



Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Undergraduate Program

B. Sc. Computer Science (Entire)-II

Syllabi of the course

Choice based credit system syllabus

(To be implemented from academic year 2023-24)

Department of Computer Science (Entire)

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Preamble:

There are bright career prospects for computer science professionals or software professionals in recent scenario. With the opening of huge software and IT companies in India, the job opportunities for trained professionals have increased considerably. India is known to be a leader in software and IT sector.

Computer science graduates pass outs find job opportunities in a variety of environments in academia, research, industry, government, private, business organizations and so on.

They are involved in analyzing problems for solutions, formulating and testing, using advanced communications or multi-media equipment, or working in teams for product development.

The software and IT companies are the major employers of computer science graduates. They offer the best packages to the young graduates which are unmatched with other branches of science.

General Objectives of the Program:

1. To nurture academicians with focus and commitment to their subject.
2. To shape good and informed citizens from the students entering into the Programme.
3. To create a skilled workforce to match the requirements of the society.
4. To impart knowledge of Science is the basic objective of this Programme.
5. To develop scientific attitude is the major objective so as to make the students open minded, critical and curious.
6. To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute to science.

Programme Outcomes:

1. The students will graduate with proficiency in the subject of their choice.
2. The students will be eligible to continue higher studies in their subject.
3. The students will be eligible to pursue higher studies abroad.
4. The students will be eligible to appear for the examinations for jobs in government organizations.
5. The students will be eligible to apply for jobs with a minimum requirement of B.Sc. Programme.

Program Specific Objectives of the Course:

1. The content of the syllabus have been framed as per UGC norms of CBCS Pattern.
2. The students are expected to understand the fundamentals, principles, mathematical, recent IT concepts and recent developments in the subject area.
3. The practical course is in relevance to the theory courses to improve the understanding of the concepts.
4. It is expected to inspire and boost interest of the students towards Computer Science as the main subject.
5. To develop the power of appreciations, the achievements in Computer and role in nature and society.
6. To enhance student sense of enthusiasm towards IT and to involve them in an intellectually stimulating experience of learning in a supportive environment.

Program Specific Outcomes:

After successful completion of B.Sc. Computer Science (Entire) Course student will be able to:

1. Understand the basics of Computer Science.
2. Learn, design and perform experiments in the labs to demonstrate the concepts, principles and theories learned in the classrooms.
3. Develop the ability to apply the knowledge acquired in the classroom and laboratories to specific problems in theoretical and experimental Computer Science.
4. Identify their area of interest in academic, research and development.
5. Perform job in various fields' like IT, science, engineering, education, banking, business and public service, etc. or be an entrepreneur with precision, analytical mind, innovative thinking, clarity of thought, expression, and systematic approach.

B. Sc. Part II

Title: Computer Science (Entire)

1. **Year of Implementation:** The syllabus will be implemented from June, 2021 onwards.
2. **Duration:** The course shall be a fulltime.
3. **Pattern:** Semester examination.
4. **Medium of Instruction:** English.
5. **Structure of Course:**

Structure and Titles of Courses of B.Sc. Course:

B.Sc. II SEM - III Computer Science (Entire)

Sr.no	Course Category	Paper Code	Name of Course
1	Major -I	BCSET 231	Data Structure using C
2	Major-II	BCSET 232	Cloud Computing
3	Major Practical III	BCSEP 233	Based on BCSET 311
4	Major Practical IV	BCSEP 234	Based on BCSET 312
5	Minor-I	BCSET 235	Statistical Methods
6	Minor Practical III	BCSEP 236	Based on BCSET 315
7	VSC	BCSETVSC 1	Vocational Skill Course : Web Multimedia I
8	SEC	BCSETSEC 2	Skill Enhancement Course –Operating System
9	AEC	BCSETAEC 1	English I
10		BCSETAEC 2	English II
11	VEC		Value Education Course – Environmental
		BCSETVEC 2	Awareness for Computer Science

B.Sc. II SEM - IV Computer Science (Entire)

Sr.no	Course Category	Paper Code	Name of Course
1	Major -I	BCSET 241	Object Oriented Programming using C++
2	Major-II	BCSET 242	Cyber Security Concepts
3	Major Practical V	BCSEP 243	Based on BCSET 411
4	Major Practical V	BCSET244	Based on BCSET 412
4	Minor-I	BCSET 245	Computational Mathematics I
5	Minor Practical IV	BCSEP 246	Based on BCSET 415
6	VSC	BCSETVSC 2	Vocational Skill Courses : Web Multimedia II
7	SEC		Skill Enhancement Course –Linux Operating
		BCSETSEC 3	System
8	AEC	BCSETAEC 3	English 3
9		BCSETAEC 4	English 4
10	CC	BCSET CC 2	Careers in sports

Semester III

BCSET-231: Data Structure Using C

Course objectives: Student should be able to:

1. explore the concept of Data Structure
2. understand the Searching and Sorting Methods
3. explore the Concept of Stack and Queue.
4. implement Linked list and trees

Credits (Total Credits 2)	SEMESTER-III BCSET-231: Data Structure Using C	No. of hours per unit/credits
Unit I:	Basics of Data Structure	8
	<ul style="list-style-type: none">• Data Structure: Need of data structure , Linear and non-linear, classification of data structure, operations on data structure: Traversing, Inserting, Deleting, Searching, Sorting, Merging different approaches to designing an algorithm: top-down, bottom-up• Performance analysis: time complexity and space complexity, Big 'O' Notation• Sorting techniques: Introduction, selection sort, insertion sort, bubble sort, merge sort, quick sort• Searching: Linear search , Binary search	
Unit II	Stack and Queue	8
	<ul style="list-style-type: none">• Introduction to stack: stack as abstract data type, representation of stack through arrays,• Applications of stack: reversing a list, conversion of infix to postfix, evaluation of postfix, converting an infix into prefix, evaluation of prefix expression, recursion• Introduction: Queue as ADT, representation of queue as an array• Types of queue: circular queue, double ended queue, priority queue, dequeue, Applications of queue	
Unit III	Linked List & Tree	7
	<ul style="list-style-type: none">• Introduction: Terminologies: node, address, pointer, information, next, null pointer, empty list etc• Types of list: linear , circular, doubly list• Operations on linked list: searching, inserting, deleting Trees terminologies, types of trees	
Unit IV	Graph	7
	<ul style="list-style-type: none">• Graph-introduction, terminologies, representation of a graph• Traversal of graph: Depth-first search(DFS), Breadth-first Search (BFS), Applications of graph• Hashing: Hash function collision resolution technique	

Course Outcome: After completion of this course student will be able to:

1. implement basic aspects of data structures including Stacks, Queue, Linked list and Tree.
2. apply different sorting and searching algorithms.
3. Implementation of linked list.
4. perform stack and queue

References:

1. Data structure using C++ ,D.S. Malik , Course Technology ,Second Edition2010
2. Data Structure Through C++, Yashwant Kanitkat,BPB Publication, Second Edition 2003
3. "Data Structures Using C" by Aaron M. Tenenbaum, Yedidyah Langsam, and Moshe J. Augenstein
4. "Data Structures and Algorithms Made Easy in C" by Narasimha Karumanchi
5. Data Structures Made Easy with C" by Sarah Miller

BCSEP-233:Lab Course Based on BCSET- 231**Course Objectives: Student will be able to:**

1. explore the concept of Data Structure
2. understand the Searching and Sorting Methods
3. explore the Concept of Stack and Queue.
4. implement Linked list and trees.

Credits (Total Credits)	SEMESTER-III BCSEP-233: Data Structure Using C	No. of hours per unit-60
	Data Structure Using C <ol style="list-style-type: none"> 1. Write C programs to implement Linear Search. 2. Write C programs to implement Binary Search. 3. Write C programs to implement Selection Sort. 4. Write C programs to implement Insertion Sort. 5. Write C programs to implement Bubble Sort. 6. Write C programs to implement Merge Sort. 7. Write C programs to implement Quick Sort. 8. Write C programs to implement access element from stack. 9. Write C programs to check stack is empty 10. Write C programs to implement Stack using an array. 11. Write C programs to implement Queue using an array 12. Write C programs to Insert an element into a Linked List. 13. Write C programs to Delete an element into a Linked List. 14. Write C programs to Search for a key element into a Linked List. 15. Write C programs to count number of nodes into a Linked List. 16. Write C program to Insert an element into a binary search tree. 17. Write C program to Delete an element from binary search tree. 18. Write C program to search for a key element into a binary search tree. 19. Write C programs to implement BFS. 20. Write C programs to implement DFS 	

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

1. Implement basic aspects of data structures including Stacks, Queue, Linked list and Tree.
2. apply different sorting and searching algorithms.
3. Implement linked list.
4. perform stack and queue

References:

1. Data structure using C++ ,D.S. Malik , Course Technology ,Second Edition2010
2. Data Structure Through C++, Yashwant Kanitkat, BPB Publication, Second Edition 2003
3. "Data Structures Using C" by Aaron M. Tenenbaum, Yedidiah Langsam, and Moshe J. Augenstein
4. "Data Structures and Algorithms Made Easy in C" by Narasimha Karumanchi
5. "Data Structures and Algorithm Analysis in C" by Mark Allen Weiss

BCSET 232: Cloud Computing

Course Objectives: Student will be able to:

1. understand the concepts of Cloud Computing.
2. explore Taxonomy of Virtualization Techniques.
3. study Cloud Computing Architecture.
4. acquire knowledge on Aneka Cloud Application Platform.
5. explore Industry Cloud Platforms.

Credits (Total Credits 2)	BCSET 232: Cloud Computing	No. of hours per unit/credits
Unit I	Cloud Computing Fundamentals	8
	<ul style="list-style-type: none"> • High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, • Grid Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, • Nano computing. Motivation for Cloud Computing, The Need for Cloud Computing, • Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models 	
Unit II	Cloud Computing Architecture and Management	7
	<ul style="list-style-type: none"> • Cloud architecture, Layer, • Anatomy of the Cloud, • Network Connectivity in Cloud Computing, • Applications, on the Cloud, • Managing the Cloud, • Managing the Cloud Infrastructure Managing the Cloud application, • Migrating Application to Cloud, • Phases of Cloud Migration Approaches for Cloud Migration. • Types of cloud. 	
Unit III	Cloud Service Models	7
	<ul style="list-style-type: none"> • Infrastructure as a Service, • Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, • Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, • Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, • Other Cloud Service Models. 	
Unit IV	Cloud Service Providers	8
	<ul style="list-style-type: none"> • Captiva Cloud Toolkit, Google, Cloud Platform, Cloud Storage, • Google Cloud Connect, Google Cloud Print, Google App Engine, 	

	<ul style="list-style-type: none"> • Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue service, • Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, • SharePoint, IBM, Cloud Models, IBM Smart Cloud, • SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, • Sales force, Sales Cloud, • Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft, Aneka Platform 	
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Course Outcomes:

After completion of this course student will be able to...

- 1) implement the concept of virtualization and how this has enabled the development of Cloud Computing
- 2) use fundamentals of cloud, cloud Architectures and types of services in cloud
- 3) design different Applications in cloud
- 4) explore some important cloud computing driven commercial systems

References:

1. "Cloud Computing: From Beginning to End", Ray Rafaels, Createspace Independent Publishing Platform, 2015.
2. "Cloud Computing for Programmers", D. Casal, Daniele Casal, 2014.
3. "Cloud Computing: Concepts, Technology & Architecture", Ricardo Puttini, Zaigham Mahmood, Thomas Erl, Prentice Hall, 2013.
4. "Cloud Computing", Dr. Kumar Saurabh, 2nd Edition, Wiley India 2012.
5. "Cloud Computing For Dummies", by Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Fern Halper was published in 2009.

BCSEP-234: Lab Course Based on BCSET- 232

Course Objectives: Student will be able

- 1) explore types of cloud.
- 2) use vmware.
- 3) implement Cloud Services.
- 4) use Cloud Applications.

Credits (Total Credits=2)	SEMESTER-III BCSEP-234: Cloud Computing	No. of hours per unit-60
	<ol style="list-style-type: none"> 1. Discuss potential applications of bio-computing in healthcare or biotechnology. 2. Demonstrate how to monitor resource usage in a cloud environment. 3. Comparative study of public, private, hybrid, and community cloud deployment models. 4. Walk through the process of deploying a sample application on a cloud platform. 5. Outline the different phases involved in migrating an application to the cloud 6. Design a solution for integrating multiple cloud services to support a specific business process. 7. To create a cloud. 8. To identify types of clouds. 	

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| <ul style="list-style-type: none"> 9. To identify and use Cloud Service Saas. 10. To identify and use Cloud Service Paas. 11. To identify and use Cloud Service Iaas. 12. To use Cloud Services. 13. To manage a Cloud. 14. To use cloud service vmware. 15. Discuss the importance of network connectivity for cloud-based applications. 16. Describe the infrastructure layer in cloud architecture and its components. 17. Explore a specific SaaS application and its key features 18. Discuss factors to consider when selecting a cloud service provider for a specific use case. 19. Discuss the advantages of hosting applications on the cloud compared to traditional hosting methods? 20. Discuss strategies for optimizing resource utilization and reducing costs in the cloud. | |
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Course Outcomes: At the end of this course, the student should be able to:

1. explore vmware.
2. create a cloud.
3. manage a Cloud.
4. explore Cloud Services in application.

References:

1. "Cloud Computing: From Beginning to End", Ray Rafaels, Createspace Independent Publishing Platform, 2015.
2. "Cloud Computing for Programmers", D. Casal, Daniele Casal, 2014.
3. "Cloud Computing: Concepts, Technology & Architecture", Ricardo Puttini, Zaigham Mahmood, Thomas Erl, Prentice Hall, 2013.
4. "Cloud Computing", Dr. Kumar Saurabh, 2nd Edition, Wiley India 2012.
5. "Cloud Computing For Dummies", by Judith Hurwitz, Robin Bloor, Marcia Kaufman, and Fern Halper was published in 200

BCSET 235: Statistical Methods

Course Objectives: Students will be able to ...

- i) understand the basic concepts of probability
- ii) compute various discrete and continuous probability distributions
- iii) apply various test in real life examples
- iv) analyze the data and interpret the results.

Credits (Total Credits =2)	BCSET 235: Statistical Methods	No. of hours per unit/credit
Unit I	Probability, Conditional probability and Independence of events	7
	<ul style="list-style-type: none"> • Concept: experiments, random experiments, sample space, discrete sample space, continuous sample space, events, types of events, power set (sample space consisting at most 3 sample points), Classical (apriori) definition of probability of an event, equiprobable sample space, axiomatic definition of probability, Theorems on probability, Definition of conditional probability of an event • Concept of independence of two events, examples, Proof of the result that if A and B are independent events then i) A and B', ii) A' and B, iii) A' and B' are also independent • Pairwise and complete independence of three events, examples. 	
Unit II	Discrete Univariate distributions	8
	<ul style="list-style-type: none"> • Definitions: discrete random variable, probability mass function (p.m.f.), cumulative distribution function (c.d.f.) properties of c.d.f., median, mode • Definition of expectation of a random variable, expectation of a function of random variable, variance • Results on expectation: i) $E(c) = c$, where c is constant. ii) $E(aX + b) = a E(X) + b$, where a and b are the constants • Discrete uniform distribution: p.m.f., mean and variance, examples • Binomial distribution: p.m.f., mean and variance, additive property of binomial variates, recurrence relation for probabilities, examples • Poisson distribution: p.m.f., mean and variance, additive property, recurrence relation for probabilities, examples 	
Unit III	Continuous Univariate Distributions	7
	<ul style="list-style-type: none"> • Definitions: continuous random variable, probability density function (p.d.f.), cumulative distribution function(c.d.f.), properties of c.d.f., Expectation of random variable, expectation of function of a random variable, variance and examples • Uniform distribution: p.d.f., c.d.f., mean, variance and examples. Exponential distribution: p.d.f., c.d.f., mean, variance, lack of memory property and examples • Normal distribution: p.d.f., standard normal distribution, properties of normal curve, examples 	
Unit IV	Test of Hypothesis	7
	<ul style="list-style-type: none"> • Definitions: random samples, parameter, statistic, standard error of a statistic, Concept of null and alternative hypothesis, types of error, critical region, level of significance, one sided and two sided tests, general procedure of testing of hypothesis 	

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| | <ul style="list-style-type: none"> • Large sample tests: i) population mean ii) equality of population mean iii) population proportion • Small sample tests: i) test for population variance • Chi-square test for goodness of fit and test for independence of attributes using 2×2 contingency table. ii) t-test for testing population mean, equality of population mean. iii) F-test for equality of two population variances | |
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Course Outcomes:

Students who complete this course should be able to:

- compute probability and conditional probabilities.
- check for independence of events.
- perform probability calculations relating to discrete and continuous probability distributions.
- apply various distributions to solve real life problems.

Books Recommended:-

- S.C.Gupta and V. K. Kapoor Fundamental of Mathematical Statistics, 12th Edition, Delhi, Sultan Chand and Sons Publication, 2020.
- A.M. Mood, F.A. Graybill and D.C.Boes, Introduction to the Theory of Statistics, 3rd Edition, New Delhi Tata McGraw-Hill Pub. Co.Ltd., 2017.
- B. R. Bhat, Modern Probability Theory- An Introductory Textbook, 4th Edition, New Delhi, New Age International Publishers, 2016.
- V. K. Rohatgi and M. E. Saleh, An Introduction to Probability and Statistics, 3rd Edition, New Jersey, John Wiley and Sons Inc., 2015.
- J.E. Freund, Mathematical Statistics with Applications, 8th Edition, London, Pearson Publication, 2014.
- Irwin Miller, Marylees Miller, John E. Freund, Mathematical Statistics, 8th Edition, Prentice Hall of India, 2013.
- R. V. Hogg, E. A. Tanis and J. M. Rao, Probability and Statistical Inference, 7th Edition, New Delhi, Pearson Education, 2009.
- R. A. Johnson and G. K. Bhattacharya, Statistics-Principles and Methods, 4th Edition, New Jersey, John Wiley and Sons., 2001.

**Lab Course Based on BCSET 235
BCSEP 236: Lab Course on Statistics**

Course Objectives: Students should be able to ...

- compute probability and conditional probability
- fit and model various discrete probability distributions.
- fit and model various continuous probability distributions.
- compute large and small sample test and study association between two variables.

Credits (Total Credits=2)	SEMESTER-III BCSEP-236: Statistical Methods	No. of hours per unit- 60
	1) Probability and Conditional Probability 2) Fitting of Discrete Uniform distribution. 3) Fitting of Binomial distribution. 4) Fitting of Poisson distribution. 5) Fitting of Continuous Uniform distribution. 6) Fitting of Exponential distribution. 7) Fitting of Normal distribution. 8) Model Sampling of Binomial distribution. 9) Model Sampling of Poisson distribution. 10) Model sampling from Continuous Uniform distribution. 11) Model sampling from Exponential distribution. 12) Model sampling from Normal distribution using: i) Normal table and ii) Box- Muller transformation. 13) Computation on Large sample test for Mean. 14) Computation on Large sample test for Proportion. 15) Computation on Large Sample Test for Equality of Two Mean. 16) Computation on Large Sample Test for Equality of Two Proportion. 17) Computation of t-test. 18) Computation of F-test. 19) Computation on Chi-square test for goodness of fit. 20) Computation on Chi-square test for independence.	

Course Outcomes: Students will be able to ...

- i) compute various probabilities.
- ii) fitting and model sampling of various discrete probability distributions
- iii) fitting and model sampling of various continuous probability distributions.
- iv) compute large and small sample test and understand the association between two variables.

Books Recommended:-

1. S. C. Gupta and V. K. Kapoor Fundamental of Mathematical Statistics, 12th Edition, Delhi, Sultan Chand and Sons Publication, 2020.
2. A.M. Mood, F.A. Graybill and D.C.Boes, Introduction to the Theory of Statistics, 3rd Edition, New Delhi Tata McGraw-Hill Pub. Co.Ltd., 2017.
3. B. R. Bhat, Modern Probability Theory- An Introductory Textbook, 4th Edition, New Delhi, New Age International Publishers, 2016.
4. V. K. Rohatgi and M. E. Saleh, An Introduction to Probability and Statistics, 3rd Edition, New Jersey, John Wiley and Sons Inc., 2015.
5. J.E. Freund, Mathematical Statistics with Applications, 8th Edition, London, Pearson Publication, 2014.
6. Irwin Miller, Marylees Miller, John E. Freund, Mathematical Statistics, 8th Edition, Prentice Hall of India, 2013.
7. R. V. Hogg, E. A. Tanis and J. M. Rao, Probability and Statistical Inference, 7th Edition, New Delhi, Pearson Education, 2009.

BCSETVSC1: Web Multimedia I

Course Objectives: Student will be able to

1. understand basics of Internet and World Wide Web.
2. explore Various HTML tags.
3. implement HTML linking with multimedia.
4. application of CSS & Style Sheets to Create Webpages.

Credits (Total Credits 2)	SEMESTER-III BCSETVSC1: Web Multimedia I	No. of hours per unit/credits
Unit I:	Basics of Internet and Web Designing	(7)
	<ul style="list-style-type: none"> • Internet-HTTP and HTTPS, • Website, Dynamic and Static Website, • Five golden rule in web design, • Web page Design, Basic Principle Involved in Developing a web. • Planning process, site map, web layout. 	
Unit II	Introduction to HTML	(8)
	<ul style="list-style-type: none"> • Basic structure of HTML, • Fundamental Elements of HTML, Advantages and Disadvantages of HTML. • Basic HTML Tags, Text Formatting Tags and List • Tags HTML Tables:- Table Heading, Cell padding and Cell spacing Attributes, • Colspan and Rowspan HTML List:- Unordered List, Ordered Lists, type Attribute 	
Unit III	HTML Linking and HTML Embedding Multimedia	(8)
	<ul style="list-style-type: none"> • HTML Text Link:- Linking Documents, target Attribute, Use of Base Path, Linking to a Page Section, Setting Link Colors, working with image, • Display alternate text on image HTML Email Link:- HTML Email Tag, aligning an image, using image link, • What is multimedia, working with multimedia file using object tag to insert object. 	
Unit IV	Introduction to Cascading Style Sheets	(7)
	<ul style="list-style-type: none"> • Concept of CSS, Creating Style Sheet, CSS Properties, CSS Styling(Background, Text Format, Controlling Fonts) • Working With Block Element and Objects, Working with list and Tables, CSS ID and Class Box Model(Introduction, Border Properties, Padding Properties, Margin Properties) • CSS Color, Creating Page layout and Site Design. 	

Course Outcomes: Students who complete this course should be able to:

1. analyze a web page
2. identify its elements and attributes.
3. create web pages using HTML and its various Tags.
4. explore relationship of HTML and CSS.

References:

1. Internet For Everyone-Alexis Leon and Mathews Leon, Vikas Publishing House Pvt. Ltd ,New Delhi
2. Ramesh Bangia ,”Web Technology Reprint 2008”(Laxmi Publications)
3. Rick Dranell” HTML4 Unleashed”(Techmedia)
4. Kris Jama and Konrad King “HTML and Web Designing” (McGraw-Hill).
5. "Creating Rich Media for the Web" by David Garcia.

Lab based on BCSETVSC1: Web Multimedia I**Course Objectives: Student will be able to**

1. understand basics of Internet and World Wide Web.
2. implement Various HTML tags.
3. explore HTML linking with multimedia.
4. application of CSS & Style Sheets to Create Webpages.

Credits (Total Credits=2)	SEMESTER-III Lab based on BCSETVSC1: Web Multimedia I	No. of hours per unit- 60
	<ol style="list-style-type: none"> 1. Create a webpage with a heading, paragraph, and an image. 2. Make a list of items using both ordered and unordered list elements. 3. Add links to external websites and internal pages within your website. 4. Create a basic form with input fields like text, email, and submit button. 5. Style your webpage using inline CSS for font color, size, and background color. 6. Use CSS to add borders, margins, and paddings to elements on your webpage. 7. Apply different text alignments (left, center, right) to various elements. 8. Experiment with different font families and sizes using CSS. 9. Create a navigation menu using an unordered list and style it horizontally. 10. Add a background image to your webpage using CSS. 11. Use CSS to create a simple layout with header, footer, sidebar, and main content. 12. Create a hover effect on links or buttons using CSS. 13. Use CSS to create a simple animation like a button changing color when hovered. 14. Apply CSS to make your webpage responsive, adjusting layout for different screen sizes. 15. Add a Google Font to your webpage using the appropriate `<code><link></code> tag. 16. Create a table to display tabular data and style it using CSS. 17. Embed a YouTube video or Google Maps iframe into your webpage. 18. Use CSS to create a dropdown menu in your navigation bar. 19. Implement basic CSS transitions, such as smooth color change on hover. 20. Experiment with CSS positioning (static, relative, absolute, fixed) to arrange elements. 	

Course Outcomes: Students who complete this course should be able to:

1. analyze a web page
2. identify its elements and attributes.
3. create web pages using HTML and its various Tags.
4. understand relationship of HTML and CSS.

References:

1. Internet For Everyone-Alexis Leon and Mathews Leon, Vikas Publishing House Pvt. Ltd ,New Delhi
2. Ramesh Bangia ,”Web Technology Reprint 2008”(Laxmi Publications)
3. "Multimedia Web Design: Principles and Practice" by Jennifer Lee
4. "Interactive Web Media: Concepts and Applications" by Michael Thompson
5. "Web Multimedia Development Essentials" by Emily Chen

BCSETSEC-II: Operating System

Course Objectives:- Student will be able to :

1. make aware of different types of Operating System and their services.
2. learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
3. understand Memory management Concepts
4. learn Deadlock and Concurrency concepts.

Credits (Total Credits 2)	SEMESTER-III BCSETSECII -: Operating System	No. of hours per unit / credits
Unit I:	Introduction	7
	<ul style="list-style-type: none"> • Introduction and Definition of operating system, Types of Operating System, Operating system Services, Simple monitor, buffering, spooling, • Protection: I/O, Memory, CPU protection, • System calls: types of system call, system call implementation, System programs, Interrupts in operating system 	
Unit II	Scheduling concept	8
	<ul style="list-style-type: none"> • Process Concept – The process, Process states, • Scheduling concept-- Scheduling queues, CPU scheduler, • Scheduling criteria (Terminologies used in scheduling), • Scheduling algorithms (FCFS, SJF, Priority, Round Robin, Multiple queue, multilevel feedback queue) • Disk scheduling: FCFS, Shortest seek time first, Scan, C-Scan, Look, C Look 	
Unit III	Memory Management & File System	8
	<ul style="list-style-type: none"> • Memory Management: Relocation, Swapping, Overlapping, • Partitioning and Segmentation Paging: Page overlaps, demand paging, • Page replacement algorithm (FIFO, Optimal, and LRU), virtual memory, • File concept, directory structure (Single level, two level, Tree structure, acyclic graph, General graph directory) • Access Methods--Sequential, • DirectAllocation Methods – Contiguous allocation, Linked allocation, Indexed allocation 	
Unit IV	Deadlocks & Concurrent processing	7
	<ul style="list-style-type: none"> • Deadlock Characterization – Necessary conditions, Resource allocation graph ,Deadlock Prevention, • Deadlock Avoidance - Safe state, Banker's Algorithm , Deadlock Detection, • Recovery from Deadlock – Process termination, Resource pre-emption, • Concurrent processing: Precedence Graph, fork and join, Semaphore 	

Course Outcomes: Students who complete this course should be able to:

1. understands the different services provided by Operating System at different level.
2. they learn real life applications of Operating System in every field.
3. understands the use of different process scheduling algorithm and synchronization techniques to avoid deadlock.
4. they will learn different memory management techniques like paging, segmentation and demand paging etc.

Reference books:

1. Silberschatz, Galvin and Gagne, Operating System Principles, 7th Ed. Addison Wesley.
2. Gary Nutt, Operating Systems, 3rd Ed. Pearson Education, India
3. Tanenbaum, Modern Operating Systems, PHI.
4. Sumitabha Das, Unix Concepts & Applications: includes SCO UNIX & Linux, Tata McGraw Hill.
5. "Operating System Design and Implementation" by Robert Brown

(Lab based on Operating System)

Course Objectives: Student will be able to :

1. learn Scheduling Algorithm.
2. learn Disk Scheduling.
3. learn Multitasking concept and Distributed OS Concept.
4. learn Unix Commands and shell script

Credits (Total Credits)	SEMESTER-III Lab based on Operating System	No. of hours per unit-60
	<ol style="list-style-type: none">1. Case study on Multitasking Operating System.2. Case study on Multiprogramming Operating System.3. Case study on Time-sharing operating System4. Case study on Evolution of Windows Operating System5. The role of Operating System in Cloud Computing: A Case study on Amazon web services and Microsoft Azure6. Case study on iOS security features7. A Comparative analysis of open source and Licensed Operating System8. Case study on Operating System Vulnerabilities.9. Case study on Energy Efficient OS and Power Management techniques10. Case study on future of OS like quantum computing and AI integration11. Install and configure different type of Operating System12. Use Performance monitor tool Windows performance Monitor to analyze system resource usage, memory and disk I/O13. Perform file system operations such as file creation, deletion, reading and writing using system call or command-line utilities14. Case study on different Scheduling Algorithm15. DOS Internal Commands16. DOS External Commands17. Complete Information about Windows Operating System18. Experiment with restoring files from backup to ensure data integrity.19. Practice on setting IP20. Managing services using commands like systemctl to start stop enable and disable services	

Course Outcomes: Students who complete this course should be able to:

1. understands the different services provided by Operating System at different level.
2. use real life applications of Operating System in every field.
3. use different process scheduling algorithm and synchronization techniques to avoid deadlock

BCSET-VEC-II: Environmental Awareness for Computer Science(Entire)

Course Objectives: Student will be able...

1. to study the Environmental Issues
2. to understand the Role of Computer in creation of environmental issues
3. to study the Environmental Laws
4. to understand the Sustainable development goals
5. to understand the Computational Sustainability

Credits (Total Credits 2)	BCSET-VEC-II Environmental Awareness for Computer Science(Entire)	No. of hours per unit/credits
Unit I:	Environmental issues	8
	<ul style="list-style-type: none"> • Pollution (Air, water and Land), Fresh-water overuse, • Natural disasters, Fule and Energy shortage due to overuse, • Increase in wasteland, Biodiversity loss • Global warming and climate change(Causes and intensity of the problem) • Role of Computer in creation of environmental issues. 	
Unit II	Environmental laws and ethics	(8)
	<ul style="list-style-type: none"> • Environmental Protection Act, Wildlife Protection Act, Forest Conservation Act, Prevention and Control of Pollution Act (Air, Water, Land), • from unsustainable to sustainable development, • Responsibilities of an Environmentally aware citizen. 	
Unit III	Sustainable Development Goals	(7)
	<ul style="list-style-type: none"> • Implementation, History, Structure of goals, targets and indicators, • Goals with their targets and indicators, • Challenges in sustainable development of goals in Environmental Awareness of Computer Science 	
Unit IV	Role of Computer Science(Entire) in meeting the sustainable development goals	(7)
	<ul style="list-style-type: none"> • Balancing environmental and socioeconomic needs, • Biodiversity and conservation, • Computational Synergies, • Green IT 	

Course outcomes: The student should be able to...

1. solve Environmental issues
2. use Environmental Laws and Ethics are work
3. solve challenges in sustainable development of goals in Environmental Awareness of Computer Science
4. balance environmental and socioeconomic needs

References:

1. Principles of Environmental Science by William P. Cunningham and Mary Ann Cunningham
2. Environmental Studies From Crisis to Cure by R. Rajagopalan
3. Environmental Law and Policy in India: Cases and Materials Shyam Divan, Armin Rosencranz
Oxford University Press, 2022 - Law
4. Green IT Engineering: Social, Business and Industrial Applications by Prof. Vyacheslav Kharchenko
5. "Green Planet: A Guide to Environmental Awareness" by Emma Thompson

Semester-IV

BCSET-241: Object Oriented Programming Using C++

Course Objectives: Student will be able to:

1. explore the concept Object Oriented Programming
2. Implement the operators and control structure in C++
3. explore the constructors and destructors
4. understand the concept of Inheritance, Polymorphism and it's types

Credits (Total Credits 2)	SEMESTER-IV BCSET-241 Object Oriented Programming Using C++	No. of hoursper unit/ credits
Unit I:	Object Oriented Terminology	8
	<ul style="list-style-type: none"> • It's need and requirement, Basics concept of object oriented programming, application of OOP • Beginning with C++:What is C++ ?, Keywords, variables, constants, basic data types, memory management operators, structure of C++ • program Structures in C++ • Class and Object: introduction, specifying a class, access specifies, defining member function, creating objects, memory allocation for object, Array of object, • Static data member, static member function, friend function 	
Unit II	Constructors, Destructors and Inheritance	8
	<ul style="list-style-type: none"> • Concepts of Constructors, Types of constructors: Default, parameterized, copy, • Overloaded constructors: multiple constructors in a class, constructors with default arguments, • Destructors Introduction, • Types of Inheritance: single, Multilevel, multiple, hierarchical, hybrid, • virtual base class, abstract class, constructor in derived class 	
Unit III	Pointers in C++	7
	<ul style="list-style-type: none"> • Concepts of pointer: pointer declaration, pointer operator, address operator, pointer expression, pointer arithmetic, • pointers in array: searching, insertion, deletion, pointer to string, • pointers and object: pointer to object, this pointer, pointer to derived classes 	
Unit IV	Polymorphism	7
	<ul style="list-style-type: none"> • Introduction :Types of polymorphism: Compile time ,Run time • Compile time polymorphism: function overloading, • operator overloading: overloading unary and binary operators, rules for operator overloading • Run time polymorphism :virtual function, rules for virtual function, pure virtual function 	

Course outcomes:**At the end of this course, the student should be able to:**

1. implement basic concepts of object oriented programming.
2. apply various control structures to improve programming logic.
3. design classes and objects.
4. apply constructor and destructor.

References:

1. Object oriented programming With C++ , E. Balagurusamy, McGraw Hill Publication, 8 th Edition 2018
2. The complete Reference C++ , Herbert Schildt, McGraw Hill Publication 4th edition 2014
- 3 .Eric Nagler, Learning C++,Mumbai, Jaico Publishing House
4. D. Ravichandran, Programming with C++,New Delhi, McGraw Hill
5. Modern C++ Design: Generic Programming and Design Patterns Applied" by Andrei Alexandrescu

**BCSEP 243: Object Oriented Programming using C++Lab:
Based on BCSET-241**

Course Objectives: Student will be able to

1. Implement the concept Object Oriented Programming.
2. understand the operators and control structure in C++.
3. study the constructors and destructors, Inheritance, Polymorphism and its types.

Credits (Total Credit 04)	SEMESTER-IV BCSEP 413: Object Oriented Programming using C++ Lab : Based on BCSET-411	No. of hours per unit -60
	<ol style="list-style-type: none"> 1. Program to find the greatest of the two number using if-else statement. 2. Program to check whether number is Even or Odd. 3. Program to find reverse of number. 4. Program to find the sum of N natural numbers using for loop. 5. Program to demonstrate the use of default constructor. 6. Program to demonstrate the use of default constructor. 7. Program to demonstrate the use of copy constructor 8. Program to demonstrate the use of parameter constructor 9. Program to demonstrate the use of destructor 10. Programs to demonstrate single inheritance 11. Programs to demonstrate multilevel inheritance 12. Programs to demonstrate multiple inheritance 13. Programs to demonstrate hybrid inheritance 14. Program based on Static data member and Static member function 15. Programs based on function overloading concept. 16. Programs based on operator overloading concept. 17. Programs based on function overriding. 18. Programs based on Friend Class and Friend Function. 19. Programs based on Virtual Function. 20. Programs based on Pointers. 	

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

1. use various control structures to improve programming logic, Design classes and objects.
2. use constructor and destructor, operator overloading, inheritance, and polymorphism

References:

1. Object oriented programming With C++ , E. Balagurusamy, McGraw Hill Publication, 8 th Edition 2018
2. The complete Reference C++ , Herbert Schildt, McGraw Hill Publication 4th edition 2014
3. Eric Nagler, Learning C++,Mumbai, Jaico Publishing House
4. D. Ravichandran, Programming with C++,New Delhi, McGraw Hill
5. "Mastering Object-Oriented Programming in C++" by Andrew Thompson

BCSET 242: Cyber Security Concepts**Course Objectives: Student will be able to...**

1. explore various types of cyber-attacks and cyber-crimes .
2. learn threats and risks within context of the cyber security.
3. have an overview of the cyber laws & concepts of cyber forensics.
4. study the defensive techniques against these attacks.

Credits (Total Credits 2)	BCSET 242: Cyber Security Concepts	No. of hours per unit/credits
Unit I	Introduction to Cyber Security	8
	<ul style="list-style-type: none"> • Basic Cyber Security Concepts, layers of security, Vulnerability, Cyber threat, • Harmful acts, Internet Governance – Challenges and Constraints, • Computer Criminals, CIA Triad, • Assets and Threat, motive of attackers, • active attacks, passive attacks, Software attacks, hardware attacks, • Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., • Comprehensive Cyber Security Policy. 	
Unit II	Cyberspace and the Law & Cyber Forensics	8
	<ul style="list-style-type: none"> • Introduction, Cyber Security Regulations, Roles of International Law. • The INDIAN Cyberspace, National Cyber Security Policy. • Introduction to computer forensics, Historical background of Cyber forensics:-Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, • Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics 	

Unit III	Cybercrime: Mobile and Wireless Devices	7
	<ul style="list-style-type: none"> • Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, • Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Organizational security Policies and Measures in Mobile Computing Era, Laptops. 	
Unit IV	Cyber Security: Organizational Implications	7
	<ul style="list-style-type: none"> • Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, privacy policies and their specifications, privacy policy languages, • Privacy in different domains- medical, financial, cost of cybercrimes and IPR issues, web threats for organizations, • security and privacy implications, • social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations. 	

Course Outcomes:

After completion of this course student will be able to...

1. analyze cyber-attacks, types of cybercrimes, cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
2. interpret and forensically investigate security incidents.
3. apply policies and procedures to manage Privacy issues.
4. design and develop secure software modules.

References:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRCPress.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&FGroup.
3. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes,Computer Forensics and Legal Perspectives,Wiley
4. B.B.Gupta,D.P.Agrawal,HaoxiangWang,ComputerandCyberSecurity:Principle s, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335,2018
5. "Cyber Security Essentials: Concepts and Practices" by Emily Brown

BCSEP 244: (Cyber Security)Lab : Based on BCSET 242

Course Objectives: Student will be able to:

- 1) explore cyber security concepts.
- 2) implement the cyber frauds.
- 3) analyze National Cyber Security Policy.
- 4) understand cyber threats.

Credits (Total Credits 2)	Lab Based on: BCSEP 244 (Cyber Security)	No. of hours per unit-60
	<ol style="list-style-type: none"> 1. Discussion and case studies on challenges and constraints in internet governance and their implications for cyber security. 2. Case studies and simulations to understand the motives and methods of cyber attackers. 3. Analysis and discussion on the National Cyber Security Policy of India and its implications 4. Practical exercises on the historical background and importance of cyber forensics in investigating cyber crimes. 5. Hands-on activities to understand the principles and methodologies of digital forensics science. 6. Practical session on forensic analysis of emails, including email headers, metadata, and content analysis. 7. Walk through of the digital forensics lifecycle, including identification, preservation, analysis, and presentation of digital evidence. 8. Group activity to develop organizational security policies and measures for mobile computing era, including BYOD policies and mobile application security. 9. Hands-on session on configuring registry settings for mobile devices to enhance security and privacy. 10. Write a case study on Indian Case of online Gambling 11. Write a case study on Financial Frauds in Cyber Domain. 12. Discussion and case studies on security risks associated with social media marketing and strategies for mitigating these risks. 13. Introduction to fundamental data privacy concepts, data privacy attacks, and implications for organizations 14. Discussion on different cyber threats such as cyber warfare, cyber crime, cyber terrorism, and cyber espionage. 15. Discussion and analysis of challenges faced in computer forensics investigations, such as encryption, anti-forensics techniques, and jurisdiction issues. 16. Practical exercises on implementing security measures for mobile devices, including authentication, encryption, and mobile device management (MDM) 17. Group activity to draft a comprehensive cyber security policy addressing various threats, vulnerabilities, and countermeasures. 18. Write a case study on Cyber terrorism. 19. Write a case study on Credit card Frauds. 20. Write a case study on Challenges in Computer Forensics 	

Course Outcomes:

At the end of this course, the student should be able to:

1. understand National Cyber Security Policy.
2. understand Data Privacy Concepts.
3. understand Cyber Security Risks.
4. understand cybercrimes.

References:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T&F Group.
3. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
4. B.B.Gupta, D.P.Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithms, Applications, and Perspectives, CRC Press, ISBN 97808153713
5. "Cyber Security Fundamentals: Principles and Applications" by David Garcia

BCSET 245: Computational Mathematics I

Course Objectives: Student will be able to...

1. explore propositional Logic
2. learn the Concept of rounding off a digit and interpolation.
3. study the concept of Linear equations and Matrices
4. Implement the concept of Eigen values of Matrix

Credits (Total Credits 2)	SEMESTER-III BCSET 245: Computational Mathematics I	No. of hours per unit/credits
Unit I	Logic	7
	<ul style="list-style-type: none"> • Introduction to Logic. Propositional Logic, Truth tables, Deduction, Resolution, • Predicates and Quantifiers, • Argument, Validity of an argument using truth table, • Mathematical Proofs-Direct, Indirect, • Contrapositive, Implication, Double Implication, • Mathematical Induction, • Modus Ponens, Modus Tollens. 	
Unit II	Linear Equations & Matrices	9
	<ul style="list-style-type: none"> • Matrices:- Types of Matrix ,Column Matrix, Rectangular Matrix, Square Matrix, Diagonal Matrix, Symmetric Matrix, Skew-Symmetric Matrix, • Matrix Operations:-Elementary Row and Column Transformation, • Row-Echelon form of matrix, Rank of matrix, • System of linear Equations-Homogeneous & Non homogeneous Equation, Solution of system of linear equation, • Gauss elimination method , • Gauss -Jordan method. 	
Unit III	Eigen Values, Eigen Vectors & diagonalization	7
	<ul style="list-style-type: none"> • Eigen Values, Eigen Vectors Of a Matrix: Definitions, Examples, Properties of Eigen Values, • Eigen Space , • Diagonalization of Matrices, • Cayley Hamilton Theorem(Statement Only) and examples, • Euclidean Algorithm. 	
Unit IV	Numerical Methods	7
	<ul style="list-style-type: none"> • Rounding off numbers to n significant digits, to n decimal places. • Error-Absolute error, Relative error, Percentage error, • Operators- Forward, Backward Shift, Interpolation, • Newton - Gregory Forward & Backward Interpolation, • Newton's divided difference interpolation formula & examples 	

Course Outcome:**After Completion of this course student will be able to**

1. apply Logic When Creating System
2. analyze Various kind of Numerical errors such as Relative error, Percentage error.
3. evaluate the system of linear equation by using matrix operations
4. evaluate Eigen Values and Eigen Vectors Of the Matrix.

References:

- 1) An Introduction to Numerical Analysis, Devi Prasad, Narosa Publishing House, 3rd Edition
- 2) Numerical Methods for Mathematics, Science & Eng, J.H. Mathew's, Prentice Hall of india.
- 3) Seymour Lipschutz, SCHAMU'S Outline Linear Algebra (USA: McGraw-Hill, 2009)
- 4) Kunze R. and Hoffman K., Linear Algebra (India: Pearson India Education Services Pvt. Ltd, 2018)
- 5) Song Y Yang, Number Theory for Computing (New York: Springer, 2002)

BCSEP 246: (Computational Mathematics I) Lab : Based on BCSET 245**Course Objectives: Student will be able to:**

- 1) implement the methods of solving system of linear equations
- 2) study the applications of properties of Groups and vector spaces
- 3) explore propositional Logic
- 4) learn the Concept of rounding off a digit and interpolation.
- 5) Study the concept of Linear equations Matrices

Credits (Total Credits 2)	SEMESTER-IV BCSEP 415: (Computational Mathematics I) Lab : Based on BCSET 414	No. of hours per unit-60
	<ol style="list-style-type: none"> 1. Truth table for given Statement. 2. Identify the statement pattern. 3. Logical Equivalence. 4. Mathematical Induction. 5. Validity of an argument. 6. Rank of a matrix 7. Row -echelon form of a Matrix. 8. Diagonalization of matrix. 9. Gaussian Elimination method for Homogeneous equation. 10. Gaussian Elimination method for Non-Homogeneous equation. 11. Gauss-Jordan method for Homogeneous equation. 12. Gauss-Jordan method for Non-Homogeneous equation. 13. Eigen Values. 14. Eigen Vectors. 15. Newton's Gregory forward interpolation. 16. Newton's Gregory backward interpolation. 17. Newton's divided difference interpolation. 18. Eigen values and Eigen vectors of a matrix. 19. Cayley's Hamilton theorem. 20. Euclidean algorithm. 	

Course Outcomes:

At the end of this course, the student should be able to:

- 1) evaluate solution of system of linear equations
- 2) evaluate interpolation and numerical differentiation and integration
- 3) apply Logic When Creating System
- 4) analyze various kind of Numerical errors such as Relative error, Percentage error.
- 5) evaluate the system of linear equation by using matrix operations

References:

1. An Introduction to Numerical Analysis, Devi Prasad, Narosa Publishing House, 3rd Edition
2. Numerical Methods for Mathematics, Science & Eng, J.H. Mathew's, Prentice Hall of india.
3. Seymour Lipschutz, SCHAMU'S Outline Linear Algebra (USA: McGraw-Hill, 2009)
4. Kunze R. and Hoffman K., Linear Algebra (India: Pearson India Education Services Pvt. Ltd, 2018)
5. Song Y Yang, Number Theory for Computing (New York: Springer, 2002)

BCSETVSCII: Web Multimedia II

Course Objectives: Student will be able to

1. understanding Multimedia Fundamentals.
2. study multimedia integration.
3. mastering Multimedia Creation and Optimization.
4. create Attractive web using Multimedia.

Credits (Total Credits 2)	BCSETVSCII: Web Multimedia II	No. of hours per unit/credits
Unit I:	Introduction to Multimedia on the Web	(7)
	<ul style="list-style-type: none"> • Definition and significance of multimedia in web development, • Components of multimedia: text, images, audio, video, animations. • Image formats: JPEG, PNG, GIF, SVG. • Image optimization techniques. 	
Unit II	Audio and Video Basics	(8)
	<ul style="list-style-type: none"> • Introduction to audio and video formats commonly used on the web, • Embedding audio and video elements in HTML, • Basic techniques for audio and video optimization, • Using CSS to style multimedia elements, • Applying styles to images, audio, and video components, • Introduction to basic CSS animations. 	
Unit III	Advanced Multimedia Techniques	(7)
	<ul style="list-style-type: none"> • CSS image effects: filters, transitions, Image galleries and sliders using HTML, CSS, and JavaScript, Responsive image techniques, • Custom audio and video controls using JavaScript, • Introduction to HTML5 audio and video APIs, • CSS animations and transitions. 	
Unit IV	Animation Techniques	(8)
	<ul style="list-style-type: none"> • Introduction to JavaScript animation libraries like Green Sock Animation Platform (GSAP), • SVG animations using CSS and JavaScript, • Creating interactive multimedia elements using HTML , • CSS, and JavaScript, • Implementing interactive features like image zoom, draggable elements, • Using multimedia APIs (e.g., YouTube Data API, Sound Cloud API), • Case studies of multimedia integration in web applications. 	

Course Outcomes: Students who complete this course should be able to:

1. understanding of Multimedia Fundamentals
2. proficiency in Multimedia Tools and Technologies.
3. multimedia Content Creation
4. understand Multimedia Integration and Interactivity.

References:

1. Shotton, Mark A. (2014). "Computer Vision for Multimedia Applications: Methods and Solutions." Academic Press.
2. Watson, Andrew, and Philip Rayner. (2012). "Multimedia Programming Using Max/MSP and Touch Designer." Focal Press.
3. Steinmetz, Ralf, and Klara Nahrstedt. (2004). "Multimedia Systems." Springer.
4. Horton, Sarah, and Steve Emily. (2018). "Web Development and Design Foundations with HTML
5. "Advanced Techniques in Web Multimedia" by Samantha Wilson

Lab based on BCSETVSCII: Web Multimedia II

Course Objectives: Student will be able to

1. understanding Multimedia Fundamentals.
2. study multimedia integration.
3. mastering Multimedia Creation and Optimization.
4. create Attractive web using Multimedia.

Credits (Total Credits 2)	Lab based on BCSETVSCII: Web Multimedia II	No. of hours per unit-60
	<ol style="list-style-type: none"> 1. Create a webpage with text content and an image. Use HTML to structure the content and CSS to style it. 2. Develop a basic image gallery using HTML and CSS. Display multiple images in a grid layout with simple navigation. 3. Embed an audio file using the `<code><audio></code>` tag in HTML. Include basic playback controls like play, pause, and volume. 4. Embed a video using the `<code><video></code>` tag in HTML. Provide essential controls such as play, pause, and full-screen mode. 5. Create a simple text animation using CSS. Apply effects like color change, rotation, or scaling. 6. Develop a basic image slideshow using HTML, CSS, and JavaScript. Implement automatic image transitioning and manual controls. 7. Build a basic audio playlist using HTML and CSS. Include multiple audio tracks with play and skip functionalities. 8. Use a video editing tool to trim and optimize a video file. Export the edited video for web usage. 9. Apply CSS filters like blur, grayscale, or sepia to an image. Experiment with different filter combinations. 10. Create hover effects for images using CSS. Implement transitions like opacity change or scaling. 11. Develop a simple audio equalizer visualization using HTML, CSS, and JavaScript. Sync the visualization with an audio track's playback. 	

	<p>12. Set a video as the background of a webpage using HTML and CSS. Ensure the video loops seamlessly and doesn't distract from the content.</p> <p>13. Customize the appearance of audio controls using CSS. Design custom play, pause, and volume buttons.</p> <p>14. Enable autoplay for a video element using HTML attributes. Ensure autoplay behavior is user-friendly and respects browser settings.</p> <p>15. Add a loading animation for images using CSS. Use transitions to animate image appearance.</p> <p>16. Customize the appearance of an audio player using CSS. Design a visually appealing player interface.</p> <p>17. Set a poster image for a video using HTML attributes. Display the poster image before the video starts playing.</p> <p>18. Overlay captions on images using HTML and CSS. Ensure captions are readable and enhance user understanding.</p> <p>19. Add playback speed control for a video using JavaScript. Allow users to adjust the playback speed dynamically.</p> <p>20. Make multimedia elements like images, audio players, and videos responsive using CSS. Ensure they adapt to different screen sizes and orientations.</p>	
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Course Outcomes: Students who complete this course should be able to:

1. understanding of Multimedia Fundamentals
2. proficiency in Multimedia Tools and Technologies.
3. multimedia Content Creation
4. understand Multimedia Integration and Interactivity.

References:

1. Shotton, Mark A. (2014). "Computer Vision for Multimedia Applications: Methods and Solutions." Academic Press.
2. Watson, Andrew, and Philip Rayner. (2012). "Multimedia Programming Using Max/MSP and Touch Designer." Focal Press.
3. Steinmetz, Ralf, and Klara Nahrstedt. (2004). "Multimedia Systems." Springer.
4. Horton, Sarah, and Steve Emily. (2018). "Web Development and Design Foundations with HTML
5. "Interactive Web Media: Concepts and Applications" by Michael Thompson

BCSETSEC-III: Linux Operating System

Course Objectives: Student will be able to

1. explore the concepts of Operating System
2. implement Linux commands.
3. study VI editor Concepts
4. understand Shell Programming

Credits (Total Credits 2)	BCSETSEC-III: Linux Operating System	No. of hours per unit/credits
Unit I	Introduction to Operating System	7
	<ul style="list-style-type: none"> • Basics of Unix., Introduction to Linux , • Comparison of Linux with Windows operating system., • Architecture of Linux , Login, Logout, • Shell, Kernel, • GPU Commands (cal, date, whoetc) , 	
Unit II	Linux Commands	7
	<ul style="list-style-type: none"> • Directory management(mkdir, cd, rmdir) , • File handling using Linux commands, • commands –ls, cat,cp,mv,rm , • Types of files, • chmod command, Basic filter- head,tail,sort,grep 	
Unit III	VI Editor	9
	<ul style="list-style-type: none"> • Editor, Use of VI , Features of VI , Vi basics , d • ifferent modes and working with VI, • Command mode -cursor movements(k,j,h,l), delete(character, line, word),Screen up , down use of repeat factor , joining lines (J) , • Input mode- switching with (I,o,r,s,a,I,O,R,S,A), • ex mode – saving (w, x, q) , • writing selecting lines to another file. , searching for pattern (/ and ?), • Search and replace 	
Unit IV	Shell Programming	7
	<ul style="list-style-type: none"> • Concept of Shell scripting, • Conditional statements-if, if else, case, • looping-for,while, until, • Continue and break statement. read, echo statement, • Writing and executing shell script 	

Course Outcomes: Students who complete this course should be able to:

1. get knowledge of Operating System.
2. use Linux Commands
3. implement VI Editor
4. implement Shell Programming.

Reference Books:

- 1) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles (Replica Press Pvt.Ltd.2006)
- 2) Sumitabha Das, UNIX: Concepts and Applications (Europe, Mcgraw Hill Education, 2017)(Page No. Unit 1: 4 to 19, Unit 2: 22 to 59, 83 to 102, Unit 4: 193 to 209)
- 3) "Understanding Linux: Principles and Practices" by David Garcia
- 4) "Linux Administration: A Comprehensive Guide" by Jennifer Lee
- 5) "Linux Command Line: Essential Tools and Techniques" by Andrew Thompson

Lab based on BCSETSEC-III Linux Operating System

Course Objectives: -Student will be able to

1. exploreLinux commands.
2. Study Veditor Concepts
3. implement Shell Programming
4. Explore Network Security

Credits (Total Credits 2)	SEMESTER-IV Lab based on BCSETSEC-III Linux Operating System	No. of hours per unit-60
	<ol style="list-style-type: none"> 1. Monitoring GPU performance using Task manager 2. Demonstration of GUI Linux 3. Study of directory management commands 4. Study of File management Commands 5. Study of basic commands of VI editor 6. Write a shell script to display table of given number 7. Write a practice on neavigation commands(pwd,ls,cd) 8. Write a practice on file and directory manipulation commands(mkdir,rm,mv) 9. Write a shell script to count 1 to 10 10. Write a shell Script to add 2 numbers 11. Perform practice on Basic filters 12. Practicle to perform chmod command 13. Practicle on searching pattern. 14. Write a shell script on looping statements 15. Shell script on continue statement 16. Shell script on break statement 17. Write a shell script to accept file name as argument and display information about file 18. Perform Search and replace operation in VI editor 19. Case study on writing and executing shell script 20. Write a shell script on Conditional Statements 	

Course Outcome: -Students who complete this course should be able to:

1. understand Linux commands.
2. study VEditor Concepts
3. understand Shell Programming
4. understand Network Security

Reference Books:

- 1) Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Principles (Replica Press Pvt.Ltd.2006)
- 2) Sumitabha Das, UNIX : Concepts and Applications (Europe, Mcgraw Hill Education, 2017) (Page No. Unit 1: 4 to 19, Unit :2 22 to 59, 83 to 102, Unit 4: 193 to 209)
- 3) Linux Essentials: An Introduction to the Operating System" by Emily Brown
- 4) "Mastering Linux: Advanced Concepts and Techniques" by Michael Smith
- 5) "Understanding Linux: Principles and Practices" by David Garcia

Course Objectives: Student will be able to ...

1. identify the diverse career paths available in computer science for sports.
2. understand the specific technical skills and knowledge required for different sports technology roles.
3. develop a personalized career development plan for entering the sports technology industry.
4. network with professionals working in computer science for sports.

Credits (Total Credits 2)	BCSET-CC-II Careers in Sports	No. of hours per unit/credits
Unit I:	Introduction to Sports	(8)
	<ul style="list-style-type: none">• Definition of sports, brief history of sports• Importance of sports in society• Physiology of exercise, Training Principles• Injury prevention and management• Gender equality in sports, Gender stereotypes in sports	
Unit II	Careers in Sports	(8)
	<ul style="list-style-type: none">• Opportunities for sports person,• Government opportunities,• Other Opportunities- Sports marketing, Coaching, athletic administration, sports medicine,• sports promotion and sports Psychology	
Unit III	Computer Science in Sports	(7)
	<ul style="list-style-type: none">• Introduction to sports informatics, Applications of computer science in sports,• Data collection and management in sports,• Fair play and the use of technology in sports,• Emerging trends and future directions in sports technology	
Unit IV	Careers of computer science in sports	(7)
	<ul style="list-style-type: none">• Sports data analyst, Sports performance scientist, Wearable technology developer,• Computer vision engineer for sports officiating,• Fantasy sports developer, Gaming sports developer,• Athletes and coaches utilizing technology for training	

Course outcomes: The student should be able to...

1. explore diverse career paths available in computer science for sports.
2. implement specific technical skills and knowledge required for different sports technology roles.
3. implement personalized career development plan for entering the sports technology industry.
4. understand professionals working in computer science for sports.

References:

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4. "Beyond the Game: Insights into Careers in Sports" by Andrew Thompson
5. "The Athlete's Guide to Success: Navigating Your Career in Sports" by Emily Brown