

### SEMESTER –III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	BOE3** / BAS303	Science Based Open Elective/BSC (Maths-III/Math IV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	BVE301 / BAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	BCS301	Data Structure	T	PC	3	1	0	20	10	30	70	100	4
4	BCS302	Computer Organization and Architecture	T	PC	3	1	0	20	10	30	70	100	4
5	BCS303	Discrete Structures & Theory of Logic	T	PC	2	1	0	20	10	30	70	100	3
6	BCS351	Data Structure Lab	P	PC	0	0	2		50	50	50	100	1
7	BCS352	Computer Organization and Architecture Lab	P	PC	0	0	2		50	50	50	100	1
8	BCS353	Web Designing Workshop	P	PC	0	0	2		50	50	50	100	1
10	BCC301 / BCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
11	BCC351	Internship Assessment /Mini Project*	P							100		100	2
		<b>Total</b>			<b>15</b>	<b>5</b>	<b>6</b>						<b>25</b>

- **Mathematics –III** for CE / ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & allied Branches
- **Mathematics-V** for Bio Technology / Agriculture Engineering

## SEMESTER –IV

[illegible]

\*The Mini Project or internship (4 weeks) will be done during summer break after 4<sup>th</sup> Semester and will be assessed during V semester.

## SYLLABUS

BCS301 DATA STRUCTURE		
Course Outcome ( CO)		Bloom's Knowledge Level (KL)
<b>At the end of course , the student will be able to understand</b>		
<b>CO 1</b>	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	<b>K<sub>1</sub>, K<sub>2</sub></b>
<b>CO 2</b>	Discuss the computational efficiency of the sorting and searching algorithms.	<b>K<sub>2</sub></b>
<b>CO 3</b>	Implementation of Trees and Graphs and perform various operations on these data structure.	<b>K<sub>3</sub></b>
<b>CO 4</b>	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	<b>K<sub>4</sub></b>
<b>CO 5</b>	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	<b>K<sub>5</sub>, K<sub>6</sub></b>
<b>DETAILED SYLLABUS</b>		<b>3-1-0</b>
Unit	Topic	Proposed Lecture
<b>I</b>	<b>Introduction:</b> Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) <b>Arrays:</b> Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. <b>Linked lists:</b> Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	<b>08</b>
<b>II</b>	<b>Stacks:</b> Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. <b>Queues:</b> Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	<b>08</b>
<b>III</b>	<b>Searching:</b> Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. <b>Sorting:</b> Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	<b>08</b>

IV	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	08
V	<b>Graphs:</b> Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm.	08

**Text books:**

1. Aaron M. Tenenbaum, Yedidiah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India.
2. Gilberg ,Forouzan, Data Structures: A Pseudocode Approach with C 3rd edition , Cengage Learning publication.
3. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
4. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
5. Thareja, "Data Structure Using C" Oxford Higher Education.
6. AK Sharma, "Data Structure Using C", Pearson Education India.
7. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
8. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
9. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
10. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.
11. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
12. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
13. Adam Drozdek "Data Structures and Algorithm in Java", Cengage Learning

BCS302 COMPUTER ORGANIZATION AND ARCHITECTURE		
Course Outcome ( CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Study of the basic structure and operation of a digital computer system.	K <sub>1</sub> , K <sub>2</sub>
CO 2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.	K <sub>2</sub> , K <sub>4</sub>
CO 3	Implementation of control unit techniques and the concept of Pipelining	K <sub>3</sub>
CO 4	Understanding the hierarchical memory system, cache memories and virtual memory	K <sub>2</sub>
CO 5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces	K <sub>2</sub> , K <sub>4</sub>
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	<b>Introduction:</b> Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	08
II	<b>Arithmetic and logic unit:</b> Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	08
III	<b>Control Unit:</b> Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	08
IV	<b>Memory:</b> Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	08
V	<b>Input / Output:</b> Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	08
<b>Text books:</b> 1. Computer System Architecture - M. Mano 2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012 3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books 4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006. 5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011. 6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012 7. Structured Computer Organization, Tannenbaum(PHI)		

BCS303 Discrete Structures & Theory of Logic		
Course Outcome ( CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Acquire Knowledge of sets and relations for solving the problems of POSET and lattices.	K <sub>3</sub> , K <sub>4</sub>
CO 2	Apply fundamental concepts of functions and Boolean algebra for solving the problems of logical abilities.	K <sub>1</sub> , K <sub>2</sub>
CO 3	Employ the rules of propositions and predicate logic to solve the complex and logical problems.	K <sub>3</sub>
CO 4	Explore the concepts of group theory and their applications for solving the advance technological problems.	K <sub>1</sub> , K <sub>4</sub>
CO 5	Illustrate the principles and concepts of graph theory for solving problems related to computer science.	K <sub>2</sub> , K <sub>6</sub>
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	<b>Set Theory&amp; Relations:</b> Introduction, Combination of sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. <b>POSET &amp; Lattices:</b> Hasse Diagram, POSET, Definition & Properties of lattices – Bounded, Complemented, Distributed, Modular and Complete lattice.	08
II	<b>Functions:</b> Definition, Classification of functions, Operations on functions. Growth of Functions. <b>Boolean Algebra:</b> Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps.	08
III	<b>Theory of Logics:</b> Proposition, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.	08
IV	<b>Algebraic Structures:</b> Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	08
V	<b>Graphs:</b> Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. <b>Combinatorics:</b> Introduction, Counting Techniques, Pigeonhole Principle	08
<b>Text books:</b> 1.Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006. 2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004. 3.E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000. 4.R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004 5.Liptschutz, Seymour, " Discrete Mathematics", McGraw Hill. 6.Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill. 4. Deo, 7.Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI. 8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi		

### **BCS351- Data Structure Lab**

#### **List of Experiments (Indicative & not limited to)**

1. **Implementing Sorting Techniques:** Bubble Sort, Insertion Sort, Selection Sort, Shell , Sort, Radix Sort, Quick sort
2. **Implementing Searching and Hashing Techniques:** Linear search, Binary search, Methods for Hashing: Modulo Division, Digit Extraction, Fold shift, Fold Boundary, Linear Probe for Collision Resolution. Direct and Subtraction hashing
3. **Implementing Stacks:** Array implementation, Linked List implementation, Evaluation of postfix expression and balancing of parenthesis , Conversion of infix notation to postfix notation
4. **Implementing Queue:** Linked List implementation of ordinary queue, Array implementation of circular queue, Linked List implementation of priority queue, Double ended queue
5. **Implementing Linked List:** Singly Linked Lists, Circular Linked List, Doubly Linked Lists : Insert, Display, Delete, Search, Count, Reverse(SLL), Polynomial , Addition , Comparative study of arrays and linked list
6. **Implementing Trees:** Binary search tree : Create, Recursive traversal: preorder, post order, in order, Search Largest , Node, Smallest Node, Count number of nodes, Heap: Min Heap, Max Heap: reheap Up, reheap Down, Delete , Expression Tree, Heapsort
7. **Implementing Graphs:** Represent a graph using the Adjacency Matrix, BFS, Find the minimum spanning tree (using any method Kruskal's Algorithm or Prim's Algorithm) Self Learning Topics : Shortest Path Algorithm





### **BCS352- Computer Organization Lab**

#### **List of Experiments (Indicative & not limited to)**

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

## BCS353- Web Designing Workshop

### Syllabus:

-  **HTML:** Elements, attributes, heading, paragraph, styles, comments, links, images, favicon, tables, list, class, id, HTML forms, HTML media, navigation bar.
  
-  **CSS:** Types of CSS, colors, background, margins, padding, height, width, text, font, icon, links, list, tables, display, z-index, float, overflow, CSS media queries, inline block, navigation bar, image gallery, forms, round corners
  
-  **BOOTSTRAP :** Fundamentals of implementing responsive web design ,Use Balsamiq to mockup and wireframe websites, The fundamentals of UI design for websites ,How to install the Bootstrap framework ,Understanding the Bootstrap grid layout system, How to use bootstrap containers to layout your website easily, Use other Bootstrap components such as buttons ,Adding symbols using Font Awesome, Bootstrap carousels. Add Bootstrap cards to your website. Using Bootstrap navigation bars,
  
-  **JavaScript** script, function, output, statement, variables, operators, datatypes, objects, events, string methods, Arrays, if else, switch, loop for, loop in, loop for, debugging, validation of forms , Functions and invocation patterns Discussion of ECMAScripts Intermediate JavaScript , JS Expressions, Operators, Statements and Declarations , Object-Oriented Programming JS Objects and Prototypes, `This`, Scope and Closures Objects and Prototypes Refactoring and Debugging



### Textbook

1. Meloni, J. C., Kyrnin, J. (2018). HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3, and ES6, Sams Teach Yourself. United Kingdom: Pearson Education.
2. McGrath, M. (2020). HTML, CSS & JavaScript in easy steps. United Kingdom: In Easy Steps Limited.

### Reference Books

1. Duckett, J. (2014). Web Design with HTML, CSS, JavaScript and JQuery Set. United Kingdom: Wiley.
2. Fajfar, I. (2015). Start Programming Using HTML, CSS, and JavaScript. United Kingdom: CRC Press.

### List of Experiments (Indicative & not limited to)

Experiment No.	List of Experiments (Indicative & not limited to)
1	<p>Design the following static web pages required for an online bookstore website.</p> <p><b>HOME PAGE:</b></p> <ul style="list-style-type: none"><li> The static home page must contain three <b>frames</b>.</li><li> Top frame: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).</li></ul>



For example: When you click the link “CSE” the catalogue for CSE Books should be displayed in the Right frame. Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the WebSite			



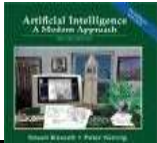

#### LOGINPAGE:

This page looks like below:

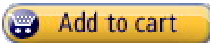

Logo	WebSite Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	<div> <div>Login Page</div> <div>User Name: <input type="text"/></div> <div>Passwords: <input type="password"/></div> <div> <input type="button" value="Submit"/> <input type="button" value="Reset"/> </div> </div>			

**CATALOGUE PAGE:** The catalogue page should contain the details of all the books available in the website in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	WebSite Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book:XMLBible Author : Winston Publication:Wiely	\$40.5	
ECE		Book :AI Author:S.Russel Publication:Princetonhall	\$63	
EEE				
CIVIL				



				Book : Java 2 Author:Watson Publication:BPBpublications  Book : HTML in 24 hours Author : Sam Peter Publication:Sampublication	\$35.5    \$50	    																														
4.	<b>CARTPAGE:</b> The cart page contains the details about the books which are added to the cart. The cart page should look like this: <table><tr><td>Logo</td><td colspan="4">Web Site Name</td></tr><tr><td>Home</td><td>Login</td><td>Registration</td><td>Catalogue</td><td>Cart</td></tr><tr><td>CSE</td><td>Book name</td><td>Price</td><td>Quantity</td><td>Amount</td></tr><tr><td>ECE</td><td>Java 2</td><td>\$35.5</td><td>2</td><td>\$70</td></tr><tr><td>EEE</td><td>XML bible</td><td>\$40.5</td><td>1</td><td>\$40.5</td></tr><tr><td>CIVIL</td><td>Total amount</td><td>- \$130.5</td><td></td><td></td></tr></table>						Logo	Web Site Name				Home	Login	Registration	Catalogue	Cart	CSE	Book name	Price	Quantity	Amount	ECE	Java 2	\$35.5	2	\$70	EEE	XML bible	\$40.5	1	\$40.5	CIVIL	Total amount	- \$130.5		
Logo	Web Site Name																																			
Home	Login	Registration	Catalogue	Cart																																
CSE	Book name	Price	Quantity	Amount																																
ECE	Java 2	\$35.5	2	\$70																																
EEE	XML bible	\$40.5	1	\$40.5																																
CIVIL	Total amount	- \$130.5																																		
5.	<b>REGISTRATION PAGE :</b> Create a“ registration form“ with the following fields  1)Name (Text field)  2)Password (password field)  3) E-mailid(text field) 4) Phone Number(text field) 5) Sex(radio button) 6) Date of birth(3 select boxes) 7) Languages known(checkboxes–English, Telugu, Hindi, Tamil) 8) Address(text area)																																			
6.	<b>Js VALIDATION:</b> Write <b>JavaScript to validate</b> the following fields of the above registration page.  1. Name (Name should contains alphabets and the length should not be less than 6 characters). 2. Password (Password should not be less than 6 characters length).																																			
7.	<b>Js VALIDATION:</b>  3. E-mailid (should not contain any invalid and must follow the standard pattern(name@domain.com) 4. Phone Number(Phone number should contain 10 digits only).																																			
8.	<b>CSS:</b> Design a web page using <b>CSS(Cascading Style Sheets)</b> which includes the following:  1) Use different font, styles: In the style definition you define how each selector should work(font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.  2) Set a background image for both the page and single elements on the page.																																			
9.	<b>CSS:</b>  1) Control the repetition of the image with the background-repeat property. 2) Define styles for links as																																			

	<p>A:link</p> <p>A:visited</p> <p>A:active</p> <p>A:hover</p>
<b>10.</b>	<p>Consider a small topic of your choice on which you can develop static Webpages and try to implement all topics of html, CSS and Js within the topic.</p> <p>Choose any one topic.</p> <ol style="list-style-type: none"><li>1. Your Own Portfolio</li><li>2. To-Do List</li><li>3. Survey Form</li><li>4. A Tribute Page</li><li>5. A Questionnaire</li></ol>