J. C. Bose University of Science and Technology, YMCA, Faridabad, Haryana

Department of Computer Applications

Scheme and Syllabus

Bachelor of Computer Applications(BCA)

(Semester III)

w.e.f(2024-25)

The Scheme & Syllabus approved in 7th meeting of BOS for UG courses held on 22.4.2024

SEMESTER
III

BCA Scheme of Studies

Semester– III

Sr. No	Category	Course code	Course Title	Course Requirements (hrs)			Sessional Marks/End Term Marks		Total Marks	Credits
				L	P	Total	Sessional	End Term		
1	Discipline Specific-Major	BCA-23- 201	Data Structures	4	-	4	25	75	100	4
2	Discipline Specific-Major	BCA-23-203	Object-oriented Programming Using C++	4		4	25	75	100	4
3	Discipline Specific-Minor	BCA-23-205	Internet and Web Technology	4	-	4	25	75	100	4
4	Multidisciplinary	BCA-23- 207	Algebra & Calculus	3	-	3	25	75	100	3
5	Ability Enhancement courses	AEC-103-N3	Effective Corporate Communication	3	-	3	25	75	100	3
6	Value Aided Course	VAC-102-N1	Environment Science -II	3	-	3	25	75	100	4
8	Skill Enhancement Courses	BCA-23-209	Data Structures Lab	-	4	4	15	35	50	2
9	Skill Enhancement Courses	BCA-23-211	Object-oriented Programming Using C++ Lab	-	4	4	15	35	50	2
10	Skill Enhancement Courses	BCA-23-213	Internet and Web Technology Lab	-	2	2	15	35	50	1
			Total			**32**	**195**	**555**	**750**	**27**

BCA-23-201
Data Structures
BCA-III Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. To understand the basic concepts of data structures and algorithms along with an introduction to strings and some basic search algorithms (Linear Search and Binary Search).
2. To understand Arrays and linked lists in detail.
3. To become familier with the concept of stacks and queues along with their representations in memory.
4. To understand the representation and traversal of trees and graphs along with some algorithms in detail.

Syllabus:

Unit I: Introduction to Data Structure and Strings
Elementary data organization, Data Structure definition, Data type vs. data structure, Categories of data structures, Data structure operations, Applications of data structures, Algorithms complexity and time-space tradeoff, Big-O notataion.
Strings: Introduction, Storing strings, String operations, Pattern matching algorithms, Linear search, binary search.

Unit II: Arrays and Linked List
Introduction, Linear arrays, Representation of linear array in memory, address calculations, Traversal, Insertions, Deletion in an array, Multidimensional arrays, Parallel arrays, Sparse arrays. Searching and Sorting algorithms.
Linked List: Introduction, Array vs. linked list, Representation of linked lists in memory, Traversal, Insertion, Deletion, Searchingin a linked list, Header linked list, Circular linked list, Two-way linked list, Threaded lists, Garbage collection, Applications of linked lists.

Unit III: Stack and Queues

Introduction to stack, Array and linked representation of stacks, Operations on stacks, Applications of stacks: Polish notation, Reverse Polish notation, Recursion, Evaluation of arithmetic operations.
Introduction to queue, Array and linked representation of queues, Operations on queues, Dequeues, Priority Queues, Applications of Queues.

Unit IV: Tree and Graph
Introduction to Tree, Representing Binary tree in memory, traversing binary trees using recursion and using stacks.
Introduction to graph, Matrix, List and linked representation of graphs, Traversal of the graph, Warshall's algorithm for the shortest path, Dijkstra algorithm for the shortest path, Minimum spanning tree: Prim's and Kruskal's algorithm.

Course Outcomes:

A student will be able to:
CO1: Understand the various types of data structures along with their advantages and disadvantages.
CO2: Analyze them to determine the time and computation complexity.
CO3: Implement search problem (Linear search and Binary search).
CO4: Access the performance of Arrays, Stacks, Queues, linked lists and trees, and also their time and computation complexity.
CO5: Implement tree and graph search, and traversal algorithms and determine their time and computation complexity

Text/ Reference Books:

1 Seymour Lipschutz, "Data Structure", Tata-McGraw-Hill
2 Aaron M. Tanenbaum, Data Structures using C/C++, PHI
Horowitz, Sahni & Anderson-Freed, "Fundamentals of Data Structures in C", Orient Longman.
3 Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw- Hill International Student Edition, New York.
4 Mark Allen Weiss Data Structures and Algorithm Analysis In C, Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

BCA-23-203
Object Oriented Programming Using C++
BCA-III Semester

No. of Credits: 4

L	T	P	Total
4	0	0	4

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand the difference between object-oriented programming and procedural programming.
2 To learn basic concepts and syntax of C++.
3 To implement C++ classes using encapsulation and design principles.
4 To critically understand a program using more advanced C++ features such as the composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates etc.

Syllabus:

Unit I: Object Oriented Programming Concepts
Procedural Language and Object-Oriented approach, Characteristics of OOP, user-defined types, polymorphism, and encapsulation. Getting started with C++: syntax, data types, variables, string, function, namespace and exception, operators, flow control, recursion, array and pointer, and structure.

Unit II: Abstracting Mechanism and Memory Management
Classes, private and public, Constructor and Destructor, member function, static members, references;
Memory Management: new, delete, object copying, copy constructor, assignment operator, this input/output.

Unit III: Inheritance and Polymorphism

Derived Class and Base Class, Different types of Inheritance, Overriding member function, Abstract Class, Public and Private Inheritance, Ambiguity in Multiple inheritances, Virtual function, Friend function, Static function, Operator Overloading.
Template and Standard Template Library: Template classes, declaration, template functions, namespace, string, iterators, hashes, streams, and other types.

Unit IV Exception and File Handling

Exception and derived class, function exception declaration, unexpected exception, and exception when handling an exception, resource capture, and release.
Streams and File handling: I/O streams, fos.open, fos.close, I/O stream libraries.

Course Outcomes:

A student will be able to:

CO1: Understand the difference between object-oriented programming and procedural programming.
CO2: Learn basic concepts and syntax of C++.
CO3: Implement C++ classes using encapsulation and design principles.
CO4: Implement a program using more advanced C++ features such as the composition of objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, file I/O, exception handling, templates, etc.

Text/ Reference Books:

1 Bjarne Stroustrup, The C++ programming language, Pearsons education
2 Robert Lafore, Object oriented programming using C++,PHI
3 Paul Deitel & Harvey Deitel, C++ How to program , Pearsons education
4. Yashawant Kanetkar, Let Us C++, BFB

BCA-23-205
Internet and Web Technology
BCA-III Semester

No. of Credits:			**4**	**Total Sessional:**	**25 Mark**
L	**T**	**P**	**Total**	**Theory:**	**75 Marks**
4	**0**	**0**	**4**	**Total:**	**100 Marks**
				Duration of Exam:	**3 Hours**

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1. To learn the basic concepts of the internet, its history and various fundamental features of the world wide web like HTTP, TCPIP protocols etc.
2. To understand the utility of search engines, its components and working.
3. To undersatand the concepts of Web site design and Publishing and acquaint them with advanced graphics features for designing effective web sites.
4. To analyze and implement the student the concepts of cascading style sheets and the basics of client-side scripting using JavaScript

Syllabus:

Unit I: Introduction to Internet and World Wide Web

Evolution and History of World Wide Web; Basic features; Web Browsers; Web Servers; Hypertext Transfer Protocol, Overview of TCP/IP and its services; URLs; Searching and Web-Casting Techniques; Search Engines and Search Tools.

Unit II: HTML

Introduction to HTML; Hypertext and HTML; HTML Document Features; HTML command Tags; Creating Links; Headers; Textstyles; Text Structuring; Text colors and Background; Formatting text; Page layouts,

Unit III: Dynamic HTML

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, Dynamic HTML, Features of DHTML,CSS, CSSP (cascading style sheet positioning) and JSSS (JavaScript assisted style sheet), Architecture of Web Browser, The ID attributes, DHTML events.

Unit IV: Web Publishing

Hosting your Site; Internet Service Provider; Web terminologies, Phases of Planning and designing your Web Site; Steps for developing your Site; Choosing the contents; Home Page; Domain Names, Front page views, Hosting website on server and on cloud, Security issues related to website.

Course Outcomes:

A student will be able to:

CO1: Understand the basics of the internet, its applications and ways to connect to it and learned the basics and types of search engines.

CO2: Implement programs based opn HTML and learned the need and basics of CSS and the concepts of client-side JavaScript

CO3:Evaluate the difference between client-side and server-side scripting

CO4: Implement how to import multimedia pages over the web.

Text/ Reference Books:

1 Douglas E. Comer : Computer Networks and Internets.

2 Raj Kamal, “Internet and Web Technologies”, Tata McGraw-Hill.

3 Thomas A. Powell, “Web Design: The Complete Reference” , 4/e, Tata McGraw-Hill.

4 Wendy Willard, “HTML Beginners Guide”, Tata McGraw-Hill.

5 Deitel and Goldberg, “Internet and World Wide Web, How to Program”, PHI.

BCA-23-207
Algebra and Calculus
BCA-III Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional: 25 Marks
Theory: 75 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

Course Objectives:

1 To understand relations, equivalence relations and partitions with linear algebra.
2 To learn the ideas of the importance of multivariable calculus differentiation
3 To formulate the mathematical model of multivariable calculus-Integration and sequences and series.
4 To Access the performance of the Series representation of functions

Syllabus:

Unit I: Matrices
Definition, Types of Matrices, Addition, Subtraction, Scalar Multiplication and Multiplication of Matrices, Adjoint, Inverse, solving system of linear equation Cramer's Rule. Symmetric, Skew-Symmetric, Orthogonal and Unitary matrices, Rank of a Matrix, Consistency, Characteristic equation – Eigen values and Eigen vectors.

Unit II: Differential Calculus

Derivative of a function, Derivatives of Sum, Differences, Product & Quotient of functions, Derivatives of polynomial, trigonometric, exponential, logarithmic, inverse trigonometric and implicit functions, Logarithmic Differentiation, Chain Rule and differentiation by substitution.

Unit III: Integral Calculus

Indefinite Integrals, Methods of Integration by Substitution, By Parts, Partial Fractions, Integration of Algebraic and Transcendental Functions, Reduction Formulae for simple and Trigonometric Functions, Definite Integral as Limit of Sum, Fundamental Theorem of Integral Calculus, Evaluation of definite integrals by substitution, using properties of definite integral.

Unit IV: Sequences and Series

Convergence of sequences and series, the convergence of geometric series and p-series(without proof), test of convergence (comparison, ratio and root tests without proof); Alternating series and Leibnitz test, absolute and conditional convergence.
Taylor series (without proof, assuming the possibility of power series expansion in appropriate domains), Binomial series and series representation of exponential, trigonometric, logarithmic functions (without proofs of convergence);

Course Outcomes:

A student will be able to:

CO1: Understand the systems of linear equations, diagonalize matrices and characterize quadratic forms

CO2: Compute the partial and total derivatives and maxima and minima of multivariable functions.

CO3: Utilize the multiple integrals and apply them to find areas and volumes of geometrical shapes,mass and centre of gravity of plane laminas.

CO4: Implement various tests to determine whether a given series is convergent, convergent or conditionally convergent

Text/ Reference Books:

1 H. Anton, I. Biven,S.Davis, “Calculus”, Wiley, 10th edition, 2015.

2 Erwin Kreyszig, Advanced Engineering Mathematics, 10thEdition, John Wiley & Sons, 2016.

3 J. Stewart, Essential Calculus, Cengage, 2nd edition, 2017

4 G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9 th Edition, Pearson, Reprint, 2002.

5 Peter V. O'Neil, Advanced Engineering Mathematics, Cengage, 7th Edition, 2012

6 Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

7 B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36 Edition, 2010.

Effective Corporate Communication (ECC)
AEC-103-N3
BCA III Semester

No. of Credits:			3
L	T	P	Total
3	0	0	3

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Course Objectives:
CO I: To understand the appropriate grammatical structures in written forms.
CO II: To understand the significance of technical writing and formal communication
CO III: To develop and demonstrate effective writing skills in varied forms.
CO IV: To understand how to deliver persuasive presentations.

Unit-I: Writing Skills and Basics of Grammar
Subject-verb agreement; sentence correction; tense-verb usage; Composition of a Paragraph; Characteristics of a Good Paragraph; Use of Idioms and Proverbs, Literary Tropes and Use of Figures of Speech.

Unit-II: Technical Writing and Reports
SPSE structure; IMRD structure; Report Writing: Types of Reports and Structure of a Long Report.Hedging, Nominalization; Memos; Agenda and MoM; Case Study Method; Presentations; Business Letters-quotation and placing order.

Unit-III: Drafting proposals
From essays to proposals; Types of Essay Writing:Structure of an essay; Argumentative essays; Expository essays; Narrative essays; and Descriptive essays;Structure of an EssayReading, Writing and Comprehension. Drafting proposals;Synopsis Writing;Definitions; Comparisons and Contrasts; Hedging; Nominalization, proposal presentations

Unit-IV: Exercises in Proposal Presentations
Drafting and Presenting Proposals.

Course Outcomes:
The students will be able to:
CO I: Use appropriate grammatical structures in written forms.
CO II: Understand the significance of technical writing and formal communication.
CO III: Develop and demonstrate effective writing skills in varied forms.
CO IV: Deliver persuasive presentations

VAC-102-N1
Environment Science II
BCA-IV Semester

No. of Credits: 3

L	T	P	Total
3	0	0	3

Sessional:	25 Marks
Theory:	75 Marks
Total:	100 Marks
Duration of Exam:	3 Hours

Note: The examiner will be required to set seven questions in all having two parts. Part I will have Question Number 1 consisting of a total of 10 parts (short-answer type questions) covering the entire syllabus and will carry 15 marks. In Part II, there will be six questions. The examiner will set one and a half questions from each Unit of the syllabus and each question will carry 15 marks. Question Number 1 will be compulsory. In addition to the compulsory question, A student will have to attempt four more questions from Part II.

COURSE OUTCOMES:

At the completion of this course, the learner will be able to:

CO1: Understand about different types of pollution, their sources and their adverse impacts.

CO2: Develop understanding on the climate change concept, climate change adaptation and mitigation.

CO3: Understand broad aspects of environmental management systems and various methods followed for assessment of environmental quality and associated risks.

CO4: Learn about the major environmental conventions/protocols adopted at national and international level to protect and conserve environment.

Unit I: Environment Pollution and Health (6 hrs)

Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution.

A) Air pollution: Sources of air pollution; Primary and secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter, and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards.

B) Water pollution: Sources of water pollution; River, lake, and marine pollution, groundwater pollution; water quality. Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life.

C) Soil pollution and solid waste: Soil pollutants and their sources; Solid and hazardous waste; Impact on human health.

D) Noise pollution: Definition of noise; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health.

E) Thermal and Radioactive pollution: Sources and impact on human health and ecosystems.

Unit II: Climate Change: Impacts, Adaptation and Mitigation (6 hrs)

Understanding climate change: Natural variations in climate; Structure of atmosphere; Anthropogenic climate change from greenhouse gas emissions– past, present and future; Projections of global climate change with special reference to temperature, rainfall, climate variability and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent.

Impacts, vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity, and carbon neutrality; Energy efficiency measures; Renewable energy sources; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice. **Unit III: Environmental Management (6 hrs)**

Introduction to environmental laws and regulation: Constitutional provisions- Article 48A, Article 51A (g) and other derived environmental rights.

Environmental legislations in India: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules.

Environmental management system: ISO 14001, Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis, Environmental audit and impact assessment; Environmental risk assessment, Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Eco mark scheme.

Unit IV: Environmental Treaties and Legislation (6 hrs)

An overview of the following national and international cooperation, agreements, conventions, protocols - adoption, signature, ratification and entry into force; binding and nonbinding measures; Conference of the Parties (COP):

A) Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Status phase-out of production and consumption of Ozone Depleting Substances by India.

B) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention on Persistent Organic Pollutants; Minamata Convention on Mercury.

C) United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions.

D) National Green Tribunal; Some landmark Supreme Court judgements.

E) Major International organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Unit V: Case studies/ Field Work (6 hrs)

The students are expected to be engaged in some of the following or similar identified activities:

a) Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report.

b) Discussion on one national and one international case study related to the environment and sustainable development.

c) Campus environmental management activities such as solid waste disposal, water management and sanitation and sewage treatment plant

Suggested Readings:

1. Adenle A., Azadi H., Arbiol J. (2015). Global assessment of technological innovation for climate change adaptation and mitigation in developing world, Journal of Environmental Management, 161 (15): 261-275.
2. Ahluwalia, V. K. (2015). *Environmental Pollution, and Health*. The Energy and Resources Institute (TERI).
3. Barnett, J. & S. O'Neill (2010). Maladaptation. Global Environmental Change—Human and Policy Dimensions 20: 211–213.
4. Barrow, C. J. (1999). Environmental management: Principles and practice. Routledge.
5. Berrang-Ford, L., J.D. Ford & J. Paterson (2011). Are we adapting to climate change? Global Environmental Change—Human and Policy Dimensions 21: 25-33.
6. Bohra, Saroj, Judicial Intervention and Evolution of Environmental Principles and Doctrines (January 7, 2019). Available at SSRN: https://ssrn.com/abstract=3311406 or http://dx.doi.org/10.2139/ssrn.3311406
7. Central Pollution Control Board Web page for various pollution standards. https://cpcb.nic.in/standards/
8. India Code – Digital repository of all Central and State Acts: https://www.indiacode.nic.in/
9. Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education.
10. Jørgensen, Sven Marques, Erik João Carlos and Nielsen, Søren Nors (2016) Integrated Environmental Management, A transdisciplinary Approach. CRC Press.
11. Kanchi Kohli and Manju Menon (2021) Development of Environment Laws in India, Cambridge University Press.
12. Kaushik, A., & Kaushik, C. P. (2006). Perspectives in environmental studies. New Age International.
13. Masters, G. M., & Ela, W. P. (2008). *Introduction to environmental engineering and science* (No. 60457). Englewood Cliffs, NJ: Prentice Hall.
14. Miller, G. T., & Spoolman, S. (2015) Environmental Science. Cengage Learning.
15. Ministry of Environment, Forest and Climate Change (2019) A Handbook on International Environment Conventions & Programmes. https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf
16. Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition.Routledge.
17. Richard A. Marcantonio, Marc Lame (2022). Environmental Management: Concepts and Practical Skills. Cambridge University Press.

18. Theodore, M. K. and Theodore, Louis (2021) Introduction to Environmental Management, 2nd Edition. CRC Press.
19. Tiefenbacher, J (ed.) (2022), Environmental Management - Pollution, Habitat, Ecology, and Sustainability, Intech Open, London. 10.5772/
20. UNEP (2007) Multilateral Environmental Agreement Negotiator's Handbook, University of Joensuu, ISBN 978-952-458-992-5
21. www.ipcc.org; https://www.ipcc.ch/report/sixth-assessment-report-cycle

Lab Syllabus

BCA-23-209					
Data Structures Lab					
BCA-III Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Write a program to find an element in list using linear search					
2.Write a program to find an element in list using binary search.					
3.Write a program to concatenate two strings of different lengths					
4. Write a program to transpose a given matrix					
5. Write a program to implement various Sorting Algorithms.					
6. Write a program for Implementation of stacks using array.					
7. Write a program to perform all operations of queues.					
8. Write a program to perform infix to postfix using stack					
9. Write a program to implement Link List.					
10. Write a program to implement (preorder, in order,postorder) traversal in a tree..					

BCA-23-211					
Object-oriented Programming Using C++ Lab					
BCA-III Semester					
Discipline Specific Course					
No. of Credits:			2		
L	T	P	Total	Sessional:	15 Marks
0	0	4	4	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours

List of Experiments

1. WAP to check a Number is prime or not

2.Write a program to find an element in list using binary search.

3. WAP to implement Student grade using Classes

4. . WAP to compute total salary of employees using containership

5. write a program to calculate grade of students using array of objects
write a program to calculate area of different shapes using function overloading
a) circle
b) square
c) cylinder
d) triangle
e) cone

6. Write a program to find compound interest using default argument

7. write a program to do swapping of two numbers using
a) call by value
b) call by reference
c) call by address

8. Write a program to have 2 times addition using argument passing

9. write a program to addition of two Matrix using argument passing

10. Write a program to add two complex number using constructor function

11.WAP to implement friend function to add two complex numbers

12. write a program to add two complex number by using overloading binary + operator.

13. write a program to implement overloading unary - operator using point class

14. write a program to compare two length object by using == operator

15. Write a program to implement incremental operator on time class object using overloading function

12write a program to exchange the values of two variables using function templates

12write a program to implement an inheritance hierarchy of class quadrilateral, parallelogram, triangle and square use quadrilateral as super class for the hierarchy specify the instance variable and member function for each class,the private instance variable of quadrilateral should be xy coordinate pair for each of four numeric
Write a program that creates a object of class and output of each as area (except quadrilateral)
Write a program to implement stack using class template that offers the following services for generic data type:-
a) push an element on a stack

b) pop an element from a stack

BCA-23- 213					
Internet & Web Technology Lab					
BCA-III Semester					
Discipline Specific Course					
No. of Credits:			1		
L	T	P	Total	Sessional:	15 Marks
0	0	2	2	Theory:	35 Marks
				Total:	50 Marks
				Duration of Exam:	3 Hours
List of Experiments					
1. Write a program using basic tags:- a)Bold b) Italic c) underline d) paragraph					
2. create a table for railway time table					
3. create a student table with attributes (name,age,roll no,class, semester)using cell spacing(4) and cell padding (3,4,5)					
4.Write a program to insert an image in the web page,use atleast 2 attributes of image ising H1 H2 tags.also write description of image					
5. Wap to use frames in a web page implementing different elements					
6. WAP to create a University Website					
7. WAP to add two numbers using JavaScript					
8. Wap to find a factorial of number using recursion in JS.					
9.Wap to add two numbers make use of the functions called sum and pass tha parameter					
10. WAP to create a University Website					