

**Bachelor of Computer Application  
(Semester - 1 and Semester - 2)  
Saurashtra University  
Effective from June – 2016**

**B.C.A. (Semester – 2)**

<b>SR. NO.</b>	<b>COURSE</b>	<b>No. OF LECT./Lab. PER WEEK</b>	<b>CREDIT</b>
1.	<b>CS – 07</b> DATA STRUCTURE USING C LANGUAGE	5	5
2.	<b>CS – 08</b> WEB PROGRAMMING	5	5
3.	<b>CS – 09</b> COMPUTER ORGANIZATION & ARCHITECTURE	5	5
4.	<b>CS – 10</b> MATHEMATICAL AND STATISTICAL FOUNDATION OF COMPUTER SCIENCE	5	5
5.	<b>CS – 11</b> PRACTICALS-1 (BASED ON CS-07)	5	5
6.	<b>CS – 12</b> PRACTICALS-2 (BASED ON CS-08)	5	5
<b>Total Credits of Semester – 2</b>			<b>30</b>

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<b>CS-07: DATA STRUCTURE USING C LANGUAGE</b>		
<b>Objective:</b> To learn algorithm analysis, data structures, sorting and searching techniques.		
Sr. No.	Topic	Detail
1	<b>Algorithm Analysis</b>  <b>Advanced Concepts of C and Introduction To data Structures</b>	<ul style="list-style-type: none"> <li>• The analysis of algorithm.</li> <li>• Time and space complexities.</li> <li>• Asymptotic notation.</li> <li>• Classes of algorithm.</li> <li>• Big-Oh Notation</li> <li>• Big-Omega Notation</li> </ul> <ul style="list-style-type: none"> <li>• Data types</li> <li>• Arrays</li> <li>• Handling arrays               <ul style="list-style-type: none"> <li>▪ Initializing the arrays</li> </ul> </li> <li>• Multidimensional arrays               <ul style="list-style-type: none"> <li>▪ Initialization of two dimensional array</li> </ul> </li> <li>• Pointers               <ul style="list-style-type: none"> <li>▪ Advantages and disadvantages of pointers</li> <li>▪ Declaring and initializing pointers</li> <li>▪ Pointer arithmetic</li> </ul> </li> <li>• Array of pointers</li> <li>• Passing parameters to the functions</li> <li>• Relation between pointers and arrays</li> <li>• Scope rules and storage classes               <ul style="list-style-type: none"> <li>▪ Automatic variables</li> <li>▪ Static variables</li> <li>▪ External variables</li> <li>▪ Register variable</li> </ul> </li> <li>• Dynamic allocation and de-allocation of memory               <ul style="list-style-type: none"> <li>▪ function malloc(size)</li> <li>▪ function calloc(n,size)</li> <li>▪ function free(block)</li> </ul> </li> <li>• Dangling pointer problem.</li> <li>• Structures.</li> <li>• Enumerated constants</li> <li>• Unions</li> </ul>
2	<b>Sorting and Searching</b>	<ul style="list-style-type: none"> <li>• Bubble sorting</li> <li>• Insertion sorting</li> <li>• Quick sorting</li> <li>• Bucket sorting</li> <li>• Merge sorting</li> <li>• Selection sorting</li> </ul>

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		<ul style="list-style-type: none"> <li>• Shell sorting</li> <li>• Basic searching technique</li> <li>• Index searching</li> <li>• Sequential searching</li> <li>• Binary searching</li> </ul>
	<b>Graph</b>	Adjacency matrix and adjacency lists Graph traversal Depth first search (dfs) Implementation Breadth first search (bfs) Implementation <ul style="list-style-type: none"> <li>• Shortest path problem</li> <li>• Minimal spanning tree</li> </ul>
<b>3</b>	<b>Introduction To data Structure</b>	Primitive and simple structures Linear and nonlinear structures file organization.
	<b>Elementary Data Structure</b>	Stack Definition Operations on stack Implementation of stacks using arrays Function to insert an element into the stack Function to delete an element from the stack Function to display the items Recursion and stacks Evaluation of expressions using stacks Postfix expressions Prefix expression Queue Introduction Array implementation of queues Function to insert an element into the queue Function to delete an element from the queue Circular queue Function to insert an element into the queue Function for deletion from circular queue Circular queue with array implementation Dequeues Priority queues
<b>4</b>	<b>Link List</b>	Singly linked lists. Implementation of linked list Insertion of a node at the beginning Insertion of a node at the end Insertion of a node after a specified node Traversing the entire linked list Deletion of a node from linked list

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		Concatenation of linked lists Merging of linked lists Reversing of linked list Doubly linked list. Implementation of doubly linked list Circular linked list Applications of the linked lists
<b>5</b>	<b>Tree</b>	Objectives Properties of a tree Binary trees Properties of binary trees Implementation Traversals of a binary tree In order traversal Post order traversal Preorder traversal Binary search trees (bst) Insertion in bst Deletion of a node Search for a key in bst <ul style="list-style-type: none"> <li>• Height balanced tree</li> <li>• b-tree</li> </ul> Insertion Deletion

Seminar - 5 Lectures

Expert Talk - 5 Lectures

Test - 5 Lectures

**Total Lectures 60 + 15 = 75**

**Reference Books:**

1. Data Structure through C/C++ Author : Tennaunbuam.
2. Let us C Author : Kanitkar.
3. Pointer in C Author : Kanitkar.
4. Data and File Structure Author : Trembley & Sorrenson.

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<b>CS-08: WEB PROGRAMMING</b>		
<b>Objective:</b>		
<ul style="list-style-type: none"> <li>• To learn web programming</li> <li>• Learn to develop web site using PHP</li> </ul>		
Unit No.	Topic	Detail
<b>1</b>	<b>Web Programming</b>	<ul style="list-style-type: none"> <li>• Static and Dynamic Web</li> <li>• Client side &amp; Server Side Scripting</li> <li>• Introduction to other server side languages</li> <li>• Webserver (IIS &amp; Apache)</li> <li>• HTTP &amp; HTTPS protocol</li> <li>• FTP</li> <li>• Web Hosting, Virtual Host, Multi-Homing</li> <li>• Distributed Web Server Overview,</li> <li>• Document Root</li> </ul>
	<b>Web Services</b>	XML and JSON <ul style="list-style-type: none"> <li>• Introduction to JSON</li> <li>• Installation &amp; Configuration</li> <li>• Resource Types</li> <li>• JsonSerializerizable</li> <li>• JSON Functions : json_decode, json_encode</li> </ul>
<b>2</b>	<b>PHP Basic</b>	<ul style="list-style-type: none"> <li>• Introduction to PHP</li> <li>• PHP configuration in IIS &amp; Apache Web server</li> <li>• Understanding of PHP.INI file</li> <li>• Understanding of PHP .htaccess file</li> <li>• PHP Variable</li> <li>• Static &amp; global variable</li> <li>• GET &amp; POST method</li> <li>• PHP Operator</li> <li>• Conditional Structure &amp; Looping Structure</li> <li>• Array</li> <li>• User Defined Functions:               <ul style="list-style-type: none"> <li>▪ argument function</li> <li>▪ default argument</li> <li>▪ variable function</li> <li>▪ return function</li> </ul> </li> <li>• Variable Length Argument Function               <ul style="list-style-type: none"> <li>▪ func_num_args</li> <li>▪ func_get_arg, func_get_args</li> </ul> </li> <li>• Variable Functions (Gettype, settype, isset, unset, strval, floatval, intval, print_r)</li> <li>• String Function(Chr, ord, strtolower, strtoupper, strlen, ltrim, rtrim trim, substr, strcmp, strcasecmp, strpos, strrpos, strstr, stristr, str_replace, strrev,</li> </ul>

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		<p>echo, print, explode(), implode(), join(), md5(), str_split(), str_shuffle(), strcspn(), strpbrk(), substr_compare(), substr_count(), ucfirst(), ucwords())</p> <ul style="list-style-type: none"> <li>• Math Function(Abs, ceil, floor, round, fmod, min, max, pow, sqrt, rand, cos(), acos(), sin(), asin(), tan(), atan(), bindec(), decbin(), hexdec(), dechex(), is_finite(), is_infinite(), log(), base_convert(), deg2rad())</li> <li>• Date Function (Date, getdate, setdate, Checkdate, time, mktime, date_add(), date_create(), date_format(), gmtime(), localtime(), strftime(), strtotime(), strtotime(), gettimeofday())</li> <li>• Array Function (Count, list, in_array, current, next, previous, end, each, sort, rsort, asort, arsort, array_merge, array_reverse, array_diff(), array_merge_recursive(), array_shift(), array_slice(), array_unique(), array_unshift(), array_keys(), array_key_exists(), array_push(), array_pop(), array_multisort(), array_search())</li> <li>• Miscellaneous Function (define, constant, include, require, header, die, exit)</li> <li>• File handling Function (fopen, fread, fwrite, fclose, file_exists, is_readable, is_writable, fgets, fgetc, file_get_contents, fputcsv, fputs, file_putcontents, ftell, fseek, rewind, copy, unlink, rename, move_uploaded_file)</li> </ul>
<b>3</b>	<b>Handling Form, Session Tracking &amp; PHP Components</b>	<ul style="list-style-type: none"> <li>• Handling form with GET &amp; POST</li> <li>• Cookies</li> <li>• Session</li> <li>• Server variable</li> <li>• PHP Components <ul style="list-style-type: none"> <li>- PHP GD Library</li> <li>- PHP Regular expression</li> <li>- Uploading file</li> <li>- Sending mail using mail()</li> <li>- Sending mail using smtp()</li> </ul> </li> </ul>
	<b>AJAX</b>	<ul style="list-style-type: none"> <li>• What is AJAX</li> <li>• PHP with AJAX</li> <li>• How AJAX works with PHP</li> <li>• Working with AJAX as background process</li> <li>• Using JQuery with PHP</li> <li>• JQuery AJAX with PHP</li> </ul>

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<b>4</b>	<b>Introduction of SQL</b>	<ul style="list-style-type: none"> <li>• Working with MySQL using PhpMyAdmin</li> <li>• SQL DML Statement (Insert, Update, Select, Delete) Command</li> <li>• PHP-MySQL Connectivity</li> <li>• PHP-MySQL Functions</li> <li>• mysql_connect, mysql_close,mysql_error, mmysql_erro, mysql_select_db, mysql_query, mysql_fetch_array, mysql_num_Rows, mysql_affected_Rows, mysql_fetch_assoc, mysql_fetch_field , mysql_fetch_object,mysql_fetch_row, mysql_insert_id, mysql_num_fields,mysql_result, mysql_tablename, mysql_list_tables, mysql_list_fields, mysql_field_type, mysql_db_name, mysql_db_query, mysql_data_seek</li> </ul>
<b>5</b>	<b>jQuery</b>	<ul style="list-style-type: none"> <li>• What IsjQuery?</li> <li>• jQuery Syntax</li> <li>• jQuery Selector <ul style="list-style-type: none"> <li>- Element Selector</li> <li>- Class Selector</li> <li>- id Selector</li> </ul> </li> <li>• jQuery Events Click, dblclick, keypress, keydown, keyup, submit, change, focus, blur, load, resize, scroll, unode</li> <li>• jQuery Effects hide show, fade, slide</li> </ul>

Seminar - 5 Lectures  
Expert Talk - 5 Lectures  
Test - 5 Lectures

**Total Lectures: 60+15=75**

**Reference Books:**

1. Modern PHP: New Features and Good Practices by Josh Lockhart (ORELLY)
2. PHP Cookbook: Solutions & Examples for PHP Programmers by David Sklar and Adam Trachtenberg (ORELLY)
3. Programming PHP by Kevin Tatroe and Peter MacIntyre ORELLY)
4. PHP for the Web: Visual QuickStart Guide (4th Edition) by Larry Ullman (Peachpit Press)

**Additional Topics (Not to be asked in examination ) :**

Student should be aware of followings

- Uses and Advantages of CMS
- Wordpress [Introduction & Installation]
- Joomla [Introduction & Installation]
- Magento [Introduction & Installation]

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<b>CS-09: COMPUTER ORGANIZATION AND ARCHITECTURE</b>		
<b>Objective:</b> To learn how hardware of computer system works		
Unit No.	Topic	Detail
1	<b>Digital Logic Circuits</b>	<ul style="list-style-type: none"> <li>• <b>Logic Gates</b> <ul style="list-style-type: none"> <li>▪ AND,OR,NOT,NAND,NOR,XOR, Exclusive NOR gates</li> </ul> </li> <li>• <b>Boolean Algebra</b> <ul style="list-style-type: none"> <li>▪ Boolean algebra?</li> <li>▪ Boolean variable and Boolean function (Analog and Digital Signals)</li> <li>▪ Truth table</li> <li>▪ Postulates</li> <li>▪ Theorem related to postulates</li> <li>▪ Simplified Boolean function using postulates and draw logical diagram of simplified function</li> <li>▪ Simplified Boolean function using Karnaugh map method with DON'T CARE condition</li> </ul> </li> <li>• <b>Sequential And Combinational Circuits</b> <ul style="list-style-type: none"> <li>▪ Clock pulses</li> <li>▪ Combinational circuit, sequential circuit and adder</li> </ul> </li> <li>• <b>Flip Flops</b> <ul style="list-style-type: none"> <li>▪ SR, Clocked SR, D, JK, JK – Master Slave, T</li> </ul> </li> <li>• <b>Universal Gate</b></li> </ul>
2	<b>Digital Component</b>	<ul style="list-style-type: none"> <li>• Integrated Circuits <ul style="list-style-type: none"> <li>▪ Decoders (2 X 4, 3 X 8)</li> <li>▪ Encoders (Octal to Binary – 8 X 3)</li> <li>▪ Multiplexer (4 X 1)</li> <li>▪ Demultiplexer (1 X 4)</li> </ul> </li> <li>• <b>Register</b> <ul style="list-style-type: none"> <li>▪ Block diagram of register</li> <li>▪ Parallel register and shift register</li> <li>▪ Asynchronous 4-bits Binary Counter</li> </ul> </li> </ul>
3	<b>Data Representation</b>	<ul style="list-style-type: none"> <li>• Multiplication and division of two binary numbers</li> <li>• Floating point representation</li> <li>• Fixed point representation</li> <li>• Error Detection code – (Parity Bit)</li> </ul>
4	<b>Central Processing Unit</b>	<ul style="list-style-type: none"> <li>• Introduction Of CPU</li> <li>• Major component of CPU</li> <li>• General Register Organization</li> </ul>



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		<ul style="list-style-type: none"> <li>▪ control word</li> <li>▪ Accumulator Register</li> <li>• <b>Stack Organization</b> <ul style="list-style-type: none"> <li>▪ Register stack</li> <li>▪ Memory stack</li> <li>▪ Polish notation and reverse polish notation</li> </ul> </li> <li>• <b>Arithmetic And Logic Unit</b> <ul style="list-style-type: none"> <li>▪ Block diagram of ALU</li> </ul> </li> <li>• <b>Interrupts</b></li> </ul>
<b>5</b>	<b>Input-Output Organization</b>	<ul style="list-style-type: none"> <li>• Memory buses</li> <li>• Block diagram and function</li> <li>• Data Bus, Address Bus and Control lines</li> <li>• Input Output Buses</li> <li>• Concept of input output interface</li> <li>• Input Out Processor (IOP)</li> <li>• Direct Memory Access</li> <li>• DMA controller</li> </ul>

Students seminar - 5 Lectures  
 Expert Talk - 5 Lectures  
 Students Test - 5 Lectures  
**Total Lectures 60 + 15 = 75**

**Reference Books:**

1. Computer System Architecture – By Morris Mano (PHI).
2. Digital Logic And Computer Design – By Morris Mano.
3. Digital Computer Electronics – By Malvino And Leach.

**Hands On (Not to be asked in examination):**

- Instruction Formats
- Simulator Base Program

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<b>CS-10: MATHEMATICAL AND STATISTICAL FOUNDATION OF COMPUTER SCIENCE</b>		
<b>Objective:</b> <ul style="list-style-type: none"> <li>• To Aware about basic Mathematics and Statistics</li> <li>• To develop Reasoning ability and Logical ability</li> <li>• To develop Arithmetic's ability</li> <li>• To develop a positive attitude towards learning Mathematics &amp; statistics</li> <li>• To perform mathematical &amp; statistical operations and manipulations with confidence, speed and accuracy.</li> </ul>		
<b>Unit No.</b>	<b>Topic</b>	<b>Details</b>
1	<b>Determinants</b>	<ul style="list-style-type: none"> <li>• Introduction</li> <li>• <math>2 \times 2</math> , <math>3 \times 3</math> order determinant</li> <li>• Cramer's method for solving linear equation(Two and Three Variables)</li> <li>• Properties of Determinants</li> <li>• Examples</li> </ul>
2	<b>Matrices</b>	<ul style="list-style-type: none"> <li>• Introduction,</li> <li>• Different types of matrix(square matrix, column matrix, row matrix, Diagonal matrix. Unit matrix, null matrix),</li> <li>• Transpose of matrix,</li> <li>• Addition, subtraction &amp; multiplication of two matrices,</li> <li>• Adjoint of a square matrix,</li> <li>• Inverse of matrix</li> </ul>
3	<b>Co-ordinate Geometry</b>	<ul style="list-style-type: none"> <li>• Introduction,</li> <li>• Quadrants &amp; Axes,</li> <li>• Distance between two points in <math>R^2</math>(without proof),</li> <li>• Section formula(without proof),</li> <li>• Area of triangle(without proof),</li> <li>• Typical examples</li> </ul>
	<b>Set Theory</b>	<ul style="list-style-type: none"> <li>• Introduction,</li> <li>• Method of representation of a set,</li> <li>• Operation on sets &amp; its properties(with only Logical proof),</li> <li>• De'Morgan laws with Logical proof,</li> <li>• Difference of two sets,</li> <li>• Cartesian products(up to two sets),</li> <li>• Typical examples</li> </ul>
4	<b>Measures of Central Tendency &amp; Dispersion</b>	<ul style="list-style-type: none"> <li>• Mean(ungroup data, group data),</li> <li>• Median(ungroup data, group data),</li> <li>• Mode(ungroup data, group data),</li> <li>• Range,</li> <li>• Quartiles,</li> <li>• Standard Deviation,</li> <li>• Typical examples</li> </ul>

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<b>5</b>	<b>Arithmetic &amp; Geometric progression</b>	<ul style="list-style-type: none"> <li>• Sequence,</li> <li>• Series,</li> <li>• Arithmetic progression( Definition &amp; Nth term, sum of n terms),</li> <li>• Geometric progression</li> <li>• ( Definition &amp; Nth term, sum of n terms),</li> <li>• Harmonic Progression</li> <li>• Relation Between AM GM HM ( Two Numbers)</li> <li>• Typical examples</li> </ul>
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Student Seminar – 5 Lectures  
 Expert Talk – 5 Lectures  
 Student Test – 5 Lectures  
**Total Lectures 60 + 15 = 75**

**Reference Books:**

1. Business Mathematics By Sancheti & Kapoor Sultan & Chand
2. Statistical Method By Gupta Sultan & Chand
3. Discrete Mathematical Structures with Applications to Computer Science By J.P. Tremblay & R. Manohar TMH
4. Business Mathematics : V.K. Kapoor
5. Business Mathematics : Dr Kachot
6. Fundamentals of Statistics : S. C. Gupta

<b>CS-11 : PRACTICAL-1 (based on CS – 07)</b>	
<b>Topics</b>	<b>Marks</b>
DATA STRUCTURE USING C LANGUGAE	<b>100</b>

<b>CS-12 : PRACTICAL-2 (based on CS – 08)</b>	
<b>Topics</b>	<b>Marks</b>
WEB PROGRAMMING	<b>100</b>

**Note :**

- Each session is of 3 hours for the purpose of practical Examination.
- Practical examination may be arranged before or after theory exam

**Additional Topics to be taught during the semester-2 (Not to be asked in examination):**

Following tools should be used to train students.

- Simulator 8051
- Using Trainer kit
- Case studies of DBMS
- Case studies of data structure