming in C++, PHI. OOP's using C++ for Dummies.
2.	Journals & Periodicals:



3.	<p>Other Electronic Resources:</p> <ol style="list-style-type: none"> 1. https://onlinecourses.nptel.ac.in/noc22_cs103/preview 2. https://www.edx.org/learn/object-oriented-programming/ibm-object-oriented-implementation-using-c
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Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment / Skill enhancement activities / case study / Assignment	15 marks
	Article Review /Presentation/ miscellaneous activities / Projects	10 marks
	Total	40 Marks
	Practical Marks	Attendance
Practical Exam		20 marks
Viva		10 marks
Journal		10 marks
Discipline		05 marks
Total		50 Marks



COURSE CODE BSDS203	COURSE NAME Fundamentals of Data Structures	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	30	0	75	3	1	0	4

Course Pre-requisites	Fundamentals of any programming language
Course Category	Major
Course focus	Employability
Rationale	The present course will focus on fundamentals of programming concepts of C++.
Course Revision/ Approval Date:	
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> Understand the basic concepts of Object Oriented Programming using C++. Understand the fundamentals of input/output, arrays Understand the fundamentals of working with classes. Define and create the functions, and understand the function overloading and inheritance. Understand the concepts of operator overloading, pointers and files.

Course Content (Theory)	Weightage	Contact hours
Unit 1: Introduction Introduction to Data Structures, data organization, data structure operations, algorithmic notations, complexity of algorithms, overview of array & strings	20%	9
Unit 2: Stacks, Queues & Linked List Linear Data Structures: Stacks: Operations and Applications, Queues: Operations and Applications, Circular Queues: Operations and Applications, Links Lists: Operation – Creations,	20%	9



insertion, Deletion, Circular Lists, Doubly Linked list, application of linked lists		
<p>Unit 3: Trees & Graphs Terminologies, definition and concepts, binary trees, representing binary trees in memory, traversals and other operations on binary trees, threaded binary trees, binary search trees, heap trees; heap sort, height balanced binary trees (avl trees), weight balanced trees (Huffman tree), general trees, b-trees & b+ trees</p> <p>Introduction to graphs, representing graph in memory, operations on graph, traversing and searching, applications of graphs</p>	20%	9
<p>Unit 4: Sort, Search & Hashing Introduction, insertion sort, selection sort, bubble sort, merging, mergesort, quick sort, radix sort, searching and data modification</p> <p>Hash tables, hashing techniques and functions, collision resolution techniques – open addressing & chaining</p>	20%	9
<p>Unit 5: File Structures Concepts of fields, records and files, sequential, indexed and relative/random file organization, indexing structure for index files, hashing for direct files, multi-key file organization and access methods</p>	20%	9

List of Practical	Weightage	Contact hours
<p>1:</p> <ul style="list-style-type: none"> a. Implement basic data structures such as arrays and strings. b. Construct algorithms for common operations on arrays and strings, such as sorting, searching, and manipulation. c. Analyze the time and space complexity of algorithms using Big O notation. d. Practice expressing algorithms using pseudocode or simple flowcharts. e. Solve coding problems related to array and string manipulation. 	20%	6
<p>2:</p> <ul style="list-style-type: none"> a. Implement stack and queue data structures using arrays or linked lists. b. Perform operations like push, pop, enqueue, and dequeue on stacks and queues. c. Implement singly linked lists and perform operations like insertion, deletion, and traversal. 	20%	6



<ul style="list-style-type: none"> d. Extend linked list concepts to circular linked lists and doubly linked lists. e. Solve problems that involve stack, queue, and linked list operations such as evaluating postfix expressions or implementing a queue using stacks. 		
<p>3:</p> <ul style="list-style-type: none"> a. Implement binary trees and perform operations like insertion, deletion, and traversal. b. Implement binary search trees (BST) and perform searching and insertion operations. c. Implement basic graph representations using adjacency lists or matrices. d. Perform graph traversal algorithms such as depth-first search (DFS) and breadth-first search (BFS). e. Solve problems involving tree and graph algorithms such as finding the lowest common ancestor in a binary tree or determining if a graph is bipartite. 	20%	6
<p>4:</p> <ul style="list-style-type: none"> a. Implement sorting algorithms like bubble sort, selection sort, insertion sort, merge sort, and quick sort. b. Implement searching algorithms like linear search, binary search, and interpolation search. c. Implement a basic hash table using arrays and handle collision resolution techniques such as chaining or open addressing. d. Compare the performance of different sorting and searching algorithms on various input sizes. e. Solve problems related to sorting, searching, and hashing such as finding the kth smallest element in an array or implementing a dictionary using hashing. 	20%	6
<p>5:</p> <ul style="list-style-type: none"> a. Implement file operations like reading from and writing to text files using file handling libraries in the chosen programming language. b. Implement sequential file organization and perform basic file manipulation operations like adding records or searching for records. c. Implement indexing techniques like primary and secondary indexing for efficient file access. d. Explore the implementation of hashing for direct file access and handle collision resolution techniques. e. Solve problems related to file structures such as merging two sorted files or implementing a database index. 	20%	6



Instructional Method and Pedagogy: Chalk board, power point presentations, demonstrations, Hands-on sessions, discussion, Quiz, online materials, Small projects, etc.

Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Understand and use the process of abstraction using any object oriented programming language.	Cognitive	Comprehension Apply
CO2: Implement various data structures viz. Stacks, Queues & Linked Lists.		Apply Create
CO3: Implement various data structures viz. Trees & Graphs.		Apply Create
CO4: Understand & implement various searching & sorting techniques.		Apply Analyze
CO5: Comprehend & Apply file structure principles in real time applications.		Understand Apply

Learning Resources	
1.	<p>Textbooks</p> <ol style="list-style-type: none"> Data Structures Using C by Reema Thareja, 2nd Edition. Fundamentals Of Data Structures in C++ by Horowitz, Sartaj Sahni, 2nd Edition. Data Structure Through C by Yashwant Kanetkar, 2nd Edition <p>Reference books</p> <ol style="list-style-type: none"> An Introduction to Data Structures with Application by JeanPaul Tremblay & Paul Sorenson, 2nd edition. Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles by Narasimha Karumanchi, 5th Edition. Data Structures: A Pseudo-code approach with C by Gilberg & Forouzan, Thomson Learning
2.	Journals & Periodicals:
3.	Other Electronic Resources: <ol style="list-style-type: none"> https://nptel.ac.in/courses/106/102/106102064/



Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment / Skill enhancement activities / case study / Assignment	15 marks
	Article Review /Presentation/ miscellaneous activities / Projects	10 marks
	Total	40 Marks
	Practical Marks	Attendance
Practical Exam		20 marks
Viva		10 marks
Journal		10 marks
Discipline		05 marks
Total		50 Marks



COURSE CODE BSDS204	COURSE NAME Mathematical Foundation for Data Science	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial 1	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	0	15	60	3	0	1	4

Course Prerequisites	Basic concepts related to Mathematics
Course Category	Minor
Course focus	Employability
Rationale	The present course will give the idea about different concepts of discrete mathematics like sets, combination and permutation, boolean algebra. Also, it focuses on matrix fundamentals.
Course Revision/ Approval Date:	
Course Objectives (As per Blooms' Taxonomy)	To enable the student to: 1: Understand basic theory of Sets. 2: Understand basic fundamentals about functions and Relations 3: Understand the concepts of counting and logic. 4: Learn the basics of Boolean algebra 5: Learn the preliminaries of Matrices and operations

Course Content (Theory)	Weightage	Contact hours
Unit 1: Set Theory Sets and Elements – Subsets – Venn Diagrams – Set Operations – Algebra of Sets – Duality – Finite Sets – Counting Principle – Classes of Sets – Power Sets – Partitions – Mathematical Induction.	20%	12
Unit 2: Relations and Functions Relations – Operations on Relations – Equivalence Relation – Partitions and Equivalence Classes – Functions – One-One and Onto Functions – Special Type of Functions – Invertible	20%	12



Functions – Compositions of Functions – Recursively Defined Functions		
Unit 3: Techniques of Counting and Logic Basic Counting Principles – Permutations – Combinations – Pigeonhole Principle – Inclusion-Exclusion Principle. Propositions and Logical Operations – Truth Tables – Equivalence – Implications – Laws of Logic –Normal Forms – Predicates and Quantifiers	20%	12
Unit 4: Boolean Algebra The Partially ordered set, Hasse diagram, Lattice, Properties of lattice, Boolean algebra, Boolean expressions and Boolean functions	18%	10
Unit 5: Vectors and Matrices Vectors in R_n , dot product and norm. Matrix addition, subtraction and scalar multiplication, Matrix multiplication, elementary row operations, inverse, rank and transpose of matrix, Square matrices: Diagonal, upper and lower triangular, symmetric, skew symmetric, orthogonal matrices. Determinants of matrices up to order 3.	22%	14

List of Tutorial	Weightage	Contact hours
Unit 1: Examples based on set theories and Vann diagrams	20%	2
Unit 2: Examples based on Equivalence relations and Recurrence relations	20%	2
Unit 3: Examples based on techniques of Counting and Logic	20%	2
Unit 4: Examples based on Hasse diagrams, lattices, and Boolean expression	18%	4
Unit 5: Examples based on Dot products and matrice	22%	5

Instructional Method and Pedagogy: Chalk & board, group discussions, assignments, , Online materials, Practice examples



Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Solve the set theory problems by creating the venn diagrams and other principles	Remember Understand Apply	Define State Classify Explain Use Solve Examine
CO2: Understand and define the functional, equivalence and recurrence relationship.	Remember Understand Apply	Define State Classify Explain Identify Use Solve
CO3: Use counting techniques and understand the logic.	Understand Apply	Describe Identify Solve Use Find
CO4: Solve the problems using concepts of Boolean algebra.	Remember Apply	Describe Use Solve
CO5: Apply the basic fundamentals of matrices to solve the problems.	Understand Apply	classify Explain Identify Use Solve Examine

Learning Resources	
1.	<p>Reference Books:</p> <ol style="list-style-type: none"> 1. Elements of Discrete Mathematics – A Computer Oriented Approach, C.L. Liu, D. Mohapatra, Tata McGraw Hill, Special Indian Edition, 2017. 2. Discrete Mathematics, S. Lipschutz and M. Lipson, 6th Edition, McGraw Hill Education, 2017. <p>Text Books:</p> <ol style="list-style-type: none"> 1. Discrete Mathematical Structures with Applications to Computer Science, J.P. Trembley and R. Manohar, Tata McGraw Hill, 35th Reprint, 2017.



	<ol style="list-style-type: none"> 2. Discrete Mathematical Structures, Kolman, R.C. Busby and S.C. Ross, 6th Edition, Pearson, 2018. 3. Discrete Mathematics and its Applications, Kenneth H. Rosen, 8th Edition, Tata McGraw Hill, 2019. 4. Narsingh Deo, Graph theory with applications to Engineering and Computer Science, Prentice-Hall of India, 1993.
2.	Journals & Periodicals:
3.	Other Electronic Resources:

Evaluation Scheme	Total Marks										
Theory: Mid semester Marks	20 marks										
Theory: End Semester Marks	40 marks										
Theory: Continuous Evaluation Component Marks	<table border="1"> <tr> <td>Attendance</td> <td>5</td> </tr> <tr> <td>MCQs</td> <td>10</td> </tr> <tr> <td>Open Book Assignment</td> <td>15</td> </tr> <tr> <td>Article Review / Presentations / Practice Assignments</td> <td>10</td> </tr> <tr> <td>Total</td> <td>40</td> </tr> </table>	Attendance	5	MCQs	10	Open Book Assignment	15	Article Review / Presentations / Practice Assignments	10	Total	40
	Attendance	5									
	MCQs	10									
	Open Book Assignment	15									
	Article Review / Presentations / Practice Assignments	10									
Total	40										



COURSE CODE BSDS205	COURSE NAME Statistics - II	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
45	30	0	75	3	1	0	4

Course Prerequisites	Basic concepts related to Statistics
Course Category	Minor
Course focus	Employability
Rationale	The syllabus covers foundational and advanced statistical concepts essential for data science. Beginning with hypothesis testing, students learn to draw conclusions from data. They progress to understanding standard error, sampling distribution, and significance testing techniques for accurate estimation and analysis. Advanced statistical tests like chi-square and ANOVA equip students to analyze complex datasets effectively. The study of advanced indexing techniques enhances multidimensional data evaluation. Time series analysis provides skills for forecasting and trend identification, preparing students for real-world data challenges across various industries.
Course Revision/ Approval Date:	
Course Objectives (As per Blooms' Taxonomy)	To enable the student to: <ol style="list-style-type: none"> Develop proficiency in conducting hypothesis tests and interpreting their results. Understand the significance of standard error and sampling distribution in statistical analysis. Explore advanced statistical tests and their applications in data science. Introduce weighted composite index numbers and quality indexing methods for representing and assessing complex data structures. Develop skills in analyzing time series data and identifying trends, seasonal variations, and cyclical patterns.



Course Content (Theory)	Weightage	Contact hours
<p>Unit 1: Statistical Inference for Data Science Introduction to Hypothesis Testing: Basics of hypothesis testing, null and alternative hypotheses. Case studies/examples related to hypothesis testing.</p>	10%	4
<p>Unit 2: Standard Error and Sampling Distribution: Understanding standard error, sampling distribution, and estimation techniques.</p> <p>Test of Significance: Two-tailed test, one-tailed test, Z-test for significance of coefficient of correlation.</p>	15%	8
<p>Unit 3: Advanced Statistical Tests Advanced Tests of Goodness: Introduction to advanced chi-square tests and their applications in data science, additional tests used for checking goodness of fit and independence in categorical data.</p> <p>ANOVA/MANOVA: Introduction to ANOVA/MANOVA and their application in analyzing the variance. Utility of ANOVA/MANOVA in data science.</p>	20%	9
<p>Unit 4: Advanced Indexing Techniques Composite Index Numbers: Weighted composite index numbers, composite indices in representing complex data structures.</p> <p>Quality Indexing: Introduction of quality indexing methods and their application in assessing data quality, role of quality indices in data science.</p>	22%	12
<p>Unit 5: Time Series Analysis Introduction, Components of Time series analysis, Measurement of trends-Graphical method, semi-average method, Moving average method, least square method, Measurement of seasonal variation-simple average, Ratio to trend and Ratio to moving average method, cyclical variation.</p>	22%	12

List of Practicals	Weightage	Contact hours
<p>1:</p> <ol style="list-style-type: none"> a. Use Excel/R to conduct t-tests and z-tests for population mean. b. Perform hypothesis testing for population proportions using Excel/R functions. 		



<ul style="list-style-type: none"> c. Analyze real-world datasets to formulate and test hypotheses. d. Conduct hypothesis tests on sample data provided in Excel sheets or imported into R. e. Analyze and interpret results using descriptive statistics and graphical representations in Excel/R. f. Compare outcomes of hypothesis tests for different scenarios. 	20%	6
<p>2:</p> <ul style="list-style-type: none"> a. Generate sampling distributions using Excel/R functions. b. Calculate standard error for sample means and proportions. c. Visualize sampling distributions and standard error using Excel/R plots. d. Perform two-tailed and one-tailed tests using Excel/R functions. e. Conduct Z-tests for correlation coefficients in Excel/R. f. Interpret p-values and make decisions based on test results. 	20%	6
<p>3:</p> <ul style="list-style-type: none"> a. Use Excel/R to perform chi-square tests for independence and goodness of fit. b. Apply additional tests for categorical data analysis, such as Fisher's exact test and McNemar's test. c. Interpret test results and assess the goodness of fit in Excel/R. d. Conduct ANOVA/MANOVA analysis using excel and/or built-in functions in R. e. Compare group means and test for statistical significance. f. Visualize multivariate data using plots and graphs in R. 	20%	6
<p>4:</p> <ul style="list-style-type: none"> a. Calculate weighted composite index numbers using Excel formulas or R functions. b. Compare different weighting schemes and their impact on index values. c. Interpret composite indices and assess trends over time. d. Implement quality indexing methods in Excel/R to assess data quality. e. Evaluate data integrity and identify areas for improvement based on quality indices. f. Develop quality assurance strategies for data science projects. 	20%	6
<p>5:</p> <ul style="list-style-type: none"> a. Use Excel/R to plot time series data and identify trends. b. Calculate trend measures like moving averages and least squares in Excel/R. c. Analyze seasonal variation using Excel/R functions and 	20%	6



<p>visualize seasonal patterns.</p> <p>d. Detect the cyclical patterns in time series data using Excel/R.</p> <p>e. Apply statistical methods to measure cyclical variation and assess its significance.</p> <p>f. Interpret cyclical trends and their implications for forecasting and decision-making.</p>		
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Instructional Method and Pedagogy: Chalk board, Powerpoint presentations, demonstrations, Hands-on sessions, discussion, Quiz, online materials, Small projects, etc.

Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Demonstrate the ability to formulate null and alternative hypotheses, conduct hypothesis tests using appropriate statistical methods, and interpret the results effectively.	Apply	Formulate Conduct Interpret
CO2: Analyze sampling distributions and understand the role of standard error in estimating population parameters, enabling them to conduct tests of significance confidently.	Understand	Analyze Understand Estimate Conduct
CO3: Apply advanced chi-square tests and ANOVA/MANOVA techniques to analyze complex datasets, deriving meaningful insights and making informed decisions in data science contexts.	Apply	Apply Analyze Derive Make
CO4: Construct weighted composite index numbers and quality indices accurately, demonstrating proficiency in representing data structures and assessing data quality effectively in data science applications.	Create	Construct Demonstrate Represent Assess
CO5: Apply graphical and statistical methods to analyze time series data, measure trends, assess seasonal variations, and identify cyclical patterns accurately, facilitating informed decision-making in data science.	Apply	Apply Analyze Measure Assess Identify Facilitate



Learning Resources	
1.	<p>Reference Books:</p> <ol style="list-style-type: none">1. D.C. Montgomery and G.C. Runger, Applied Statistics and Probability for engineers, New Jersey, John Wiley and Sons, 3rd edition, 2003.2. David. M. Levin, David. F. Stephen, and Cathryn. A. Szadat, (2013), Statistics for managers using MS-Excel, 7Th Edition, Pearson Education (India) <p>Text Books:</p> <ol style="list-style-type: none">1. S. P. Gupta, 2014, Business Statistics and Statistical Methods, S. Chand Publication, New Delhi2. L. Mayes & Keying, (2005), Probability Statistics for Engineers and Scientists, Pearson Education.3. Goon, Gupta and Dasgupta – Fundamentals of Statistics, Vol. I.
2.	<p>Journal</p>
3.	<p>Other Electronic resources:</p> <ol style="list-style-type: none">1. https://nptel.ac.in/courses/110/108/110108068/2. https://nptel.ac.in/courses/111/108/111108061/3. https://swayam.gov.in/nd2_cec20_ma07/preview4. https://swayam.gov.in/nd1_cec20_ma02/preview5. https://www.coursera.org/learn/statistics6. https://www.coursera.org/specializations/jhu-data-science



Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment / Skill enhancement activities / case study / Assignment	15 marks
	Article Review /Presentation/ miscellaneous activities / Projects	10 marks
	Total	40 Marks
	Practical Marks	Attendance
Practical Exam		20 marks
Viva		10 marks
Journal		10 marks
Discipline		05 marks
Total		50 Marks



COURSE CODE AECC201	COURSE NAME Communication Skills in English	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
30	0	0	30	2	0	0	2

Course Prerequisites	Fundamental knowledge related to English language
Course Category	Ability Enhancement Compulsory Course
Course focus	Skills Development
Rationale	It enables learners to gain & apply communicational knowledge and practices followed in corporate and organizational settings.
Course Revision/ Approval Date:	
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> Develop their basic communication skills in English. Use English language with basic rules and regulations as per proper grammatical syntaxes. Equip themselves to develop the art of listening and reading in the English language. Equip themselves with writing skills needed for academic as well as workplace context. Strengthen digital communication using technological modules and expertise.

Course Content (Theory)	Weightage	Contact hours
Unit 1: Communicative Skills: Basics of Communication, Verbal & Non-verbal Communication, Barriers to Effective Communication, Strategies of Effective Communication	20%	6
Unit 2: Grammar & Vocabulary:	15%	5



Types of sentences, Synonyms, Antonyms, Tenses - Past, Present & Future, Homophones, Modals, Verb forms, Phrasal Verbs, Error correction, commonly misused words, technical terms		
Unit 3: Listening & Reading Skills: Definitions (Listening & Reading), Types of Listening, Barriers to Effective Listening, Traits of a Good Listener, Types of Reading, Techniques of Effective Reading, Reading Tasks (Critical & Inferential)	30%	9
Unit 4: Writing Skills & Speaking Skills: Letter writing - Complaint & Leave, Article, Precise writing, Report writing, Note-taking and Note-making, Creative Writing Introducing self, Interview Skills, Public Speaking, Debates, Role plays, Group Discussion.	25%	7
Unit 5: ICT/ Digital/ E-Skills: Computer Assisted Language Learning (CALL), Mobile Assisted Language Learning (MALL), Emails, Blogs, Digital/ E-Portfolio, Filling Online Application Forms	20%	6

Instructional Method and Pedagogy: Classroom Lecture, Case Studies, Quizzes, Presentations, Role Play, Expert Lecture (Consultant)

Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Emphasize the development of listening and reading skills among learners	Understand Analyze Remember	Define Classify Demonstrate
CO2: Apply writing skills needed for academic as well as workplace context.	Analyze Apply Understand	Classify Describe Demonstrate
CO3: Develop their basic communication skills in English	Understand, remember	Define Describe Demonstrate
CO4: Improve the communicational attitude in the English Language.	Remember, Analyze	Define Describe
CO5: Build the confidence to communicate with the world using technologically advanced equipment.	Understand Apply	Define



		Classify Describe Demonstrate
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Learning Resources	
1.	<p>Reference Books :</p> <ol style="list-style-type: none"> Murphy, Raymond.(1998), Intermediate English Grammar, New York Wren & Martin (2001), English Grammar & Composition, New York Mudambadithaya G.S.,(2002) English Grammar and composition Digne, Flinders and Sweeney(2010) Cambridge University press Lupton, Mary Jane (1998). <i>Maya Angelou: A Critical Companion</i>. Westport, : Greenwood Press. ISBN 978-0-313-303225. Booher, Diana. (2004), <i>Booher's Rules of Business Grammar</i>, OUPUr, Penny (2002), <i>Grammar Practice Activities</i>, OUP <p>Text book:</p> <ol style="list-style-type: none"> An Introduction to Professional English and Soft Skills by B K Das
2.	Journals & Periodicals:
3.	Other Electronic Resources:

Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment / Skill enhancement activities / case study / Assignment	15 marks
	Article Review /Presentation/ miscellaneous activities / Projects	10 marks
	Total	40 Marks



COURSE CODE AECC203	COURSE NAME Working with Spreadsheets	SEMESTER II
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Teaching Scheme (Hours)				Teaching Credit			
Lecture	Practical	Tutorial	Total Hours	Lecture	Practical	Tutorial	Total Credit
15	30	0	45	1	1	0	2

Course Prerequisites	Basic skills related to computers
Course Category	Skill-enhancement course
Course focus	Employability
Rationale	
Course Revision/ Approval Date:	July 30, 2023
Course Objectives (As per Blooms' Taxonomy)	<p>To enable the student to:</p> <ol style="list-style-type: none"> 1. Get familiarized with essential spreadsheet features, menus, ribbons, and shortcuts to enhance navigation and productivity. 2. Understand & apply reinforced data entry techniques and implement formulas for calculations and data manipulation. 3. Develop proficiency in using advanced spreadsheet functions. 4. Use data analysis tools for extracting meaningful insights from datasets. 5. Apply acquired skills to address practical challenges related to data analysis in practical scenarios.

Course Content (Theory)	Weightage	Contact hours
Unit I: Overview of spreadsheet software (e.g., Google Sheets), Data validation and error checking, Absolute vs. relative cell references, Custom and Special formats, Conditional Formatting, Workbook and worksheet protection, Data import, export and Sharing, Find and replace, Paste special, Transpose Table, Shortcut keys.	20%	6



Unit 2: Using basic formulas and functions, Text Functions: UPPER, LOWER, PROPER, LEFT, MID, RIGHT, LEN, CONCATENATE. Date and Time Functions: Basic mathematical and Statistical functions. SUMIF, SUMIFS, COUNTIF, COUNTIFS, AVERAGEIF, AVERAGEIFS, NESTED IF, IFERROR, AND, OR, NOT Functions for Finance and Accounting	20%	6
Unit 3: Sorting and Filtering : Filtering on Text, Numbers and Colors, Advanced filters, Custom sort Text to Column, Vlookup, Hlookup, Index and Match, reverse lookup using Choose function,	20%	6
Unit 4: Pivot Tables, Filtering Pivot Tables. Graph and Charts, Print and Page Setup: Print Titles-Repeat Rows /Columns, Query functions in Google sheets	20%	6
Unit 5: Introduction to Macro and VBA : Recording Macro Solving real-world problems using spreadsheets, Latest Spreadsheet functions, Special Google-sheet functions.	20%	6

List of Practical	Weightage	Contact hours
Overview of spreadsheet software (e.g., Google Sheets)	2%	2
Data validation and error checking	3%	2
Absolute vs. relative cell references	3%	2
Custom and Special formats, Conditional Formatting	4%	2
Workbook and worksheet protection, Data import, export and Sharing,	3%	2
Find and replace, Paste special, Transpose Table, Shortcut keys.	4%	2
Using basic formulas and functions	4%	2
Text Functions: UPPER, LOWER, PROPER, LEFT, MID, RIGHT, LEN, CONCATENATE	4%	2
Date and Time Functions: Basic mathematical and Statistical functions.	3%	2
SUMIF, SUMIFS, COUNTIF, COUNTIFS, AVERAGEIF, AVERAGEIFS	4%	2
NESTED IF, IFERROR, AND, OR, NOT	4%	2
Functions for Finance and Accounting	3%	2
Sorting and Filtering : Filtering on Text, Numbers and Colors,	3%	2
Advanced filters, Custom sort	3%	2
Text to Column, Vlookup, Hlookup	5%	4
Index and Match	5%	4
reverse lookup using Choose function,	3%	2
Pivot Tables, Filtering Pivot Tables.	5%	2
Graph and Charts	3%	2



Print and Page Setup: Print Titles-Repeat Rows/Columns	3%	2
Query functions in Google sheets	6%	4
Introduction to Macro and VBA : Recording Macro	6%	4
Solving real-world problems using spreadsheets	6%	4
Latest Spreadsheet functions	4%	2
Special Google-sheet functions.	3%	2

Instructional Method and Pedagogy: Chalk board, Powerpoint presentations, demonstrations, Hands-on sessions, discussion, Quiz, online materials, Small projects, etc.

Course Outcomes:	Blooms' Taxonomy Domain	Blooms' Taxonomy Subdomain
After successful completion of the above course, students will be able to:		
CO1: Demonstrate proficiency in navigating the user interface of spreadsheet software.	Understand	Remember Understand Apply
CO2: Apply basic formulas and functions to perform calculations and manipulate data.	Apply	Formulate Apply Calculate
CO3: Apply advanced functions for more sophisticated calculations.	Apply	Apply
CO4: Create and customize pivot tables for data summarization and analysis.	Create	Create Analyze
CO5: Apply learned skills to solve a real-world problem using spreadsheets.	Apply	Apply Solve

Learning Resources

1.	Reference Books: <ol style="list-style-type: none"> 1. Understanding Goolesheets, Kevin Wilson, 2021 2. Excel 365 Bible, Michael Alexander and Dick Kusleika, Willey, 2022 3. Google Sheets: The Comprehensive Guide, Adam Smart, Zapier.com 4. Excel Functions and Formulas, Sarah Jones, 2007
2.	Journals & Periodicals:
3.	Other Electronic Resources: <ol style="list-style-type: none"> 1. https://www.w3schools.com/EXCEL/index.php 2. https://www.youtube.com/watch?v=hG5vKMb0Lpo&list=PLv9Pf9aNgemvb55w2dAh-Q1ZSOKM6vtEx



Evaluation Scheme	Total Marks	
Theory: Mid semester Marks	20 marks	
Theory: End Semester Marks	40 marks	
Theory: Continuous Evaluation Component Marks	Attendance	05 marks
	MCQs	10 marks
	Open Book Assignment / Skill enhancement activities / case study / Assignment	15 marks
	Article Review /Presentation/ miscellaneous activities / Projects	10 marks
	Total	40 Marks
	Practical Marks	Attendance
Practical Exam		20 marks
Viva		10 marks
Journal		10 marks
Discipline		05 marks
Total		50 Marks