

**Kurukshetra University, Kurukshetra**  
(Established by the State Legislature Act XII of 1956)  
(‘A+’ Grade, NAAC Accredited)

॥ योगस्थः कुरु कर्माणि ॥  
समबुद्धि व योग युक्त होकर कर्म करो  
(Perform Actions while Stead fasting in the State of Yoga)



Syllabus of Examination (2<sup>nd</sup> Semester) for Under-Graduate Programmes  
**Bachelor of Computer Applications (Data Science)**  
**BCA (DS): SCHEME D**  
according to  
Curriculum Framework for Under-Graduate Programmes  
As per NEP-2020 (Multiple Entry-Exit, Internships and Choice Based Credit  
System)  
**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS**  
(For the Batches Admitted From 2023-2024)

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS  
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

<b>Session: 2023-24</b>			
<b>Part A - Introduction</b>			
Subject	BCA (Data Science)		
Semester	II		
Name of the Course	Object Oriented Programming using C++		
Course Code	B23-CDS-201		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)	B23-CDS-101		
Course Learning Outcomes(CLO):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> <li>1. learn the input/output statements and functions in C++.</li> <li>2. get familiar with OOPS concepts, constructors, and destructors in C++.</li> <li>3. Learn the various concepts of operator overloading and inheritance.</li> <li>4. get familiar with concepts of virtual functions and exception handling in C++ language.</li> </ol> <hr style="width: 20%; margin-left: 0;"/> <p>5*. Implement the programs based on various concepts of C++.</p>		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
<b>Max. Marks:100(70(T)+30(P))</b>		<b>Time: 3 Hrs.(T), 3Hrs.(P)</b>	
<b>Internal Assessment Marks:30(20(T)+10(P))</b>			
<b>End Term Exam Marks: 70(50(T)+20(P))</b>			
<b>Part B- Contents of the Course</b>			
<b><u>Instructions for Paper-Setter</u></b>			
<p>The examiner will set a total of nine questions. Out of which, the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate will have to attempt five questions, selecting one from each unit. First</p>			

question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	<p><b>Input Output in C++:</b> Unformatted and Formatted I/O Operations. I/O using insertion and extraction operators and streams in C++.</p> <p><b>Functions:</b> Declaration and Definition, return values, arguments, passing parameters by value, call by reference, call by pointer, Recursion, Inline Functions, Function overloading.</p> <p>Pointers, structures, and union in C++.</p>	11
II	<p><b>Object-oriented features of C++:</b> Class and Objects, Data hiding and encapsulation, abstraction, Data Members and Member Functions, accessing class members, empty class, local class, global class, Scope Resolution Operator and its Uses, Static Data Members, Static Member Functions, Structure vs Class, Friend function and friend class.</p> <p><b>Constructors and Destructors:</b> Constructors, Instantiation of objects, Default constructor, Parameterized constructor, Copy constructor and its use, Destructors, Dynamic initialization of objects.</p>	12
III	<p><b>Operator Overloading:</b> Overloading unary and binary operators: arithmetic operators, manipulation of strings using operators.</p> <p><b>Inheritance:</b> Derived class, base class, Accessing the base class member, Inheritance: multilevel, multiple, hierarchical, hybrid; Virtual base class, Abstract class.</p>	11
IV	<p>Virtual Functions, pure virtual functions; Polymorphism and its types</p> <p><b>Exception Handling in C++:</b> exception handling model, exception handling constructs - try, throw, catch, Order of catch blocks, Catching all exceptions, Nested try blocks, handling uncaught exceptions.</p>	11
V*	<p>Practicum: Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <ul style="list-style-type: none"> <li>• Write a C++ program to print the following lines: <ul style="list-style-type: none"> <li>• Your introduction</li> <li>• Your institute introduction</li> </ul> </li> <li>• Write a program that accepts principle, rate, and time from the user and prints the simple interest.</li> <li>• Write a program to swap the values of two variables.</li> <li>• Write a program to check whether the given number is even or odd (using ?: ternary operator).</li> <li>• Write a program to check whether the given number is positive or negative (using ?: ternary operator).</li> <li>• Write a program that inputs three numbers and displays the largest number using the ternary operator.</li> <li>• WAP to initialize data members of the class using the constructor.</li> <li>• Pass values to the constructor and initialize the members of that class to those values.</li> <li>• Create a class called cube with the data members Length, Breadth, Height</li> </ul>	30

	<ul style="list-style-type: none"> <li>• Members functions: <ul style="list-style-type: none"> <li>• To accept the details.</li> <li>• To calculate the volume of the cube.</li> <li>• To display the details.</li> </ul> </li> <li>• WAP to calculate the sum using constructor overloading.</li> <li>• WAP to demonstrate the use of destructor.</li> <li>• Create a C++ Program to show the order of constructor and destructor.</li> <li>• C++ Program to Find the Number of Vowels, Consonants, Digits, and White Spaces in a String</li> <li>• C++ Program to Multiply Two Matrices by Passing Matrix to Function</li> <li>• Increment ++ and Decrement -- Operator Overloading in C++ Programming</li> <li>• C++ Program to Add Two Complex Numbers</li> <li>• C++ Program to Show Function Overriding</li> <li>• C++ Program to Show Polymorphism in Class</li> <li>• C++ Program to Show Function Overloading</li> <li>• C++ Program to Show Inheritance</li> </ul>	
<b>Suggested Evaluation Methods</b>		
<p><b>Internal Assessment:</b></p> <p>➤ <b>Theory</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 5</li> <li>• Mid-Term Exam: 10</li> </ul> <p>➤ <b>Practicum</b></p> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul>	<p><b>End-Term Examination:</b> A three-hour exam for both theory and practicum.</p> <p><b>End Term Exam Marks:</b> <b>70(50(T)+20(P))</b></p>	
<b>Part C-Learning Resources</b>		
<p><b>Recommended Books/e-resources/LMS:</b></p> <ul style="list-style-type: none"> <li>• Herbert Schildt, C++, The Complete Reference, Tata McGraw-Hill</li> <li>• Robert Lafore, Object Oriented Programming in C++, SAMS Publishing</li> <li>• Bjarne Stroustrup, The C++ Programming Language, Pearson Education</li> <li>• Balaguruswami, E., Object Oriented Programming In C++, Tata McGraw-Hill.</li> <li>• Richard Johnson, An Introduction to Object-Oriented Application Development, Thomson Learning.</li> </ul>		

\*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS  
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

<b>Session: 2023-24</b>			
<b>Part A - Introduction</b>			
Subject	BCA (Data Science)		
Semester	II		
Name of the Course	Introduction to Web Technologies		
Course Code	B23-CDS-202		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	After completing this course, the learner will be able to: <ol style="list-style-type: none"> <li>1. learn the basics of web development.</li> <li>2. understand different types of web pages and websites.</li> <li>3. implement HTML and CSS for web page designing.</li> <li>4. Understand the design of web crawlers and search engines.</li> </ol> <hr/> 5*. implement the programs based on various concepts of web development.		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
<b>Max. Marks:100(70(T)+30(P))</b>		<b>Time: 3 Hrs.(T), 3Hrs.(P)</b>	
<b>Internal Assessment Marks:30(20(T)+10(P))</b>			
<b>End Term Exam Marks: 70(50(T)+20(P))</b>			
<b>Part B- Contents of the Course</b>			
<b><u>Instructions for Paper- Setter</u></b>			
<p>Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question will comprise of short answer type questions covering entire syllabus.</p> <p>Candidate will have to attempt five questions in all, selecting one question from each unit. First question will be compulsory.</p> <p>Practicum will be evaluated by an external and an internal examiner. Examination will be of</p>			

three-hour duration.

Unit	Topics	Contact Hours
I	Introduction to Internet and World Wide Web (WWW); Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers; Hypertext Transfer Protocol, URLs; Searching, Search Engines and Search Tools. Web Publishing: Hosting website; Internet Service Provider; Planning and designing website; Web Graphics Design, Steps For Developing website	11
II	Creating a Website and Introduction to Markup Languages (HTML and DHTML), HTML Document Features and fundamentals, HTML Elements, Creating Links; Headers; Text styles; Text Structuring; Text color and Background; Formatting text; Page layouts, Images; Ordered and Unordered lists; Inserting Graphics; Table Creation and Layouts; Frame Creation and Layouts; Working with Forms and Menus; Working with Radio Buttons; Check Boxes; Text Boxes, HTML5	11
III	Introduction to CSS (Cascading Style Sheets): Features, Core Syntax, Types, Style Sheets and HTML, Style Rule Cascading and Inheritance, Text Properties, CSS Box Model, Normal Flow Box Layout, Positioning, and other useful Style Properties; Features of CSS3.	12
IV	The Nature of JavaScript: Evolution of Scripting Languages, JavaScript-Definition, Programming for Non-Programmers, Introduction to Client-Side Programming, Enhancing HTML Documents with JavaScript. Static and Dynamic web pages	11
V*	<p>Practicum:</p> <p>Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <ul style="list-style-type: none"> <li>• Create a web page using an ordered list and an unordered list.</li> <li>• Design a web page to show your institute with hyperlinks.</li> <li>• Create your resume on the HTML page.</li> <li>• Create a web page and divide the web page into four frames. In one frame create three links that will display different HTML forms in the remaining three frames respectively.</li> <li>• Create a web page to show the record of the college in the form of a table.</li> <li>• Write an HTML code to add internal CSS on a webpage</li> <li>• Design a blog-style personal website.</li> </ul>	30

	<ul style="list-style-type: none"> <li>• Design a web page to display your college with hyperlinks.</li> <li>• Write a JavaScript function to calculate the sum of two numbers.</li> <li>• Write a JavaScript program to find the maximum number in an array.</li> <li>• Write a JavaScript function to check if the given string is a palindrome (reads the same forwards and backward).</li> <li>• Write a CSS file and attach it to any 3 HTML web pages.</li> <li>• Use Div and span in a page and color two words with the same colors.</li> <li>• Using HTML, CSS create a styled checkbox with animation on state change</li> <li>• Design a web page that is like a compose page of e-mail. It should have: <ul style="list-style-type: none"> <li>a) Text boxes for To, CC, and BCC respectively.</li> <li>b) Text field for the message.</li> <li>c) Send button.</li> <li>d) Option for selecting a file for attachment</li> </ul> </li> <li>• After clicking the send button a new page should open with the display message “Message has been sent”.</li> </ul>	
<b>Suggested Evaluation Methods</b>		
<p><b>Internal Assessment:</b></p> <p>➤ <b>Theory</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 5</li> <li>• Mid-Term Exam: 10</li> </ul> <p>➤ <b>Practicum</b></p> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul>	<p><b>End-Term Examination:</b> A three-hour exam for both theory and practicum.</p> <p><b>End Term Exam Marks:</b> <b>70(50(T)+20(P))</b></p>	
<b>Part C-Learning Resources</b>		
<p><b>Recommended Books/e-resources/LMS:</b></p> <ul style="list-style-type: none"> <li>• Raj Kamal, Internet and Web Technologies, Tata McGraw-Hill.</li> <li>• Ramesh Bangia, Multimedia and Web Technology, Firewall Media.</li> <li>• Thomas A. Powell, Web Design: The Complete Reference, Tata McGraw-Hill</li> <li>• Wendy Willard, HTML Beginners Guide, Tata McGraw-Hill.</li> <li>• Deitel and Goldberg, Internet and World Wide Web, How to Program, PHI</li> <li>• David Flanagan, JavaScript: The Definitive Guide: The Definitive Guide.</li> <li>• Kogent Learning, Web Technologies: HTML, JavaScript, PHP, Java, JSP, XML, AJAX – Black Book, Wiley India Pvt. Ltd.</li> </ul>		

\*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS  
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

<b>Session: 2023-24</b>			
<b>Part A - Introduction</b>			
Subject	BCA (Data Science)		
Semester	II		
Name of the Course	Concepts of Operating Systems		
Course Code	B23-CDS-203		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes(CLO):	<p>After completing this course, the learner will be able to:</p> <ol style="list-style-type: none"> <li>1. understand the basic concepts of operating systems and their services along with process management.</li> <li>2. understand the concept of process scheduling and acquire knowledge of process synchronization.</li> <li>3. learn about memory management and virtual memory concepts.</li> <li>4. learn to work with directory structure and security aspects.</li> </ol> <hr style="width: 50%; margin-left: 0;"/> <p>5*. implement the programs based on the operating system.</p>		
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
<b>Max. Marks:100(70(T)+30(P))</b>		<b>Time: 3 Hrs.(T), 3Hrs.(P)</b>	
<b>Internal Assessment Marks:30(20(T)+10(P))</b>			
<b>End Term Exam Marks: 70(50(T)+20(P))</b>			
<b>Part B- Contents of the Course</b>			
<b><u>Instructions for Paper- Setter</u></b>			
<p>Examiner will set a total of nine questions. Out of which first question will be compulsory. Remaining eight questions will be set from four unit selecting two questions from each unit. Examination will be of three-hour duration. All questions will carry equal marks. First question</p>			



will comprise short answer-type questions covering the entire syllabus.  
The candidate must attempt five questions in all, selecting one question from each unit. The first question will be compulsory.  
The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	<p>Introductory Concepts: Operating System, Functions and Characteristics, Historical Evolution of Operating Systems, Operating System Structure.</p> <p>Types of Operating System: Real-time, Multiprogramming, Multiprocessing, Batch processing.</p> <p>Operating System Services, Operating System Interface, Service System Calls, and System Programs.</p> <p>Process Management: Process Concepts, Operations on Processes, Process States, and Process Control Block. Inter-Process Communication.</p>	11
II	<p>CPU Scheduling: Scheduling Criteria, Levels of Scheduling, Scheduling Algorithms, Multiple Processor Scheduling, Algorithm Evaluation.</p> <p>Synchronization: Critical Section Problem, Semaphores, Classical Problem of Synchronization, Monitors.</p> <p>Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery.</p>	12
III	<p>Memory Management Strategies: Memory Management of Single-user and Multiuser Operating Systems, Partitioning, Swapping, Contiguous Memory Allocation, Paging and Segmentation;</p> <p>Virtual Memory Management: Demand Paging, Page Replacement Algorithms, Thrashing.</p>	11
IV	<p>Implementing File System: File System Structure, File System Implementation, File Operations, Type of Files, Directory Implementation, Allocation Methods, and Free Space Management.</p> <p>Disk Scheduling algorithm - SSTF, Scan, C- Scan, Look, C-Look.</p> <p>SSD Management.</p>	11
V*	<p>Practicum:</p> <p>Students are advised to do laboratory/practical practice not limited to but including the following types of problems:</p> <ul style="list-style-type: none"> <li>• Working with various operating systems, and performing different operations using operating systems.</li> <li>• Write a program to print file details including owner access permissions, and file access time, where file name is given as argument.</li> <li>• Write a program to copy files using system calls.</li> </ul>	30

	<ul style="list-style-type: none"> <li>• Write a program to implement the FCFS scheduling algorithm.</li> <li>• Write a program to implement the Round Robin scheduling algorithm.</li> <li>• Write a program to implement the SJF scheduling algorithm.</li> <li>• Write a program to implement a non-preemptive priority-based scheduling algorithm</li> <li>• Write a program to implement preemptive priority-based scheduling algorithm.</li> <li>• Write a program to implement the SRJF scheduling algorithm.</li> <li>• Write a program to calculate the sum of n numbers using the thread library.</li> <li>• Write a program to implement first-fit, best-fit, and worst-fit allocation strategies.</li> </ul>	
<b>Suggested Evaluation Methods</b>		
<p><b>Internal Assessment:</b></p> <p>➤ <b>Theory</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 5</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: 5</li> <li>• Mid-Term Exam: 10</li> </ul> <p>➤ <b>Practicum</b></p> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 10</li> <li>• Mid-Term Exam: NA</li> </ul>	<p><b>End-Term Examination:</b> A three-hour exam for both theory and practicum.</p> <p><b>End Term Exam Marks:</b> <b>70(50(T)+20(P))</b></p>	
<b>Part C-Learning Resources</b>		
<p><b>Recommended Books/e-resources/LMS:</b></p> <ul style="list-style-type: none"> <li>• Silberschatz A., Galvin P.B.,and Gagne G., Operating System Concepts, John Wiley &amp; Sons.</li> <li>• Godbole, A.S., Operating Systems, Tata McGraw-Hill Publishing Company, New Delhi.</li> <li>• Deitel, H.M., Operating Systems, Addison- Wesley Publishing Company, New York.</li> <li>• Tanenbaum, A.S., Operating System- Design and Implementation, Prentice Hall of India, New Delhi.</li> </ul>		

\*Applicable for courses having practical components.

**DEPARTMENT OF COMPUTER SCIENCE & APPLICATIONS  
KURUKSHETRA UNIVERSITY, KURUKSHETRA**

<b>Session: 2023-24</b>			
<b>Part A - Introduction</b>			
Subject	BCA (Data Science)		
Semester	II		
Name of the Course	Mathematical Foundations for Computer Science-II		
Course Code	B23-CDS-204		
Course Type: (CC/MCC/MDC/CC- M/DSEC/VOC/DSE/PC/AEC/ VAC)	CC-M		
Level of the course (As per Annexure-I)	100-199		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO):	<p>After learning this course students will be able to:</p> <ol style="list-style-type: none"> <li>1. Understand the concept of integration.</li> <li>2. Acquire cognitive and technical knowledge about a variety of methods of representation of statistical data.</li> <li>3. Understand methods of measure of central tendency. Analyze the problem and apply the best measure of central tendency to draw inferences from the available data.</li> <li>4. Understand the concept of correlation, and correlation methods and conclude about the type of correlation for the available data. Comprehend the skills of curve fitting.</li> <li>5. * Attain a range of cognitive and technical skills to integrate various functions. Have the technical and practical skills required for selecting and using suitable methods for data representation and measurement of central tendency.</li> </ol>		
Credits	Theory	Practical	Total
	1	1	2
Contact Hours	1	2	3
<b>Max. Marks:50(30(T)+20(P))</b>		<b>Time: 3 Hrs.(T), 3Hrs.(P)</b>	
<b>Internal Assessment Marks:15(10(T)+5(P))</b>			
<b>End Term Exam Marks:35(20(T)+15(P))</b>			
<b>Part B-Contents of the Course</b>			

### Instructions for Paper-Setter

The examiner will set a total of nine questions. Out of which the first question will be compulsory. The remaining eight questions will be set from four units selecting two questions from each unit. The examination will be of three-hour duration. All questions will carry equal marks. The first question will comprise short answer-type questions covering the entire syllabus. The candidate must attempt five questions in all, selecting one question from each unit. The first question will be compulsory.

The practicum will be evaluated by an external and an internal examiner. The examination will be of three-hour duration.

Unit	Topics	Contact Hours
I	Integration of simple algebraic, trigonometric, and exponential functions. <b>Presentation of data:</b> Frequency distribution and cumulative frequency distribution, Diagrammatic and graphical presentation of data, Construction of bar, Pie diagrams, Histograms, Frequency polygon, Frequency curve, and Ogives.	4
II	<b>Measures of central tendency:</b> Arithmetic mean, Median, Mode, Geometric mean, and Harmonic mean for ungrouped and grouped data. <b>Measures of dispersion:</b> Concept of dispersion, Mean deviation and its coefficient, Range, Variance and its coefficient, Standard deviation.	4
III	<b>Correlation:</b> Concept and types of correlation, Methods of finding correlation: Scatter diagram, Karl Pearson's coefficients of correlation, Rank correlation.	3
IV	<b>Linear regression:</b> Principle of least square, Fitting of a straight line, Two lines of regression, Regression coefficients.	4
V*	<b>Practicum:</b> Students are advised to do laboratory/practical practice not limited to, but including the following types of problems: <b>Problem Solving-</b> Questions related to the practical problems based on the following topics will be worked out and a record of those will be maintained in the Practical Note Book: <ul style="list-style-type: none"> <li>• Demonstrate skills in finding integration of simple functions.</li> <li>• Representation of data using Bar and pie diagrams.</li> <li>• Representation of data using Histogram, Frequency polygon, Frequency curves, and Ogives.</li> <li>• Problems to compute measures of central tendency.</li> <li>• Problems to calculate measures of dispersion.</li> <li>• Problem to calculate Karl Pearson's coefficient of correlation.</li> <li>• Problem to fit the straight line for the given data.</li> <li>• Problem to find lines of regression.</li> </ul>	30

### **Suggested Evaluation Methods**

<p><b>Internal Assessment:</b></p> <p>➤ <b>Theory</b></p> <ul style="list-style-type: none"> <li>• Class Participation: 4</li> <li>• Seminar/presentation/assignment/quiz/class test etc.: NA</li> <li>• Mid-Term Exam: 6</li> </ul> <p>➤ <b>Practicum</b></p> <ul style="list-style-type: none"> <li>• Class Participation: NA</li> <li>• Seminar/Demonstration/Viva-voce/Lab records etc.: 5</li> <li>• Mid-Term Exam: NA</li> </ul>	<p><b>End Term Examination:</b>  <b>A three-hour exam for both theory and practicum.</b></p> <p><b>End Term Exam Marks:35(20(T)+15(P))</b></p>
<p><b>Part C-Learning Resources</b></p>	
<p><b>Text /Reference Books:</b></p> <ul style="list-style-type: none"> <li>• S.C. Gupta and V.K. Kapoor (2014). Fundamentals of Mathematical Statistics, S. Chand &amp; Sons, Delhi.</li> <li>• R.V. Hogg, J. W. McKean and A. T. Craig (2013). Introduction to Mathematical Statistics (7 th edition), Pearson Education.</li> <li>• J. V. Dyke, J. Rogers and H. Adams (2011). Fundamentals of Mathematics, Cengage Learning.</li> <li>• A.S. Tussy, R. D. Gustafson and D. Koenig (2010). Basic Mathematics for College Students. Brooks Cole.</li> <li>• G. Klambauer (1986). Aspects of calculus. Springer-Verlag.</li> </ul>	

\*Applicable for courses having practical components.