Progressive Education Society's

Modern College Of Arts, Science & Commerce (Autonomous)

Ganeshkhind, Pune – 411016

NATIONAL EDUCATION POLICY - 2020 (NEP-2020)

Basic and Honours 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 2023-2024

Title of the Course: 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 or four Year bachelor's degree 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. (research) 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 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**
NP23-BCA-111	Fundamentals Of Computers	2	-	25	25	50
NP23-BCA-112	C Programming	2	-	25	25	50
NP23-BCA-113	Applied Mathematics and Statistics	2	-	25	25	50
NP23-OE-101	BCA(Science) Students may adopt the OE courses offered by Arts and Commerce Faculty	1	1	25	25	50
NP23-OE-102	BCA(Science) Students may adopt the OE courses offered by Arts and Commerce Faculty	1	1	25	25	50
NP23-BCA-114	Fundamentals Of Computers and C Programming Laboratory	-	2	25	25	50
NP23-BCA-115	Applied Mathematics and Statistics Laboratory	-	2	25	25	50
NP23-ACE-101	English Functional English	2	-	25	25	50
NP23-VEC-101	Constitution of India	2	-	25	25	50
NP23-IKS-101	Vedic Mathematics and Computing	2	-	25	25	50
NP23-CC-101	Yoga Education	1	1	25	25	50
	Total	**15**	**7**	**275**	**275**	**550**

Total Credits: [15(TH) + 7 (PR)] = 22

TH: Theory **PR**: Practical

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

Semester -II F.Y. B.C.A (Science)						
Course Code	**Course Title**	**Credits**		**Evaluation**		
		TH	**PR**	**CIE**	**ESE**	**Total**
NP23-BCA-211	Advanced C programming	2	-	25	25	50
NP23-BCA-212	Computer Organization	2	-	25	25	50
NP23-BCA-213	Database Management System	2	-	25	25	50
NP23-BCA-214	Basics of Embedded Systems & Programming	2	-	25	25	50
NP23-OE-201	BCA(Science) Students may adopt the OE courses offered by Arts and Commerce Faculty	1	1	25	25	50
NP23-OE-202	BCA(Science) Students may adopt the OE courses offered by Arts and Commerce Faculty	1	1	25	25	50
NP23-BCA-215	Advanced C Programming and embedded system programming Laboratory	-	2	25	25	50
NP23-BCA-216	Computer Organization and Database Management System Laboratory	-	2	25	25	50
NP23-ACE-201	English Business Communication	2	-	25	25	50
NP23-VEC-201	Environment Studies	2	-	25	25	50
NP23-CC-201	Sports/NCC/NSS	1	1	25	25	50
	Total	**15**	**7**	**275**	**275**	**550**

Total Credits: [15(TH) + 7 (PR)] = 22

TH: Theory **PR**: Practical

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

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

SEMESTER I

Course Code: NP23-BCA-111

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. Data Organization- Drives, Directories and Files Number Systems-Introduction to Binary, Octal, Hexadecimal system, Conversion, Addition, Subtraction, Multiplication, Division

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, Basic Commands in Linux
2. Introduction to GUI: Desktop Icons, File and Directory, Menu Items, Control Panel
3. Utility programs: Anti-plagiarism software, Anti-virus, Disk Cleaning, Compression/ Decompression of files.
4. Application software: Examples of commercial software with brief 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:

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

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

SEMESTER I

Course Code: NP23-BCA-112

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: NP23-BCA-113

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 08 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,
3. 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 08 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 Data Presentation and Aggregation 08 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-4 Correlation Theory and Sampling 04 hrs

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

Unit-5 Probability 04 hrs

1. Introduction to Probability
2. Probability definition, Axioms of probability (without proof), Conditional probability, 'Bayes' theorem (without proof), Examples, Mathematical Expectations
3. Standard Distributions: Continuous and discrete, PDF/PMF, Introduction and properties (without proof) for binomial, normal, Standard Normal, chi-square, t, F distributions

Unit-6 Introduction to Hypothesis testing 04 hrs

1. Introduction to Hypothesis testing: Concept, definition, Null hypothesis, alternative hypothesis one sided test, two sided test, type I error, type II error

Reference Books:

1. Kenneth H. Rosen, Discrete Mathematics and Its Applications, Tata Mcgraw-Hill, Isbn 978-0-07-288008-3, 7th Edition.
2. Trivedi, K.S., " Probability, Statistics, Design Of Experiments And Queuing Theory, With Applications Of Computer Science", Prentice Hall Of India, New Delhi
3. C L Liu, "Elements Of Discrete Mathematics", Tata Mcgraw-Hill, Isbn 10:0-07-066913-9.
4. Kulkarni, M.B., Ghatpande, S.B. And Gore, S.D., "Common Statistical Tests" Satyajeet Prakashan, Pune
5. J.N. Kapur And H.C. Saxena, "Mathematical Statistics", S. Chand Publications, 20th Ed.

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

SEMESTER I

Course Code: NP23-BCA-114

Course Name: Fundamentals of Computers and Applied Mathematics and Statics 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

Topics for Laboratory Assignments	
Sr. No	**Assignment**
1	Operating System Commands
2	Word Processing
3	Spreadsheet
4	Presentation Tools
5	Utility programs, anti-plagiarism software etc
6	Google Apps: Word, Excel,Sheet

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

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

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

SEMESTER I

Course Code: NP23-BCA-115

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

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

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

SEMESTER II

Course Code: NP23-IKS-101

Course Name: Vedic Mathematics and Computing

Course Objectives:

- To provide knowledge about applying theoretical concepts of Vedic mathematics and computing to solve problems**.**

Course Outcomes:

On completion of the course, student will be able to

- Learn basics concepts of Vedic Mathematics

Course Contents

Unit I Table Formation **04 Hrs**

1. Tables near to perfect base numbers
2. Tables of Even Numbers, Tables of Odd Numbers
3. Tables of numbers having units place as 5, 8, 9...., Tables of more than two digit numbers

Unit II Multiplication **06 Hrs**

1. Multiplication of any number by 9, 99, 999, 9999...
2. Multiplication of numbers more than perfect base numbers, less than perfect base numbers
3. Multiplication of numbers more than sub base numbers, less than sub base numbers
4. Multiplication of any number by 11, 12 to 19,
5. By any two digit number
6. Multiplication of numbers having sum of units place as 10..-Having sum of last two digits as 100..-Multiplication of numbers having sum of units place near to 10
7. General Multiplication - 2-2, 3-3, 4-4, 5-5 etc..
8. Multiplication of any number by 5, 25, 125 etc...

Unit III Squares and Magic Square **06 Hrs**

1. Squares of numbers having units place as 5
2. Squares of numbers more than perfect base numbers, less than perfect base numbers
3. Squares of numbers more than sub base numbers, less than sub base numbers
4. Squares by duplexing method. Squares of numbers having last digits as 25, 75...
5. Squares of 1,11,111,1111,
6. Magic Square: Three by three, Five by five, Seven by seven, Nine by nine, Four by four.

Unit IV Cubes, Square Root and Cube Root **04 Hrs**

1. Cubing the numbers more than perfect base numbers, less than perfect base numbers
2. Cubing any two digit number...
3. Cubing the numbers near to sub base numbers
4. Square Roots and Cube Roots

Unit V Division and Test of Divisibility **06 Hrs**

1. Division of any number by two numbers, three digit number
2. Division of any number by 9...
3. Divisions of algebraic expressions
4. Division of decimal places
5. Test of Divisibility of numbers having units place as 9
6. Test of Divisibility having units place as 1
7. Test of Divisibility of 37
8. Some other...

Unit VIII Compound Interest and Fractions **04 Hrs**

1. Compound Interest: For 2 years and 3 years
2. Fractions

Reference:

1. https://www.vedicmaths.org/nc-tutorials
2. https://www.udemy.com/course/vedic-maths-i/

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

SEMESTER II

Course Code: NP23-BCA-211

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 BehrouzForouzan& Richard Gilberg

5. Y S Kanetkar, "Let Us C", BPB Publications

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

SEMESTER II

Course Code: NP23-BCA-212

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 using1'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: NP23-BCA-213

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

Unit 1: File Organization **04 Hrs**

1. Introduction to File Organization
2. Physical / logical files
3. Record organization (fixed, variable length)
4. Types of file organization(heap, sorted, indexed, hashed)

Unit 2: Introduction of DBMS **04 Hrs**

1. Overview of DBMS, File system Vs. DBMS
2. Levels of abstraction, Data independence
3. Structure of DBMS, Users of DBMS, Advantages of DBMS

Unit 3: Conceptual Design (E-R model) **06 Hrs**

1. Overview of DB design
2. ER data model (entities, attributes, entity sets, relations, relationship sets)
3. Additional constraints (key constraints, participation constraints, weak entities) aggregation, generalization, specialization
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:

1. Henry F. Korth, Abraham Silberschatz, S. Sudarshan, “Database System Concepts”, Tata McGraw-Hill Education

2. Raghu Ramakrishnan and Johannes Gehrke, “Database Management Systems”, McGraw-Hill Science/Engin

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

SEMESTER II

Course Code: NP23-BCA-215

Course Name: Basics of Embedded System and Programming

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.

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.

Course Contents

Unit 1: Introduction to Embedded System 08 Hrs

1. Introduction to embedded systems, Basic components of embedded system, Advantage and Applications of embedded system.
2. Recent trends in embedded systems, Architecture of embedded systems,
3. Hardware architecture, Software architecture, Application Software, Communication Software.

Unit 2: Introduction Microprocessor and Microcontroller Environment 06 Hrs

1. Introduction to Microprocessor: 8085 Architecture
2. Introduction to Microcontroller: Arduino Uno Architecture
3. Setup the IDE, Writing Arduino Software, Arduino Libraries
4. Basics of Embedded C programming for Arduino

Unit 3: Programming with Arduino **08 Hrs**

1. Programming with Arduino using basic components: LED, push button, LED blink, Buzzer, DC motor, LCD display, and Bluetooth.
2. Programming with Arduino using Sensors and Actuators : Ultrasonic Sensor, IR sensor, MQ2 gas sensor, Temperature and Humidity Sensors (DHT-11), Light sensor(LDR), Digital switch, Electro Mechanical switches-Relay, Proximity, Accelerometers and Gyroscope.

Unit 4: Application of Embedded System **06 Hrs**

1. Case studies: Traffic Light System, Smart Street Light System, Smart irrigation, Automatic Car Parking System, Home Automation and Plant Automation.

Reference Books:

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

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

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

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

SEMESTER II

Course Code: NP-BCA-215

Course Name: Advanced C Programming and Embedded System 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

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

Course Objectives:

- To study embedded system
- To learn the basic concept behind embedded system

Course Outcomes:

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

- Interfacing basic component of embedded design using Arduino
- Interfacing Arduino with Sensors
- Interfacing Arduino with Actuators

Sr. No	Assignment
1	Interfacings LED: Blinking LED's , 8-bit binary LED counter
2	Interfacing DC motor
3	Interfacing LCD interfacing
4	Interfacing temperature sensor
5	Interfacing temperature and humidity sensor
6	Interfacing IR sensor and DC motor
7	Interfacing ultrasonic sensor and buzzer
8	Interfacing gas sensor and relay
9	Interfacing Bluetooth
10	Interfacing GSM

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

SEMESTER II

Course Code: NP23-BCA-216

Course Name: Computer Organization and Database Management Systems 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	Code converters (Grey to Binary and Binary to Grey)
3	Adder and Subtractor Arithmetic circuits
4	Design and implement combinational circuit based on the problem given and minimizing using K-map
5	Implement Encoder and Decoder and Multiplexer and De-multiplexers
6	Study of flip-flops and counters Memory Organization
7	Study of counter ICs and designing Mod-N counters

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

Sr. No.	Assignment
1	Case study – ER diagram (generalization, specialization and aggregation)
2	Data Definition Language (DDL) - Create, Alter, Drop, Truncate, Rename and Comment
3	Data Manipulation Language (DML) – Select, Insert, Update, Delete and Merge,
4	Normalization
5	Queries using joins
6	Aggregate Functions and Clauses
7	Nested Queries