



**Progressive Education Society's**  
**Modern College Of Arts, Science & Commerce (Autonomous)**  
**Ganeshkhind, Pune – 411016**

**NATIONAL EDUCATION POLICY - 2020 (NEP-2020)**

**Basic and Honors Degree Program in**  
**Bachelor of Computer Applications (Science): B.C.A. (Science)**  
**(Faculty of Science & Technology)**

**Syllabus for F.Y. BCA (Science) 1st and 2nd Semesters**

**To be implemented from Academic Year 2024-2025**

**Title of the Program:** Bachelor of Computer Applications (Science)**Preamble of the syllabus**

The B.C.A. (Science) program is a combination of computer and applied courses from science stream. The computer related courses introduce techniques of programming, databases, web designing, system analysis, design tools and different computing environments. The applied courses include mathematics, statistics and electronics that provide theoretical and practical foundation for the learner.

**Objectives:**

- To produce knowledgeable and skilled human resources that is employable in IT and ITeS.
- To impart knowledge required for planning, designing and building Complex Application Software Systems as well as to provide support for automated systems or applications.
- It helps students analyse the requirements for system development and exposes students to business software and information systems.
- This course provides students with options to specialize in legacy application software, system software or mobile applications.
- To produce entrepreneurs

**Introduction**

The Structure is of three year bachelor basic degree and four year bachelor honors programme allows the opportunity to the students to experience the full range of holistic and multidisciplinary education in addition to a focus on the chosen major and minor as per their choices and feasibility of exploring learning in different institution.

This Undergraduate Degree Program has been designed with a semester approach in mind. The First-year courses are aimed at skills development in computers using various technologies while the second year is more focused on core courses providing conceptual frame work. The third year provides the specialization and the project work and fourth year focused on initiate research binge at start-ups level.

Students will be awarded certificate in computer application after one-year completion, diploma in computer application after two years of completion, get B.C.A. degree after three years completion and B.C.A. (honors) degree after completion of four years. A four-year degree (Eight - semesters) in Computer Applications will get skills and information not only about Computer and Information Technology but also in communication, organization, research and management with multidisciplinary approach.

**Eligibility for Admission:**

Any candidate who has passed the XII standard Examination in Science stream from, Maharashtra State Board of Secondary and Higher Secondary Education or equivalent Board of Examination, is eligible for admission to the First Year of this program.

OR

Passed Three Year Diploma Course in Computer Engineering/ Technology/ Information Technology/ Electronics Communication/ Electronics Telecommunications/ Electronics or equivalent subjects approved by the DTE, Maharashtra State or Equivalent authority.

Semester -I F.Y. B.C.A (Science)						
Course Code	Course Title	Credits		Evaluation		
		TH	PR	CIE	ESE	Total
24-BCA-11101	C Programming	2		20	30	50
24-BCA-11102	C Programming Laboratory		2	20	30	50
24-BCA-11103	Fundamentals of Computers	2		20	30	50
24-BCA-11104	Fundamentals of Computers Laboratory		2	20	30	50
24-BCA-11105	Applied Mathematics and Statistics	2		20	30	50
24-BCA-11106	Applied Mathematics and Statistics Laboratory		2	20	30	50
24-OE	Open Elective for Arts Basket BCA(Science) Students may opt the OE courses offered by Arts and Commerce Faculty	2		20	30	50
24-BCA-11407	Basic Web Designing Laboratory		2	20	30	50
24-ENG-11505	Soft Skills and Personality Development	2		20	30	50
24-VEC-11506	Value Education Course	2		20	30	50
24-IKS-11501	Foundation Course	2		20	30	50
<b>Total</b>		<b>14</b>	<b>8</b>	<b>220</b>	<b>330</b>	<b>550</b>

**Total Credits:** [14(TH) + 8 (PR)] = 22

**TH:** Theory **PR:** Practical

**CIE:** Continuous Internal Evaluation **ESE:** External Semester Examination

**Examination Pattern:** 40:60

Semester –II F.Y. B.C.A (Science)						
Course Code	Course Title	Credits		Evaluation		
		TH	PR	CIE	ESE	Total
24-BCA-12101	Advance C Programming	2		20	30	50
24-BCA-12102	Advance C Programming Laboratory		2	20	30	50
24-BCA-12103	Computer Organization	2		20	30	50
24-BCA-12104	Computer Organization & Embedded C Programming Laboratory		2	20	30	50
24-BCA-12105	Database Management system	2		20	30	50
24-BCA-12106	Database Management system Laboratory		2	20	30	50
24-OE	Open Elective for Commerce Basket BCA(Science) Students may opt the OE courses offered by Arts and Commerce Faculty	2		20	30	50
24-BCA-12407	Web Technology using PHP Laboratory		2	20	30	50
24-ENG-12508	Corporate Communication	2		20	30	50
24-VEC-12507	India's Constitution, Democracy, Election and Governance	2		20	30	50
24-CC-12601	Physical Education	2		20	30	50
<b>Total</b>		<b>14</b>	<b>8</b>	<b>220</b>	<b>330</b>	<b>550</b>

**Total Credits:** [14(TH) +8(PR)] = 22

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**Examination Pattern:** 40:60

## F.Y.B.C.A (Science)

## SEMESTER I

**Course Code: 24-BCA-11101****Course Name: C Programming****Course Objectives:**

- To provide a broad overview of problem solving techniques
- To learn C programming to solve problems

**Course Outcomes:**

At the end of the course, students will be able to

- Define algorithms and explain their characteristics
- Formulate algorithm and draw flowchart to solve a given problem
- Explain use of appropriate data types, control statements
- Demonstrate ability to use top-down program design

**Course Contents****Unit-I Problem solving, algorithms and flowcharts****04 Hrs**

1. Types of Problems, Problem solving using computer, Difficulties with problem solving, Problem solving aspects.
2. Definition & Characteristics of algorithm, Examples of algorithms, Flow charts with examples, Top-down design
3. Problem solving using Arithmetic Statements, Conditional Statement & Iterative Statements

**Unit-II C Fundamentals****06 Hrs**

1. Introduction to C, Features of C, Structure of C Program, C Character Set, Identifiers and Keywords, Variables and constants
2. Data types- Basic data types, Enumerated types, Type casting, Declarations, Expressions
3. Operators and Expressions Unary and Binary arithmetic operators, Increment Decrement operators Relational and logical operators, Bit wise operators, Assignment operators, Comma operator, size of operator, Ternary conditional operator, Precedence and associativity

**Unit-III Input Output Statements****04 Hrs**

1. printf, scanf functions, getchar, putchar, getch functions, gets, puts functions
2. Escape sequence characters, Format specifiers

**Unit-IV Control & Iterative Structures****06 Hrs**

1. If, If- Else Statements, Nested If Statements
2. Conditional Branching – switch statement, Loop (while, do...while, for), break, continue, goto statements

**Unit-V Functions****05 Hrs**

1. Introduction to Functions, Function Arguments, Library & User defined functions,
2. Methods for parameter passing, Recursion, Storage Classes – Auto, Static, Global and Register

**Unit-VI Arrays****05 Hrs**

1. Introduction, Array Declarations, Bounds Checking,
2. Types - Single dimension Arrays, Two dimensional Arrays, Arrays & Function

**Reference Books:**

1. Cormen, Leiserson, Rivest, Stein, “Introduction to algorithms”
2. Brian W. Kernighan, Dennis M. Ritchie , “The C Programming Language”, ISBN:9788120305960, PHI Learning
3. R.G. Dromey, “How to Solve it by Computer”, ISBN: 9788131705629, Pearson Education
4. Behrouz A. Forouzan, RichardF. Gilberg, “A Structured Programming Approach Using C”, ISBN:9788131500941, Cengage Learning India
5. E. Balaguruswamy, “Programming in ANSI C”, ISBN: 9781259004612, Tata Mc-Graw Hill Publishing Co Ltd.-New Delhi
6. Maureen Spankle, “Problem Solving and Programming Concepts”, ISBN: 81-317-0711- 3
7. Y S Kanetkar, “Let Us C”, BPB Publications

**F.Y.B.C.A (Science)****SEMESTER I****Course Code: 24-BCA-11102****Course Name: C Programming Laboratory****Course Objectives:**

- To learn formulation of algorithm for a given problem
- To study various data types, arrays and functions in C
- To understand input-output and, control and iterative statements in C

**Course Outcomes:**

On completion of the course, students will be able to–

- Formulate an algorithm and draw flowchart for the given problem\
- Implement the given algorithm in C
- Write programs using appropriate data types and control structures in C

<b>Sr.No</b>	<b>Assignment</b>
<b>1</b>	Assignment on use of data types, simple operators (expressions)
<b>2</b>	Assignment on decision making statements-1 (if and if-else, Switch case )
<b>3</b>	Assignment on decision making statements-2 (nested structures )
<b>4</b>	Assignment on use of loops-1 (for loop)
<b>5</b>	Assignment on use of loops-2 (while and do-while loop)
<b>6</b>	Assignment on exit, go to, continue, break
<b>7</b>	Assignment on menu driven programs.
<b>8</b>	Assignment on functions and recursive functions
<b>9</b>	Assignment on use of arrays-1 (1-D array)
<b>10</b>	Assignment on use of arrays-2 ( 2-D arrays)



**F.Y.B.C.A (Science)****SEMESTER I****Course Code: 24-BCA-11103****Course Name: Fundamentals of Computers****Course Objectives**

- To study the basics of Computer System
- To learn how to configure computer devices
- To Learn Basic Commands of Operating system and application software
- To understand Open Source Software

**Course Outcomes**

At the end of the course, students will be able to

- Define working of computers and peripherals, types of software and languages
- Troubleshoot the computer systems and use utility software
- Choose commands and features of operating systems and application software
- Use open source software

**Course Contents****Unit I Introduction to Computer System****08 Hrs**

1. Introduction– Characteristics of Computers, Basic structure and operation of a computer, functional units and their interaction,
2. Types of computers and features- Mini Computers, Micro Computers, Mainframe Computers, Super Computers, Laptops and Tablets,
3. Types of Programming Languages- Machine Languages, Assembly Languages, High level Languages. Translators- Assembler, Compiler, Interpreter
4. Number Systems-Introduction to Binary,Octal, Hexadecimal system, Conversion.

**Unit II Computer Peripherals****06 Hrs**

1. Primary storage devices – RAM, ROM, PROM, EPROM
2. Secondary Storage Devices – HDD, CD, DVD, Pen drive
3. I/O Devices - Keyboards, Scanners, Digitizers, Plotters, LCD, Plasma Display,
4. Pointing Devices – Mouse, Joystick, Touch Screens
5. Introduction to Network devices – Hubs, Switches, Routers, MODEM and Access Points

**Unit III Computer Software**

**08 Hrs**

1. Types of software: System Software, Application Software. System Software: Operating System. Types of Operating System.
2. Introduction to GUI: Desktop Icons, File and Directory, Menu Items, Control Panel
3. Utility programs: Anti-plagiarism software, Anti-virus.
4. Application software: Examples of commercial software with introduction
5. Open Source Software and its features.

**Unit IV Editors, Word Processors, Spreadsheets & Presentation Tools**

**08 Hrs**

1. Editors and Word Processors: Features and functionalities, examples
2. Spreadsheets: Features and functionalities, Spreadsheet Applications
3. Presentation Tools : Design Slides (using Text, images, charts, clipart), Slide Animation, Template and theme creation
4. Introduction to Google Apps: Google Docs, Sheets and Forms and its applications

**Reference Books:**

2. P.K. Sinha & Priti Sinha, “Computer Fundamentals”, 3rd Edition, BPB Pub.
3. John Walkenbach, Michael Alexander and Richard Kusleika, “Excel 2019 Bible”, Wiley Publication
4. Steven Roman, “Writing Excel Macros with VBA”, O’reilly Publication.
5. Sumitabha Das, “Unix Concepts and Applications”, Tata McGraw Hill Education
6. Join Josh, “PC/HARDWARE”, O’Reilly Publication

## F.Y.B.C.A (Science)

## SEMESTER I

Course Code: 24-BCA-11104

Course Name: Fundamentals of Computers Laboratory

**Course Objectives:**

- To understand installation process to install operating system and applications
- To learn various features of application software

**Course Outcomes:**

On completion of the course, students will be able to–

- Install operating system and execute various commands
- Effectively use various features of application software
- Create and use spreadsheets effective
- Prepare effective Presentation

Laboratory Assignments for Computers	
Sr. No	Assignment
1	Assignment on Computer hardware
2	Assignment on Installation of Operating System
3	Assignment on Operating System Commands: Basic DOS and Linux Command
4	Assignment on Notepad
5	Assignment on Paint
6	Assignments on Word Processing
7	Assignments on Spreadsheet
8	Assignments Presentation
9	Assignments on Google Apps: Docs, Sheets and Slides
10	Assignments on Google form

**F.Y.B.C.A (Science)****SEMESTER I****Course Code: 24-BCA-11105****Course Name: Applied Mathematics and Statistics****Course Objectives:**

- Learn basic terminology formal logic, proofs, sets, relations, functions and perform the operations associated with same
- Use formal logic proof and logical reasoning to solve problems
- To understand significance of statistical measures
- To study Correlation, Probability and sampling theory

**Course Outcomes:**

On completion of the course, students will be able to–

- Relate and apply techniques for constructing mathematical proofs and make use of appropriate set operations, propositional logic to solve problems
- Use function or relation models to interpret associated relationships
- Apply basic counting techniques and use principles of probability
- Given a data, compute various statistical measures of central tendency
- Use appropriate Sampling techniques

**Course Contents****Unit-1 Set Theory and Logic****06 hrs**

1. Sets– Set Theory, Need for Sets, Representation of Sets, Set Operations, cardinality of set,
2. Types of Sets – Bounded and Unbounded Sets, Countable and Uncountable Sets, Finite and Infinite Sets, Countably Infinite and Uncountably Infinite Sets, power set, Propositional Logic- logic, Propositional Equivalences, Application of Propositional Logic- Translating English Sentences, Proof by Mathematical Induction and Strong Mathematical Induction.

**Unit-2 Relations and Functions****06 hrs**

1. Relations: Properties, n-ary Relations and Applications, Representing Relations , Closures of Relations, Equivalence Relations, Partial Orderings, partitions, Hasse Diagram, Lattices, Transitive Closure and Warshall's Algorithm
2. Functions- Surjective, Injective and Bijective functions, Inverse Functions and

Compositions of Function, Graph Theory :Definition, Types and examples

**Unit-3 Counting****04 hrs**

1. The Basics of counting, Rule of sum and product
2. Permutation and combination , Binomial coefficients and identities
3. The Pigeonhole principle

**Unit-4 Data Presentation and Aggregation****06 hrs**

1. Data Types, Measures of Central Tendency: Mean Median and Mode and their types, Quartiles, Deciles and Percentiles
2. Measures of Dispersion: Standard Deviation, Root Mean Square, Variance, Absolute and Relative Dispersion

**Unit-5 Correlation Theory and Sampling****04 hrs**

3. Moments, Skewness and Kurtosis
4. Introduction to Correlation
5. Linear regression: Concept, The Least-Squares Method, Regression Lines
6. Elementary Sampling Theory: Sampling Theory, Random Samples and Random Numbers, Sampling With and Without Replacement, Stratified Sampling

**Unit-6 Probability and Hypothesis testing****04 hrs**

1. Introduction to Probability, Probability definition, Axioms of probability (without proof), Conditional probability, 'Bayes' theorem (without proof), Examples, Mathematical Expectations
2. Standard Distributions: Continuous and discrete, PDF/PMF, Introduction and properties (without proof) for binomial, normal, Standard Normal, chi-square, t, F distributions
3. Introduction to Hypothesis testing: Concept, definition, Null hypothesis, alternative hypothesis one sided test, two sided test, type I error, type II error

**Reference Books:**

2. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Tata Mcgraw-Hill, Isbn 978-0-07-288008-3, 7th Edition.
3. Trivedi, K.S., " Probability, Statistics, Design Of Experiments And Queuing Theory, With Applications Of Computer Science", Prentice Hall Of India, New Delhi
4. C L Liu, "Elements Of Discrete Mathematics", Tata Mcgraw-Hill, Isbn 10:0-07-066913-9.
5. Kulkarni, M.B., Ghatpande, S.B. And Gore, S.D., "Common Statistical Tests" Satyajee

Prakashan, Pune

6. J.N. Kapur And H.C. Saxena, "Mathematical Statistics", S. Chand Publications, 20<sup>th</sup> Ed.

**F.Y.B.C.A (Science)****SEMESTER I****Course Code: 24-BCA-11106****Course Name: Applied Mathematics & Statistics Laboratory****Course Objectives:**

- To provide knowledge about applying theoretical concepts of applied mathematics and statistics to solve problems.
- To provide hands-on experience on statistical package

**Course Outcomes:**

On completion of the course, student will be able to

- Apply mathematical and statistical concepts to solve problems
- Use R to perform statistical operations and data visualization

<b>List of Laboratory Assignments for Applied Statistics Laboratory</b>	
<b>Sr. No.</b>	<b>Applied Mathematics: Assignments each based on following topics</b>
<b>1</b>	Set Theory
<b>2</b>	Logic, Mathematical Induction
<b>3</b>	Relations and Functions
<b>4</b>	Counting
<b>Sr. No.</b>	<b>Applied Statistics (Assignments may be performed using R)</b>
<b>1</b>	Diagrammatic and Graphical representation
<b>2</b>	Measure of central tendency and measure of dispersion
<b>3</b>	Skewness and kurtosis using R- Software
<b>4</b>	Scatter diagram, correlation coefficient (ungrouped data), fitting of line of regression using R- Software
<b>5</b>	Probabilities and Probability graph using R – Software: Binomial, Normal distribution
<b>6</b>	Case studies

## F.Y.B.C.A (Science)

## SEMESTER I

Course Code: 24-BCA-11407

Course Name: Basics of Web Designing Laboratory

**Course Objectives:**

- To develop an ability to design and implement static and dynamic website
- Choose best technologies for solving web client/server problems
- Create conforming web pages
- Use JavaScript for dynamic effects

**Program Outcome:**

- Create web pages using HTML and Cascading Styles sheets
- Analyze a web page and identify its elements and attributes
- Create dynamic web pages using JavaScript

Sr. No	Assignment
1	Basic HTML Tags
2	List & Tables in HTML
3	Frames
4	Forms in HTML
5	CSS
6	Basics of JavaScript
7	Functions in JavaScript
8	Objects in JavaScript
9	Validation Using JavaScript & Event Handling
10	To demonstrate file handling



**F.Y.B.C.A (Science)****SEMESTER II****Course Code: 24-BCA-12101****Course Name: Advanced C Programming****Course Objectives:**

- To learn advanced features in C Programming
- To study advanced data types
- To understand built-in library functions

**Course Outcomes:**

- On completion of the course, student will be able to–
- Write programs using pointers, structures and unions
- Use Pre-processor directives
- Manipulate strings using library functions
- Write programs to perform operations on Files

**Course Contents****Unit I Preprocessor****06 Hrs**

1. Concept, Format of preprocessor directives, File inclusion directives (#include)
2. Macro substitution directives (#define), nested macros, parameterized macros, Macros versus functions, #error / #pragma directives
3. Conditional compilation (#if/#ifdef/#else/#elif/#endif)
4. Predefined macros (\_DATE\_ / \_TIME\_ / \_FILE\_ / \_LINE\_ / \_STDC\_)
5. Preprocessor operators, Macro continuation (\), stringize (#), token pasting (##), defined()

**Unit II Pointers****06 Hrs**

1. Concept – reference & dereference, Declaration, definition, initialization & use
2. Types of pointers, Pointer Arithmetic, Multiple indirection, parameter passing – call by value and call by reference
3. Arrays & Pointers - Pointer to array, Array of pointers, Functions & pointers - Passing pointer to function, Returning pointer from function, Function pointer, Pointers & const
4. Dynamic memory management, Allocation, Resizing, Releasing, Memory leak / dangling pointers

**Unit III Strings****06 Hrs**

1. Concept, Declaration, definition, initialization, format specifiers, String literals/ constants & variables
2. reading & writing from & to console, Importance of terminating NULL character
3. Strings & pointers Array of strings & array of character pointers
4. User defined functions & Predefined functions
5. Command line arguments – argc and argv

**Unit IV Structures****06 Hrs**

1. Concept, Declaration, definition, initialization
2. accessing structure members ( . operator)
3. Array of structures, Pointers to structures, Declaring pointer to structure Accessing structure members via pointer to structure, Structures & functions
4. Passing each member of structure as a separate argument, Passing structure by value / address Nested structures, typedef & structures

**Unit V Union****06 Hrs**

1. Concept, Declaration, definition, accessing union members
2. Difference between Structures & unions,
3. Structures within union, union within structures, pointers and unions, nested unions, enumerated data types, Bit fields, Concept, need, use, multi-file programs

**Unit VI File Handling****08 Hrs**

1. Concept of streams, need, Types of files
2. Operations on text & binary files
3. Random access file, library functions for file handling – fopen, fclose, fgetc, fseek, fgets, fputc etc

**Reference Books:**

1. The C Programming Language (Second Edition) – By B. W. Kerninghan & D. M. Ritchie
2. Programming in C – A Practical Approach – By Ajay Mittal (Pearson Publications)
3. Programming with C – By Byron S Gottfried (Schaum's Outlines)
4. A structural Programming Approach using C – By Behrouz Forouzan & Richard Gilberg
5. Y S Kanetkar, "Let Us C", BPB Publications

**F.Y.B.C.A (Science)****SEMESTER II****Course Code: 24-BCA-12102****Course Name: Advanced C Programming Laboratory****Course Objectives:**

- To learn advanced features in C Programming
- To study advanced data types
- To understand built-in library functions

**Course Outcomes:**

On completion of the course, student will be able to–

- Write programs using pointers, structures and unions
- Use Preprocessor directives
- Manipulate strings using library functions
- Write programs to perform operations on Files

<b>Sr. No</b>	<b>Assignment</b>
<b>1</b>	To demonstrate use of pre-processor directives
<b>2</b>	To demonstrate use of pointers
<b>3</b>	To demonstrate advanced use of pointers
<b>4</b>	To demonstrate concept of strings, array of string
<b>5</b>	To demonstrate string operations using pointers
<b>6</b>	To demonstrate command line arguments
<b>7</b>	To demonstrate structures (using array and functions )
<b>8</b>	To demonstrate nested structures and Unions
<b>9</b>	To demonstrate use of bitwise operators
<b>10</b>	To demonstrate file handling

**F.Y.B.C.A (Science)****SEMESTER II****Course Code: 24-BCA-12103****Course Name: Computer Organization****Course Objectives:**

- To study number system, logic gates
- To understand combinational and sequential circuits
- To provide a broad overview of architecture and functioning of computer systems
- To learn the basic concepts behind the architecture and organization of computers.

**Course Outcomes:**

On completion of the course, student will be able to–

- Design of combinational circuits
- Design of sequential circuits
- Explain block diagram of CPU, Memory and types of I/O transfers
- To understand the working principles of multiprocessor and parallel organization's as advanced computer architectures

**Course Contents****Unit 1 Data representation and Computers Arithmetic****08 Hrs**

1. Review of Number system and their interconversion, BCD code, Gray code, Excess-3 code, ASCII, EBCDIC, Unicode, and Concept of parity code.
2. Signed and Unsigned numbers, 1's and 2's complement of binary numbers, Binary arithmetic (Addition, subtraction and subtraction using 1's complement and 2's complement)

**Unit-2 Fundamentals of Digital Logic****10 Hrs**

1. Logic Gates, Truth Table, Boolean algebra, Simplification of Logic Circuits using Boolean Algebraic and Karnaugh Maps.
2. Combinational Circuits : Adders(HA and FA), subtractor(HS and FS), Multiplexer(Upto 4:1 MUX), De multiplexer(Upto 1:4 DEMUX), Decoder, Encoder, 4 bit-ALU,
3. Sequential Circuits : Flip-Flops (SR, JK & D), Counters : synchronous and asynchronous Counter

**Unit-3 I/O Organization and Control unit**

**06 Hrs**

1. Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP).
2. Bus organization, Micro programmed vs hardware control, instruction code and format

**Unit-4 Memory system Organization**

**06 Hrs**

1. Classification and design parameters of memory, Memory Hierarchy.
2. Internal and External Memory and its type, Cache Memory and its type, concept of Virtual Memory

**Reference Books**

1. R.P. Jain, "Modern Digital Electronics", McGraw-Hill Publications
2. Flod and Jain, "Digital Fundamentals", Pearson Publication.
3. Morris Mano, "Computer System Architecture" Prentice-Hall.
- 4 William Stallings: Computer Organization & Architecture, 9th Edition, Pearson, 2015.

**F.Y.B.C.A (Science)****SEMESTER II****Course Code: 24-BCA-12104****Course Name: Computer Organization and Embedded C Programming Laboratory****Part A: Computer Organization Laboratory****Course Objectives:**

- To study architecture and functioning of computer systems
- To learn the basic concept behind the architecture and organization of computers

**Course Outcomes:**

On completion of the course, student will be able to–

- Design and implement combinational circuits
- Design and implement sequential circuits
- Translate real world problems into digital logic formulations

Sr. No.	Assignments
1	Study of Logic gates and their ICs and universal gates
2	Combinational circuit: Half Adder, Full Adder, Multiplexer, DeMultiplexer, etc.
3	Sequential Circuit : Flip-Flops, Counters, Registers
4	Memory : RAM
5	ALU : 4-bit Arithmetic Logic Unit

## Part B: Embedded C Programming Laboratory

### Course Objectives:

- To introduce the building blocks of Embedded System
- To study and understand Various Embedded Development Strategies
- To introduce sensors and actuator for embedded system
- To impart knowledge in various embedded system case studies.
- To study embedded system
- To learn the basic concept behind embedded system

### Course Outcomes:

After completion of the course, a student will be able to

- Acquire a basic knowledge about fundamentals of microcontrollers
- Acquire a basic knowledge about programming and system control to perform a specific task.
- Acquire knowledge about sensor and actuator used in embedded system
- Develop programming skills in embedded systems for various applications. Interfacing basic component of embedded design using Arduino
- Interfacing Arduino with Sensors and Actuators

### Course Contents

Sr. No	Assignment
1	Programming with LED and LCD
2	Programming with motors : DC, Servo, Stepper Motor
3	Programming with Temperature sensors : Analog and Digital
4	Programming with gas sensor and relay
5	Programming with ultrasonic sensor and buzzer

### Reference Books:

2. Tianhong Pan, Yi Zhu, “Designing Embedded Systems with Arduino”, Springer

3. Raj Kamal, “Embedded Systems: Architecture, Programming and Design”, McGraw Hill Education India Private Limited

K.V. Shibu, “Introduction to Embedded Systems” 2<sup>nd</sup> Edition, McGraw Hill Education India Private Limited

**F.Y.B.C.A (Science)****SEMESTER II****Course Code: 24BCA12105****Course Name: Database Management Systems****Course Objectives:**

- To study and understand systematic database design approaches
- To explain basic database concepts, applications, data models, schemas and instances
- Describe the basics of SQL and construct queries using SQL.
- To emphasize the importance of normalization in databases.

**Course Outcomes:**

After completion of the course, a student will be able to

- Design E-R Model for given requirements and convert the same into database tables.
- Formulate database queries using SQL
- Design a database in appropriate normal form

**Course Contents**

<b>Unit 1: File Organization</b>	<b>04 Hrs</b>
<ol style="list-style-type: none"> <li>1. Introduction to File Organization</li> <li>2. Physical / logical files</li> <li>3. Record organization (fixed, variable length)</li> <li>4. Types of file organization(heap, sorted, indexed, hashed)</li> </ol>	
<b>Unit 2: Introduction of DBMS</b>	<b>04 Hrs</b>
<ol style="list-style-type: none"> <li>1. Overview of DBMS, File system Vs. DBMS</li> <li>2. Levels of abstraction, Data independence</li> <li>3. Structure of DBMS, Users of DBMS, Advantages of DBMS</li> </ol>	
<b>Unit 3: Conceptual Design (E-R model)</b>	<b>06 Hrs</b>
<ol style="list-style-type: none"> <li>1. Overview of DB design</li> <li>2. ER data model (entities, attributes, entity sets, relations, relationship sets)</li> <li>3. Additional constraints (key constraints, participation constraints, weak entities) aggregation, generalization, specialization</li> </ol>	



4. Case Studies

**Unit 4: Structure of Relational Databases****04 Hrs**

1. Concepts of a table(a row, a relation, a tuple and a key in a relational database)
2. Conversion of ER to Relational model
3. Integrity constraints (primary key, referential integrity, Null constraint, unique constraint, check constraint)
4. Examples of Conversion of ER to Relational model

**Unit 5: SQL****09 Hrs**

1. Introduction to SQL
2. DDL commands (create, drop, alter) with examples
3. Basic structure of SQL query
4. Set operations, Aggregate functions, Null values
5. Nested Sub-queries
6. Modifications of Database (insert, delete, update)
7. SQL mechanisms for joining relations (inner joins, outer joins and their types)
8. Examples on SQL (case studies)

**Unit 6: Relational Database Design****05 Hrs**

1. Functional dependencies (Basic concepts, Closure of set of functional dependencies, Closure of an Attribute set)
2. Concept of Decomposition, Desirable Properties of Decomposition (Lossless join and Dependency preservation)
3. Concept of Normalization - Normal forms (only definitions) 1NF, 2NF, 3NF, BCNF  
Examples on Normalization

**Reference Books:**

2. Henry F. Korth, Abraham Silberschatz, S. Sudarshan, "Database System Concepts", Tata McGraw-Hill Education
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw-Hill Science/Engin

**F.Y.B.C.A (Science)****SEMESTER II****Course Code: 24-BCA-12106****Course Name: Database Management Systems Laboratory****Course Objectives:**

- To learn design of E-R diagrams
- To prepare and execute database queries

**Course Outcomes:**

On completion of the course, student will be able to–

- Prepare E-R Diagram for the given problem statement
- Formulate appropriate SQL DDL Queries
- Formulate appropriate SQL DML Queries

<b>Sr. No.</b>	<b>Assignment</b>
<b>1</b>	ER diagram (generalization, specialization and aggregation)
<b>2</b>	Data Definition Language (DDL) - Create, Alter, Drop, Truncate, Rename and Comment
<b>3</b>	Data Query Language ( DQL) – Select queries
<b>4</b>	Data Manipulation Language ( DML) – Insert, Update, Delete
<b>5</b>	Constraints
<b>6</b>	Joins (inner, left, right and full outer)
<b>7</b>	Aggregate Functions
<b>8</b>	Clauses (OrderBy and GroupBy)
<b>9</b>	Nested Queries
<b>10</b>	Concepts Of Normalization

## F.Y.B.C.A (Science)

## SEMESTER II

Course Code: 24-BCA-12407

Course Name: Web Technology using PHP Laboratory

**Course Objectives:**

- To get familiar with basics of the Internet Programming.
- To acquire knowledge and skills for creation of web site using client and server side programming
- To understand process of developing responsive web applications
- To explore different web extensions and web services standards

**Course Outcomes:**

After successful completion of this course, learners will be able to

- Design and implement static and dynamic websites using appropriate client side and server side technologies.
- Build Dynamic web site using PHP Programming and Database connectivity.
- Build applications using AJAX and XML and web services

Sr. No.	Assignment
1	Introduction to PHP
2	PHP Functions and Array
3	Classes and Objects
4	Inheritance, Interface and Constructor
5	Cookies and Session
6	Processing Forms
7	File Uploading
8	Databases
9	XML
10	Ajax