ALAGAPPA UNIVERSITY, KARAIKUDI
NEW SYLLABUS FOR AFFILIATED COLLEGES
UNDER CBCS PATTERN WITH EFFECT FROM 2022-23 ONWARDS

B.Sc. COMPUTER SCIENCE
Programme Structure

Sem.	Part	Course Code	Courses	Title of the Course	T/P	Credits	Hrs./ Week	Max. Marks		
								Int.	Ext.	Total
I	I	2211T	T/OL	Tamil/other languages – I	T	3	6	25	75	100
	II	712CE	E	Communicative English – I	T	3	6	25	75	100
	III	22BCE1C1	CC	Programming in C	T	5	5	25	75	100
		22BCE1P1	CC	Practical- Programming in C	P	4	4	40	60	100
		-	AL – IA	BCA/B.Sc., IT/Mathematics/ Electronics/ Software	T	3	3	25	75	100
		-	AL - IA	Practical-Respective Allied Theory Course	P	2	2	40	60	100
	IV	22BVE1	SEC - I	Value Education	T	2	2	25	75	100
				Library		-	2	-	-	-
				Total		**22**	**30**	**205**	**495**	**700**
II	I	2221T	T/OL	Tamil/other languages – II	T	3	6	25	75	100
	II	722CE	E	Communicative English – II	T	3	6	25	75	100
	III	22BCE2C1	CC	Object Oriented Programming with C++	T	5	5	25	75	100
		22BCE2P1	CC	Practical- Object Oriented Programming with C++	P	4	4	40	60	100
		-	AL – IA	BCA/B.Sc., IT/ Mathematics / Electronics/ Software	T	3	3	25	75	100
		-	AL - IA	Practical-Respective Allied Theory Course	P	2	2	40	60	100
	IV	22BES2	SEC - II	Environmental Studies	T	2	2	25	75	100
				Library		-	2	-	-	-
						22	**30**	**205**	**495**	**700**
III	I	2231T	T/OL	Tamil/other languages – III	T	3	6	25	75	100
	II	2232E	E	English for Enrichment - I	T	3	6	25	75	100
	III	22BCE3C1	CC	Microprocessor and its applications	T	3	3	25	75	100
		22BCE3C2	CC	Data Structures and Computer Algorithms	T	3	3	25	75	100
		22BCE3P1	CC	Practical- Data Structures and Computer Algorithms	P	3	3	40	60	100
		-	AL – IA	BCA/B.Sc., IT/Mathematics/ Electronics/ Software	T	3	3	25	75	100
		-	AL - IA	Practical-Respective Allied Theory Course	P	2	2	40	60	100
	IV	22BE3	SEC-III	Entrepreneurship	T	2	2	25	75	100
		-	NME-I	1. Adipadai Tamil (or) 2. Advanced Tamil (or) 3. IT Skills for Employment (or) MOOC's	T	2	2	25	75	100
				Total		**24**	**30**	**255**	**645**	**900**
IV	I	2241T	T/OL	Tamil/other languages – IV	T	3	6	25	75	100
	II	2242E	E	English for Enrichment - II	T	3	6	25	75	100
		22BCE4C1	CC	Java Programming	T	4	4	25	75	100
		22BCE4C2	CC	Operating System	T	4	4	25	75	100

	III	22BCE4P1	CC	Practical – Java Programming	P	3	3	40	60	100
		-	AL – IA	BCA/B.Sc., IT/Mathematics/ Electronics/ Software	T	3	3	25	75	100
		-	AL - IA	Practical-Respective Allied Theory Course	P	2	2	40	60	100
	IV	-	NME-II	1. Adipadai Tamil (or) 2. Advanced Tamil (or) 3. Small Business Management (or) MOOC's	T	2	2	25	75	100
				Total		**24**	**30**	**230**	**570**	**800**
V	III	22BCE5C1	CC	Relational Database Management Systems	T	4	4	25	75	100
		22BCE5C2	CC	Python Programming	T	4	4	25	75	100
		22BCE5C3	CC	Software Engineering	T	4	4	25	75	100
		22BCE5C4	CC	Computer Graphics	T	4	4	25	75	100
		22BCE5P1	CC	Practical- Relational Database Management Systems Lab	P	4	6	40	60	100
		22BCE5P2	CC	Practical – Python Programming	P	4	6	40	60	100
				Career Development/ Employability Skills		-	2	-	-	-
				Total		**24**	**30**	**180**	**420**	**600**
		22BCE6I		Internship		24	30	150	250	400
					Or					
VI	III	22BCE6C1/ 22BCE6C2		Computer Networks/ Network Security	T	6	6	25	75	100
		22BCE6C3/ 22BCE6C4		Mobile Computing / Data Mining and Data Warehousing	T	6	6	25	75	100
		22BCE6C5/ 22BCE6C6		.Net Technologies / Embedded Systems	T	6	6	25	75	100
		22BCE6C7/ 22BCE6C8		Internet of things / Cloud Computing	T	6	6	**40**	**60**	100
		others		Library/ Yoga etc.,		-	2	-	-	-
	III			Career Development / Employability Skills		-	4	-	-	-
				Total		**24**	**30**	**100**	**300**	**400**
					Or					
VI	III	22BCE6PR	DSE	Project**		6	10	25	75	100
		22BCE6C1/ 22BCE6C2		Computer Networks/ Network Security	T	6	6	25	75	100
		22BCE6C3/ 22BCE6C4		Mobile Computing / Data Mining and Data Warehousing	T	6	6	25	75	100
		22BCE6C5/ 22BCE6C6		.Net Technologies / Embedded Systems	T	6	6	25	75	100
				Library / Yoga / Career development/ employability skills/Field trip etc.		-	2	-	-	-
				Total		**24**	**30**	**100**	**300**	**400**
				Grand Total		**140**	**-**	**-**	**-**	**4100**

Note: ** Students are recommended to visit IT Park / IT Based Sectors / IT Companies

Sem.	Part	Course Code	Title of the Paper	Credit	Hours/ Week	Marks		
						Int.	Ext.	Total
I	III	71BEPP- I	Professional English for Physical Science -I	4	5	25	75	100
II		72BEPP - II	Professional English for Physical Science –II	4	5	25	75	100
III		*	Professional English for Physical Science –III	4	5	25	75	100
IV			Professional English for Physical Science –IV	4	5	25	75	100

*The Syllabus of Professional English for III & IV Semester will be provided after Receiving the syllabus from TANSCHE.

As per TANSCHE, the Professional English book will be taught to all four streams apart from the existing hours of teaching/additional hours of teaching (1hour/day) as a 4 credit paper as an add on course on par with Major paper and completion of the paper is a must to continue his/her studies further.

➢ TOL-Tamil/Other Languages,
➢ E – English
➢ CC-Core course –Core competency, critical thinking, analytical reasoning, research skill & teamwork
➢ Allied -Exposure beyond the discipline
➢ AECC- -Ability Enhancement Compulsory Course (Professional English & Environmental Studies) - Additional academic knowledge, psychology and problem solving etc.,
➢ SEC-Skill Enhancement Course - Exposure beyond the discipline (Value Education , Entrepreneurship Course, Computer application for Science, etc.,
➢ NME -Non Major Elective – Exposure beyond the discipline
➢ DSE – Discipline specific elective – -Student choice – either or
   • Internship
   • If internship – Marks = Internal =150 (75+75) two midterm evaluation through Viva voce and External 250 marks (Report =150 +Viva Voce=100) =Total 400 marks
   • Theory papers or
   • Project + 3 theory papers.
➢ MOOCs – Massive Open Online Courses
   * T- Theory, P- Practical

Practical Subjects:
The following list of parameters taken into account for the evaluation of practical examination. *Total Marks: 100 (Internal: 40 marks, External: 60 Marks)*

Parameters:
For Internal Marks:

i. Internal test: 20
ii. Record Work: 20

Total: 40

For External Marks:

i.   Aim, Procedure / Algorithm and Program: 15
ii.   Coding and Compilation: 15
iii. Debugging: 15

iv.	Results:	15
	Total:	**60**

For Project Work:

1. The students will be allowed to work on any project based on the concepts studied in core/elective courses.

2. The project work should be compulsorily done in the college only under the supervision of the department staffs.

3. The combined project shall be undertaken by the students as a team of two.

4. The number of teams should be equally assigned to existing Staff members.

5. The following list of parameters taken into account for the evaluation of Project work and Viva-voce.
   Total Marks: 100 (Internal: 40 marks, External: 60 Marks)

Parameters:

For Internal Marks: Two review meetings: $2 \times 15 = 30$ Marks
Overall Performance: = 10 Marks

For External Marks: Project Report: 20 Marks
Project demo &Presentation: 20 Marks
Viva-Voce: 20 Marks

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Semester - I					
Course Code: **22BCE1C1**	**Core Course - I**		**T/P**	**C**	**H/W**
	PROGRAMMING IN C		T	5	5
Objectives	• To give basic understanding of C Language. • To enable students to develop Program for real world Problems.				
Unit - I	**Overview of C:** History of C – Importance of C – Basic Structure of C Programs – Programming Style – Character Set – C Tokens – Keywords and Identifiers – Constants, Variables and Data Types – Declaration of Variables – Defining Symbolic Constants – Declaring a variable as a constant – overflow and underflow of data – **Operators and Expressions:** Arithmetic, relational, logical, assignment operators – increment and decrement operators, conditional operators, bitwise operators, special operators – Arithmetic Expressions- Evaluation of Expressions – Precedence of Arithmetic Operators – Type Conversions in Expressions – Operator Precedence and Associativity Mathematical functions.				
Unit - II	**Managing I/O Operations:** Reading and Writing a Character – Formatted Input, Output – **Decision Making & Branching:** if statement - if else statement - nesting of if else statements - else if ladder – switch statement – the ?: operator – goto statement – the while statement – do statement – the for statement – jumps in loops.				
Unit - III	**Arrays:** One-Dimensional Arrays – Declaration, Initialization – Two-Dimensional Arrays – Multi-dimensional Arrays – Dynamic Arrays – Initialization. **Strings:** Declaration, Initialization of string variables – reading and writing strings – string handling functions				
Unit - IV	**User-defined functions:** need – multi-function programs – elements of user defined functions – definition – return values and their types – function calls, declaration, category – all types of arguments and return values – nesting of functions – recursion – passing arrays, strings to functions – scope visibility and life time of variables. **Structures and Unions:** Defining a structure – declaring a structure variable – accessing structure members – initialization – copying and comparing – operation on individual members – array of structures – arrays within structures – structures within structures – structures and functions –unions – size of structures – bit fields.				
Unit - V	**Pointers:** the address of a variable – declaring, initialization of pointer variables – accessing a variable through its pointer – chain of pointers – pointer increments and scale factors – pointers and character strings – pointers as function arguments – pointers and structures. **Files**: Defining, opening, closing a file – IO Operations on files – Error handling during IO operations – command line arguments.				

Text Book:

E.Balagurusamy , 2012, *Programming in ANSI C*, , 6th Edition, Tata McGraw Hill Publishing Company.

UNIT I: Chapters 1 (Except 1.3-1.7, 1.10-1.12), 2 (Except 2.9, 2.13), 3 (Except 3.13)

UNIT II: Chapters 4 – 6

UNIT III: Chapters 7, 8 (Except 8.5, 8.6, 8.7, 8.9, 8.10)

UNIT IV: Chapters 9 (Except 9.20), 10

UNIT V: Chapters 11 (Except 11.8, 11.10, 11.12, 11.14, 11.15, 11.17), 12 (Except 12.6)

Books for Reference:

Ashok N.Kamthane , 2006 *Programming with ANSI and Turbo C* ,Pearson Education

Kanetkar Y., 1999.*Let us C,* BPB Pub., New Delhi,	
H. Schildt, C 2000: *The Complete Reference*, 4th Edition, TMH Edition,	
Schaum's Outline Series, Gottfried, Tata McGraw Hill, 2006 *Programming with C*,	
Outcomes	• Students gain knowledge to develop C Programs. • Students were able to apply and implement programs for solving real world problems.

	Semester - I			
		T/P	C	H/W
Course Code: **22BCE1P1**	**Core Practical - I**			
	PROGRAMMING IN C LAB	P	4	4
Objectives	• To Understand the C Language Practically • To know how to solve the real-time problems.			
Group- A	1. Write a C Program to find the sum of digits. 2. Write a C Program to check whether a given number is Armstrong or not. 3. Write a C Program to check whether a given number is Prime or not. 4. Write a C Program to generate the Fibonacci series. 5. Write a C Program to display the given number is Adam number or not. 6. Write a C Program to print reverse of the given number and string. 7. Write a C Program to find minimum and maximum of 'n' numbers using array. 8. Write a C Program to arrange the given number in ascending order. 9. Write a C Program to add and multiply two matrices. 10. Write a C Program to calculate NCR and NPR.			
Group- B	1. Write a C Program to find the grade of a student using else if ladder. 2. Write a C Program to implement the various string handling function. 3. Write a C Program to create an integer file and displaying the even numbers only. 4. Write a C Program to calculate quadratic equation using switch-case. 5. Write a C Program to count number of characters, words and lines in a text file. 6. Write a C Program to generate student mark list using array of structures. 7. Write a C Program to create and process the student mark list using file 8. Write a C Program to create and process pay bill using file 9. Write a C Program to create and process inventory control using file 10. Write a C Program to create and process electricity bill using file			
Note: **One Question from Group A and another one Question from Group B is compulsory for University Examination**				
Outcomes	• Students were able to relate the ways to solve simple programs. • Students were able to understand and trace the execution of Programs using Arrays, Structures and files.			

Semester - II				
Course code: 22BCE2C1	**Core Course -II**	**T/P**	**C**	**H/W**
	OBJECT ORIENTED PROGRAMMING WITH C++	T	5	5
Objectives	• To understand the basic concepts of OOPS • To enable Students develop programs for real-time entities.			
Unit -I	Software Crisis – Software Evolution – Basic Concepts of Object-Oriented Programming – Benefits of OOP – Object-Oriented Languages - Applications of OOP – Application of C++ - Structure of a C++ Program – Tokens – Keywords – Identifiers – Basic Data Types – User defined Data types – Derived data types – Symbolic constants – Type compatibility – Declaration of variables – Dynamic initialization of variables –Reference variables – Operators in C++ - Manipulators – Type cast operator – Expressions and their types-Implicit conversions – Control structures – The main function – Function prototyping – inline functions – Function overloading.			
Unit-II	Specifying a class – Defining member functions – Making an outside function inline – Nesting of member functions – Private member functions – Array within a class – Memory allocation for objects – Static data members – Static member functions – Array of objects - Objects as function arguments – Friendly functions – Returning objects – Constant member functions – Constructors – Parameterized constructor – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Destructors.			
Unit -III	Defining operator overloading – Overloading unary operators – Overloading binary operators – Overloading binary operators using friend function – Rules for overloading operators - Defining derived classes – Single inheritance – Making a private member inheritable – Multilevel inheritance – Multiple inheritance – Hierarchical inheritance – Hybrid inheritance - Virtual base classes – Constructors in derived class – Member classes: Nesting of classes.			
Unit -IV	Pointer to objects – this pointer – Pointers to derived classes – Virtual functions – Pure virtual functions – C++ Stream classes – Unformatted I/O operations – Managing output with manipulators.			
Unit -V	Classes of file stream operations – Opening and Closing files – Detecting end of file – More about open() function – File modes, File pointers and their manipulation – Sequential input and output operations – Command-line arguments- Templates: class templates and function templates.			

Text Book:

Object Oriented Programming with C++, E. Balagurusamy, Sixth Edition-2013, McGraw Hill Education (India) Private Limited, New Delhi.

   UNIT I – Chapter 1 (Except 1.3, 1.4),
      Chapter 2 (Only 2.6),
      Chapter 3 (Except 3.20, 3.21, 3.22), Chapter 4
  UNIT II – Chapter 5 (Except 5.18, 5.19), Chapter 6 (Except 6.8, 6.9, 6.10)
  UNIT III – Chapter 7, Chapter 8
  UNIT IV – Chapter 9, Chapter 10
  UNIT V – Chapter 11 (Except 11.8), Chapter 12 (Only 12.2, 12.3 and 12.4)

Books for Reference:

C++ - The Complete Reference, Herbert Schildt, TMH, 1998.

C++ How to Program, Paul Deitel, Harvey Deitel, PHI, Ninth edition (2014).

Ashok N.Kamthane, Object Oriented Programming with ANSI & Turbo C ++, Pearson Education, 2006.

Object-Oriented Programming With C++, Poornachandra Sarang, 2nd Edition, PHI Learning Private Limited, New Delhi, 2009.

Object-Oriented Programming Using C++, Alok Kumar Jagadev, Amiya Kumar Rath

And Satchidananda Dehuri, Prentice-Hall of India Private Limited, New Delhi, 2007.

Outcomes	• Students gain knowledge to develop Object Oriented Programs. • Using the OOPS Concepts Students were able to solve real-time problems.

Semester - II					
Course code: 22BCE2P1	**Core Practical-II**		**T/P**	**C**	**H/W**
	OBJECT ORIENTED PROGRAMMING WITH C++ LAB		**P**	**4**	**4**
Objectives	• To Understand the OOPS Concept Practically. • To know how to solve the real-time problems using OOPS.				
Group- A	1. Printing Prime numbers between two given numbers. 2. Printing 3 digit numbers as a series of words. (Ex. 543 should be printed out as Five Four Three). 3. Finding area of geometric shapes using function overloading. 4. Inline functions for simple arithmetic operations. 5. Demonstrating the use of Pre-defined Manipulators. 6. Demonstrating the use of friend function. 7. Creating student mark list using array of objects, 8. Demonstrating constructor overloading. 9. Overloading the unary – operator. 10. Demonstrating single inheritance. 11. Demonstrating the use of "this" pointer. 12. Designing our own manipulator. 13. Illustrating function templates. 14. Illustrating class templates.				
Group- B	1. Overloading the binary + operator. 2. Demonstrating Multiple inheritance. 3. Demonstrating Multilevel inheritance. 4. Demonstrating Hierarchical inheritance. 5. Demonstrating Virtual functions. 6. Processing mark list using binary file. 7. Count number of objects in a file. 8. Demonstrating the use of Command-line arguments.				
Note: **One Question from Group A and another one Question from Group B is compulsory for University Examination**					
Outcomes	• Students were able to understand the concept of OOPS. • Students were able to understand and trace the execution of Programs using OOPS Concept.				

Semester - III					
Course code: 22BCE3C1	**Core Course -III**		**T/P**	**C**	**H/W**
	Microprocessor and its applications		**T**	**3**	**3**
Objectives	➢ To gain knowledge about the Microprocessor ➢ To understand the basics of 8086 processor ➢ To gain insight about the ARM processor and programming in ARM Assembly Language				
Unit -I	**The 8086 Microprocessor** Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – byte and String Manipulation.				
Unit-II	**8086 System Bus Structure** 8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure Multiprocessor configurations – Coprocessor, closely coupled and loosely Coupled configurations – Introduction to advanced processors.				
Unit -III	**I/O Interfacing** Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.				
Unit -IV	**Introduction to Processor Design** Processor architecture and organization - Abstraction in hardware design - MU0 - a simple processor - Instruction set design - Processor design trade-offs - The Reduced Instruction Set Computer - Design for low power consumption - The ARM Architecture				
Unit -V	**ARM Assembly Language Programming** Data processing instructions - Data transfer instructions - Control flow instructions - Writing simple assembly language programs - ARM Organization and Implementation				

Reference and Textbooks:-(APA Format)

Text Books:

Liu, Y. C., & Gibson, G. A. (2007). *Microcomputer systems: The 8086/8088 family: Architecture, programming, and design*. Prentice-Hall, Inc.

Furber, S. B. (2000). *ARM system-on-chip architecture*. pearson Education.

Book for Reference:

Hall, D. V. (2012). *Microprocessors and interfacing: programming and hardware*. McGraw-Hill, Inc.

Mishra, S., Singh, N. K., & Rousseau, V. (2015). *System on chip interfaces for low power design*. Morgan Kaufmann.

Outcomes	➢ The students gain knowledge about Microprocessor and its applications ➢ The students will be able to understand the working of 8086 processor ➢ The students will gain insight ARM processor design and programming.

Semester - III				
Course code: 22BCE3C2	**Core Course-IV**	**T/P**	**C**	**H/W**
	DATA STRUCTURES AND COMPUTER ALGORITHMS	**T**	**3**	**3**
Objectives	• To acquire knowledge about various Data Structures and Algorithms. • To find suitable Data Structure and Computer Algorithms for real world problems.			
Unit -I	**Arrays**: Axiomatization – Ordered Lists – Sparse Matrices – Representation of Arrays - **Stacks and Queues**: Fundamentals – Evaluation of Expressions – Multiple Stacks and Queues			
Unit-II	**Linked Lists**: Singly Linked Lists – Linked Stack and Queues – Polynomial Addition – Doubly Linked List and Storage Management – **Trees**: Basic Terminologies – Binary Trees – Binary Tree Traversal – Threaded Binary Tree – Binary Tree Representation.			
Unit -III	**Elementary Data Structures:** Dictionaries – Priority Queues – Sets and Disjoint Set Union – Graphs.			
Unit -IV	**Algorithms:** Introduction: Algorithm Specification – Performance Analysis – Divide and Conquer: General method – Binary Search – Finding the maximum and minimum – Merge Sort – Quick Sort – Selection – Strassen's Matrix Multiplication.			
Unit -V	**The Greedy Method:** General Method – Knapsack problem – Job Sequencing with deadlines – Optimal Storage on tapes – Optimal merge patterns Minimum cost spanning trees - **Dynamic Programming**: All pairs of shortest path – single source shortest path - Travelling salesman problem. **Basic Traversal and Search Techniques**: Techniques For Graphs.			

Text Book:

"*Fundamentals of Data Structures*", Ellis Horowitz, Sartaj Sahni, Galgotia Publications.

Unit – I – Chapter 2, Chapter 3(Except 3.2)

Unit – II – Chapter 4 (Except 4.3, 4.5, 4.6, 4.7), Chapter 5 (Except 5.5, 5.8, 5.9)

Fundamentals of Computer Algorithms, Ellis Horowitz, Sarataj Sahni, Galgotia Publications Pvt. Ltd,
New Delhi

Unit III – Chapter 2 (Except 2.1, 2.2)

UNIT IV – Chapter 1 (Except 1.4), Chapter 3 (Except 3.2, 3.9)

UNIT V – Chapter 4 (Except 4.2, 4.6.3, 4.9) , Chapter 5 (Only 5.3, 5.4, 5.9), Chapter 6.2

Outcomes	• Students will be able to apply the Data Structures and Algorithms to solve simple problems. • Students were able to compare various techniques used in Data structures and Algorithms by developing real world applications.

Semester - III					
Course code: 22BCE3P1	**Core Practical-III**	**T/P**	**C**	**H/W**	
	DATA STRUCTURES AND COMPUTER ALGORITHMS LAB (USING C AND C++)	**P**	**3**	**3**	
Objectives	• To Understand the Data Structures and Computer Algorithms concept. • To know how to use the Data Structures and Computer Algorithms for real world problems.				
Group- A	**(Programs from Data Structures Using C)** 1. Implementing Stack as an array. 2. Implementing Stack as a linked list. 3. Convert Infix expression to Postfix expression using stack. 4. Convert Infix expression to Prefix expression using Stack. 5. Implementing Queue as an Array. 6. Implement Queue as a linked list. 7. Binary tree traversals. 8. Implement Binary Search Tree.				
Group- B	**(Programs from Computer Algorithms Using C++)** 1. Linear Search 2. Binary Search 3. Bubble Sort 4. Insertion Sort 5. Merge Sort 6. Quick Sort 7. Selection Sort 8. Minimum Spanning Tree				
Note: **One Question from Group A and another one Question from Group B is compulsory for University Examination**					
Outcomes	• Students were able to understand the concept of Data Structures and Computer Algorithms. • Students were able to compare various techniques by executing the programs using Data Structures and Computer Algorithms.				

Semester - IV					
Course code: 22BCE4C1	**Core Course -V**		**T/P**	**C**	**H/W**
	JAVA PROGRAMMING		**T**	**4**	**4**
Objectives	• To gain knowledge about basic concepts of Java. • To engage students to build programs using Java methodology.				
Unit -I	**Java Evolution:** Java History – Java Features – Java and Internet – World Wide Web – Web Browsers – H/W and S/W requirements – Java Support Systems – Java Environment. **Overview of Java language:** Introduction – Simple Java Program –Comments – Java Program Structure –Tokens – Java Statements – Implementing a Java Program – JVM – Command Line Arguments. Constants – Variables – Data Types – Type Casting.				
Unit-II	**Operators and Expressions:** Arithmetic Operators – Relational, Logical, Assignment, Increment and Decrement, Conditional, Bitwise, Special Operators – Arithmetic expressions, Evaluation of expression – Precedence of Arithmetic Operators – Type Conversions – Operator Precedence and associativity – Mathematical Functions. **Decision Making and Branching:** If – if…..else – Nesting of if……. Else – else if – switch - ? Operator. **Decision Making and Looping:** While – do – for – jump in loops – labeled loops.				
Unit -III	**Classes, Objects and Methods:** Defining a class – Adding variables, methods – Creating objects – Accessing Class Members– Constructors – Methods overloading – static members – Nesting of Methods – Inheritance – Overriding methods – final Variables and methods – Final classes – finalizer methods – Abstract methods and classes – visibility control. **Arrays, Strings and Vectors:** Arrays – One Dimensional Arrays – Creating an array – Two Dimensional Arrays – Strings – Vectors – Wrapper Classes **Interfaces:** **Multiple Inheritance** Defining interfaces – Extending interfaces – implementing interfaces – Accessing interface variables.				
Unit -IV	**Packages:** Java API Packages – Using system packages – Naming conventions – Creating Packages – Accessing a Package – Using a Package – Adding a Class to a Package – hiding classes. **Multithreaded Programming:** Creating Threads – Extending the Thread Class – Stopping and Blocking a Thread – Life Cycle of a Thread – Using Thread methods – Thread Exceptions – Thread Priority – Synchronization – Implementing the 'Runnable' Interface. **Managing Errors and Exceptions:** Types of errors – Exceptions – Syntax of Exception handling code – Multiple Catch Statements – Using finally statement – Throwing our own Exceptions – Using Exceptions for Debugging.				
Unit -V	**Applet Programming:** How applets differ from Applications – preparing to write applets – Building Applet Code – Applet life cycle – creating an Executable Applet – Designing a Web Page – Applet Tag – Adding Applet to HTML file – Running the Applet – Passing parameters to Applets – Displaying Numerical values – Getting input from the user **Graphics Programming:** The Graphics Class – Lines and Rectangles – Circles and Ellipses – Drawing Arcs – Drawing Polygons – Line Graphs – Using Control Loops in Applets – Drawing Bar Charts.				

Text Book:
Programming with java, E.Balagurusamy TMH, 4th Edition.

Books for Reference:
Java 2- The Complete Reference, Herbert Schildt , 5th Edition(2002) , McGraw Hill Education (India) Private Limited.

Programming with Java (Schaum's Outline Series), John R.Hubbard, 2ndEdition(2004), McGraw-Hill International Editions.

Programming in Java2, By Dr.K.Somasundaram, Publisher : First Edition JAICO Publishing House, 2008.

Outcomes	• Students will able to understand the Java programming concepts. • Students will able to apply concepts and methods for real-time problems.

	Semester - IV			
Course code: 22BCE4C2	**Core Course-VI**	**T/P**	**C**	**H/W**
	OPERATING SYSTEM	**T**	**4**	**4**
Objectives	• To understand the services provided by and the design of an operating system. • To understand the structure and organization of the file system.			
Unit -I	**Introduction**: Operating Systems - Computer-System Organization - Computer-System Architecture - Operating-System Structure - Operating-System Operations - Process Management - Memory Management - Storage Management - Protection and Security - **Operating-System Structures** : Operating-System Services : User and Operating-System Interface - System Calls - Types of System Calls - System Programs			
Unit-II	**Processes**: Process Concept - Process Scheduling - Operations on Processes - Interprocess Communication - **Process Synchronization** : Background - The Critical-Section Problem - Peterson's Solution - Synchronization Hardware - Mutex Locks - Semaphores - Classic Problems of Synchronization – Monitors.			
Unit -III	**CPU Scheduling** : Basic Concepts - Scheduling Criteria - Scheduling Algorithms - Thread Scheduling - Multiple-Processor Scheduling - Real-Time CPU Scheduling - **Deadlocks**: System Model - Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock			
Unit -IV	**Main Memory** : Background - Swapping - Contiguous Memory Allocation - Segmentation - Paging - Structure of the Page Table - **Virtual Memory**: Background - Demand Paging - Copy-on-Write - Page Replacement - Allocation of Frames - Thrashing - Memory-Mapped Files - Allocating Kernel Memory			
Unit -V	**Mass-Storage Structure**: Overview of Mass-Storage - Structure - Disk Structure - Disk Attachment - Disk Scheduling - Disk Management - Swap-Space Management - RAID Structure - Stable-Storage Implementation - **File-System Implementation**: File-System Structure - File-System Implementation - Directory Implementation - Allocation Methods - Free-Space Management - Efficiency and Performance – Recovery			
Text Book: "*Operating System Concepts*", Abraham Silberschatz, Peter Baer Galvin,Greg Gagne, Ninth Edition, John Wiley & Sons, Inc				
Outcomes	• Understands the different services provided by Operating System at different level. • They learn real life applications of Operating System in every field.			

	Semester - IV			
		T/P	**C**	**H/W**
Course code: 22BCE4P1	**Core Practical-IV**			
	JAVA PROGRAMMING LAB	**P**	**3**	**3**
Objectives	• To Understand the Java Concept Practically. • To write programs for solving real world problems using Java collection framework.			
Group- A	1. Applet Program to Displaying Digital Clock. (Ex: 09:15:45 AM) 2. Applet Program to Draw our National Flag. 3. Applet Program to Draw Bar Charts with different colors. 4. Applet Program to draw Building with attractive colors. 5. Applet Program to addition and multiplication of two numbers 6. Write applets to draw the following Shapes: 7. **(a).** Cone **(b).** Cylinder **(c).** Square inside a Circle **(d).** Circle inside a Square 8. Write an applet Program to design a simple calculator. 9. Write an Applet Program to animate a ball across the Screen.			
Group- B	1. To perform addition and subtraction of complex numbers using class and objects. 2. Program to calculate area of Square and Rectangle using Method Overloading. 3. Program to implement User-Defined Exception (minimum 3 types of exception should be used). 4. Create two threads such that one of the thread generate Fibonacci series and another generate perfect numbers between two given limits. 5. Using command line arguments, test if the given string is palindrome or not. 6. Program to perform Matrix Addition and Multiplication using class. 7. Program to perform the String operations. (Reverse, Copy, Concatenate, Compare) 8. Program to display student mark details using Single Inheritance. 9. Using multilevel inheritance process student marks. 10. Implement multiple inheritance for payroll processing. 11. Program to implement banking transaction using Interface. 12. Program to implement Multiple Thread. 13. Program to implement Package.			
Note: **One Question from Group A and another one Question from Group B is compulsory for University Examination**				
Outcomes	• Students were able to solve real world problems using Java collection framework. • Students were able to write and execute programs using various methods and concepts.			

Semester - V					
Course code: 22BCE5C1	**Core Course -VII**		**T/P**	**C**	**H/W**
	RELATIONAL DATABASE MANGEMENT SYSTEMS		T	4	4
Objectives	• To impart knowledge about various databases and deep knowledge in RDBMS. • To utilize the wide range of futures available in DBMS package.				
Unit -I	**Introduction:** Database System Applications – Purpose of Database Systems – View of Data– Database Languages – Relational Databases – Database Design – Object based and semi structured databases – Data storage and Querying – Database Users and Administrators– Transaction Management – Database users and Architectures – History of Database System. **Entity-Relationship Model**: E-R model – constraints – E-R diagrams – E-R design issues – weak entity sets – Extended E-R features.				
Unit-II	**Relational Database Design: Features of good** Relational designs – Atomic domains and First Normal Form – Decomposition using functional dependencies – Functional dependency theory – Decomposition using functional – Decomposition using multivalued dependencies – more Normal forms – database design process – modeling temporal data				
Unit -III	**Database System Architecture:** Centralized and Client-Server architecture – Server system architecture – parallel systems – Distributed systems – Network types. Parallel databases: I/O parallelism – Interquery Parallelism – Intraquery parallelism. Distributed Databases: Homogeneous and Heterogeneous databases – Distributed Data storage – Distributed transactions – Distributed query processing.				
Unit -IV	**Schema Objects** Data Integrity – Creating and Maintaining Tables – Indexes – Sequences – Views – Users Privileges and Roles –Synonyms.				
Unit -V	**PL/SQL:** PL/SQL – Triggers – Stored Procedures and Functions – Package – Cursors – Transaction.				

Text Books:

Silberschatz Korth Sudarshan, 2006,*Database System Concepts* –International (5th Edition) McGraw Hill   Higher Education

Jose A.Ramalho – Learn ORACLE 8i BPB Publications 2003

Books for Reference:

"Oracle 9i The complete reference", Kevin Loney and George Koch, Tata McGraw Hill, 2004.

"Database Management Systems", Ramakrishnan and Gehrke, Mc Graw Hill, Third Edition, 2003.

"Oracle 9i PL/SQL Programming "Scott Urman, Oracle Press, Tata Mc Graw Hill, 2002.

Outcomes	• Students acquire knowledge about RDBMS and ER models. • Students were able to find suitable PL/SQL routines to solve database related problems.

	Semester - V			
Course code: 22BCE5C2	**Core Course -VIII**	T/P	C	H/W
	PYTHON PROGRAMMING	T	4	4
Objectives	• To acquire programming skills and Object Oriented Skills in Python • To develop the skill of designing Graphical user Interfaces and ability to write database applications in Python			
Unit -I	Python Programming Introduction: IDLE – Python Strings – Relational Operators – Logical Operators – Bitwise Operators – Variables and Assignment Statements – Keywords – Script Mode – **Functions:** Built-In Functions – Function Definition and Call – Import User-defined Module – Assert statement – Command Line Arguments.			
Unit-II	**Control Structures:** IF Conditional Statement – Iteration – break – continue – pass statements – else statement - **Scope:** Objects and Object ids – Scope of Objects and Names – **Strings:** String Functions – Slicing – Membership – Built-in Functions – pattern matching.			
Unit -III	**Mutable and Immutable Objects:** Lists – Sets – Tuples – Dictionary - Files and **Exceptions:** File Handling – Writing structures to a File – Errors and Exceptions – Handling Exception			
Unit -IV	**Classes I** : Classes and Objects – Class as Abstract Data type – Date Class – **Classes II**: Polymorphism – Encapsulation – modifier and Accessor Methods – Static Method – Adding Methods Dynamically – Composition – Inheritance – Built-in Functions for Classes			
Unit -V	**Graphics:** 2D Graphics – 3D Objects – Animation – **Applications of Python:** Sharing Data using Sockets – Managing Databases using SQL – Integrating Java with Python			

Text Book:

Sheetal Taneja, Naveen Kumar, *Python Programming A Modular Approach*, Pearson India Education Services Pvt. Ltd.

Outcomes	• Students will able to define and demonstrate the use of built-in data structures "lists" and "dictionary". • Students will able to design and implement a program to solve a real world problem and as well as to Design and implement GUI application.

Semester - V					
Course code		**Core Course-IX**	**T/P**	**C**	**H/W**
22BCE5C3		**SOFTWARE ENGINEERING**	**T**	**4**	**4**
Objectives		• To equip students with the knowledge and techniques of professional practices in software processes and activities. • To acquire knowledge about developing a project.			
Unit -I		**Introduction:** Introduction to software engineering – some definitions – some size factors –quality and productivity factors – managerial issues Planning a software project: Defining the problem– developing a solution strategy – planning the development process – planning an organizational structure – other planning activities.			
Unit-II		**Software Cost Estimation:** software cost factors – software cost estimation techniques – estimating software maintenance costs **Software Requirements Definition:** The software requirements specification – formal specification techniques.			
Unit -III		**Software Design:** Fundamental design concepts – modules and modularization criteria – design notations – design techniques – Stepwise refinement – Integrated top down development – Jackson Structured Programming -detailed design considerations –test plan – milestones, walkthroughs and inspections – design guidelines			
Unit -IV		**Software Implementation:** Structured coding techniques – coding style – standards and guidelines - Verification and validation techniques – Quality Assurance – Walkthrough and inspection -Unit Testing and Debugging – System Testing			
Unit -V		**Software Maintenance:** Enhancing maintainability during development – managerial aspects of software engineering – configuration management – source code metrics – other maintenance tools and techniques.			

Text Book:

Software Engineering Concepts – Richard E. Fairley, Tata McGraw Hill Publishing Company Ltd, New Delhi

Books for Reference:

Software Engineering – A Practitioner's approach – Roger S. Pressman, (Fourth Edition) McGrawHill International Editions.

An Integrated Approach to Software engineering – Pankaj Jalote, Second Edition Narosa Publishing House

Fundamentals of Software Engineering, CarloGhezzi, Mehdi Jazayeri, Dino Mandrioli, Prentice Hall of India Pvt. Ltd.,New Delhi.

Outcomes	• Students will gain knowledge about analysis and design a project. • Students will able to develop a simple projects and testing reports.

Semester - V					
Course code: 22BCE5C4	**Core Course-X**		**T/P**	**C**	**H/W**
	COMPUTER GRAPHICS		**T**	**4**	**4**
Objectives	• To understand the concept of Graphics and their application in various areas. • To understand the concept of transformation and viewing techniques in detail.				
Unit -I	**A survey of computer graphics:** Computer-Aided Design - Presentation Graphics – Computer Art – Entertainment – Education and Training – Visualization – Image Processing – Graphical User Interfaces. Overview of Graphics Systems: Video Display Devices – Raster Scan Systems – Random Scan Systems – Input Devices – Hard Copy Devices.				
Unit-II	**Output Primitives:** Points and Lines – Line Drawing Algorithms – Circle Generating Algorithms – Ellipse Generating Algorithms – Filled Area primitives.				
Unit -III	**Attributes of Output Primitives:** Line Attributes – Curve Attributes – Color and Gray Scale Levels – Area Fill Attributes – Character Attributes – Bundled Attributes – Inquiry Functions – Antialiasing.				
Unit -IV	**Two–Dimensional Geometric Transformations:** Basic Transformations – Matrix Representations – Composite Transformations – Other Transformations – Transformations between Coordinate Systems.				
Unit -V	**Two –Dimensional Viewing :** The Viewing Pipeline – Viewing Coordinate Reference Frame – Window –to- Viewport Coordinate Transformation – Two-Dimensional Viewing Functions – Clipping Operations – Point Clipping – Line Clipping – Polygon Clipping – Curve Clipping – Text Clipping – Exterior Clipping.				

Text Books:

Computer Graphics, Donald Hearn and M. Pauline Baker, Prentice Hall Of India Pvt. Ltd., New Delhi, Second Edition, 1994.

    Unit I : Chapters 1.1 – 1.8, 2. 1-2.3, 2.5, 2.6
    Unit II : Chapters 3.1, 3.2, 3.5-3.7, 3.11
    Unit III : Chapters 4.1 – 4.8
    Unit IV : Chapters 5.1 – 5.5
    Unit V : Chapters 6.1 – 6.11

Reference Books:

Computer Graphics, Multimedia and Animation – Malay K. Pakhira, Prentice Hall Of India Pvt. Ltd. , New Delhi – 2008

Fundamentals Of Computer Graphics And Multimedia – D. P. Mukherjee, Prentice Hall Of India Pvt. Ltd. , New Delhi – 1999

Multimedia Graphics, John Villamil, Casanova , LeonyFernanadez, Eliar, PHI,1998.

Outcomes	• Students will gain knowledge about Computer Graphics and their applications • Students will able to know about the transformation and viewing techniques.

Semester - V					
Course code	**Core Practical-V**		**T/P**	**C**	**H/W**
22BCE5P1	**Relational Database Management Systems Lab**		**P**	**4**	**6**
Objectives	The following concepts must be introduced to the students:				

Objectives The following concepts must be introduced to the students:

DDL Commands
- Create table, alter table, drop table

DML Commands
- Select, update, delete and insert statements
- Condition specification using Boolean and comparison operators (and, or,not,=,<>,>,<,>=,<=)
- Arithmetic operators and aggregate functions (Count, Sum, Avg, Min, Max)
- Handling Multiple table queries
- Arranging using order by

PL/SQL Programming
- Simple PL/SQL programs with Table handling

- Concepts of Trigger, Procedures and Cursor

Group- A

1. Create a student table with the following attributes name, register number, department, marks in 5 subjects and total.
(a) Insert few records into student table.

(b) Display all the records

(c) Calculate the total marks for all the records.

(d) Display the information of student name, register number and total only.

2. Create a student table with the following attributes name, registernumber, department, marks in 5 subjects and total.
(a) Insert few records into student table.
(b) Modify the name of the student as vignesh whose register number is 211278019.
(c) Delete the records whose register number is 211278005.
(d) Display all the records.

3. Create a table student with name, roll number, gender, age and mobile number. Apply the following integrity rules to the student table
(a) The student name must be in capital letter.

(b) The roll number must be greater than zero.

(c) The age cannot be a null value.

(d) The gender must be "Male" or "Female" or "Transgend"

(e) The mobile number may contain null values.

4. Create a table student_master with the following attributes name, regno, dept and year of joining with suitable data types. Use Select command to do the following.
(a) Display all the column in the student_ master table .

(b) Display the student's name column only.

(c) Eliminate the duplicate entry in student_mastertable.

(d) Select the details of student who is studying computer science department

(e) Sort the attribute name in alphabetical order.

5. Create a table sales_order_details with the s_order_no as primary key and it contains the following fields: product_no, description, qty_ordered, qty_disp, product_rate, profit_percent, sell_price, supplier_name. Use Select command to do the following
(a) Select each row and compute sell_price*.50 and sell_price*1.50 for each row selected.

(b) Select product_no, profit_percent, Sell_price where profit_per is not between 10 and 20 both inclusive.

(c) Select product_no, description, profit_percent, sell_price where profit_percent is not between 20 and 30.

(d) Select the suppliername and product_no where suppliername has 'r' or 'h'as second character.

6. Create an Employee table with the following attributes: employee_number, name, job and manager_id. Set the manager_id as a foreign key for creating self referential structure.
(a) Insert few records

(b) Display all the records

(c) Display the employee details who are working under particular manager_id.

7. Create an Employee table with the following attributes: employee_number, employee_name, department_number, job and salary.
(a) Query to display the employee_name and Salary of all the employees earning more than 20000 INR.

(b) Query to display employee_name and department_number for the particular employee _number.

(c) Query to display employee_name and Salary for all employees whose salary is not in the range of INR 15000 and INR 30000.

8. Create an Employee table with the following attribute employee_number, employee_name, job_type, hire_date, department_number and salary.
(a) Query to display employee_name and department_number of all the employees in department_number 10 and Department number 20 in the alphabetical order by name.

(b) Query to display Name of all the employees where the third letter of their name is =A.

(c) Query to display Name with the 1st letter capitalized and all other letter lowercase

(d) Query to display Name of all employees either have two R's or have two A's in

	their Name. 9. Create an Employee table with the following attributes: employee_number, name, job, hire_date and manager_id. Set the manager_id as a forein key for creating self-referential structure. (a) Query to display name and Hire Date of every Employee who was hired in 2007. (b) Query to display name and calculate the number of months between today and the date each employee was hired. (c) Query to display name and job of all employees who don't have a current Manager.
Group- B	10. Create a table sales_order with s_order_no, client_number, delivery_address, delivery_date and order_status. Define the s_order_no as primary key using column level Constraints. (a) Create another table named as sales_order_copy with the same structure of sales_order table. Define the s_order_no as primary key using table level constraints. (b) Add a new column for storing salesman_number in sales_order using ALTER Command. (c) Modify the size of delivery_address in sales_order table using ALTER command. (d) Display the structure of sales_order table 11. Create an Employee table with the following attribute employee_number, employee_name, job_type, hire_date, department_number, salary and commission. (a) Query to display the Highest, Lowest, Sum and Average Salaries of all the Employees (b) Query to display the employee_number and employee_name for all employees who earn more than the average salary. (c) Query to display the employee_name, salary and commission for all the employees who earn commission. (d) Sort the data in descending order of salary and commission (e) Query to display employee_name, salary and commission for all employees whose commission is greater than their salary increased by 5%. 12. Create a DEPARTMENT table with the attributes of department_number and department_name. Set the department_ number as a primary key. (a) Insert few records (b) Display all the records (c) Create an employee table with the following attribute employee_number, employee_name, job and department_number. Set the employee_number as a primary key and set the department_number as a foreign key. (d) Query to display the employee details who are working in the particular department_number. (e) Query to display employee_number, employee_name and job from the employee table (f) Query to display unique jobs from the employee Table (g) Query to display the employee_name concatenated by a job separated by a comma.

13. Create a DEPARTMENT table with the attributes of department_number and department_name. Set the department number as a primary key.
   (a) Create an Employee table with the following attributes: employee_number, name, job_type, department_number and location.
   (b) Query to display Unique Listing of all Jobs that are in department_number 20.
   (c) Query to display employee name, department_name and department_number for all the employees.
   (d) Query to display name, Job, department_number and department_name for all the employees working at the Mumbai location.

14. Create a table client-master with the following fields: client_no, name, address, city, state, pincode, remarks, bal_due with suitable data types.
   (a) Create another table supplier_master from client_master.
   (b) rename the attribute client_no with supplier_no and the attribute **name** with supplier_name in the supplier_master table
   (c) Insert data into client_master
   (d) Insert data into supplier_master from client_master.
   (e) Delete the row which is having the value chennai in the city attribute of client_master table.
   (f) Drop the client_master table

15. Create a table master_book to contain the information of magazine_code, magazine_name and publisher, magazine_type (Weekly/biweekly/monthly) and price. Write a PL/SQL block to perform insert, update and delete operations on the above table

16. Create a table to contain phone_number, user_name, address of the phone user. Write a function to search for an address using phone numbers.

17. Create a table to store the salary details of the employees in a company. Declare the cursor to contain employee_number, employee_name and net_salary. Use cursor to update the employee salaries.

18. Create a table to contain the information about the voters in a particular constituency. Write a proper trigger to update or delete a row in the table.

19. Create a table employee to contain the information of employee_name, employee_number and salary.
(a)   Write a procedure to increase 10% of salary to all employees (procedure without argument).
(b)   Write a procedure to increase specific percentage for specific department number (procedure with argument).

Note: **One Question from Group A and another one Question from Group B is compulsory for University Examination**	
Outcomes	• Students were able to work with various queries • Students were able to know about database concepts, triggers, cursor programming etc.

Semester - IV					
Course code		**Core Practical-VI**	**T/P**	**C**	**H/W**
22BCE5P2		**PYTHON PROGRAMMING LAB**	**P**	**4**	**6**
Objectives	- Acquire programming skills in core Python. - Acquire Object-oriented programming skills in Python. - Develop the skill of designing graphical-user interfaces (GUI) in Python. - Develop the ability to write database applications in Python.				
Group- A	1. Write a Python program that accepts an integer (n) and computes the value of n+nn+nnn. 2. Write a Python program to compute the distance between the points (x1, y1) and (x2, y2). 3. Write a Python program to convert seconds to day, hour, minutes and seconds. 4. Write a Python program to compute the greatest common divisor (GCD) of two positive integers. 5. Write a Python program to convert an integer to binary keep leading zeros. 6. Write a Python program to count the number occurrence of a specific character in a string. 7. Write a Python function to find the maximum and minimum numbers from a sequence of numbers. Do not use built-in functions. 8. Write a Python program to find the number of divisors of a given integer is even or odd. 9. Write a Python program that accept a positive number and subtract from this number the sum of its digits and so on. Continues this operation until the number is positive. 10. Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself. 11. Write a Python program to count occurrences of a substring in a string. 12. Write a Python function that takes a list of words and return the longest word and the length of the longest one. 13. Write a Python program to count the number of strings where the string length is 2 or more and the first and last character are same from a given list of strings. 14. Write a Python function to sum all the numbers in a list. 15. Create a dictionary and apply the following methods: Print the dictionary items, access items, use get() , Change values , use len()				

	16. Create a tuple and perform the following methods: Add items, len() , check for item in tuple, Access items
	17. Write a python program to create two sets and perform the following operations: Union, Intersection, Difference, Asymmetric Difference.
	18. Write a Python script to check whether a given key already exists in a dictionary.
	19. Write a Python program to check whether an element exists within a tuple.
Group- B	1. Write a Python function to calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument.
	2. Write a Python function that checks whether a passed string is palindrome or not.
	3. Write a Python class which has two methods get_String and print_String. get_String accept a string from the user and print_String print the string in upper case.
	4. Write a Python class named Circle constructed by a radius and two methods which will compute the area and the perimeter of a circle.
	5. Write a Python program to count the number of lines in a text file.
	6. Write a python program to define a module to find Fibonacci numbers and import the module to another program.
	7. Write a script named copyfile.py. This script should prompt the user for the names of two text files. the contents of the first file should be input and written to the second file.
	8. Demonstrate a python code to print try, except and finally block statements
	9. Write a 2D Graphics program for the following (a) Draw a Star (b) Draw a letter (c) Draw a hexagon with color.
	10. Write a python program to animate an object from left to right and right to left.
	11. Write a python program for displaying the database records from SQL.
	12. Write a python program to demonstrate the use of Java program.
Note: **One Question from Group A and another one Question from Group B is compulsory for University Examination**	
Outcomes	• Students were able to understand the concept of Python programming. • Students were able to execute programs for real time applications.

Semester - VI					
Course code		**DSE -I**	**T/P**	**C**	**H/W**
22BCE6E1		**(A) COMPUTER NETWORKS**	**T**	**6**	**6**
Objectives	• To develop an understanding of computer networking basics. • To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.				
Unit -I	**Uses of Computer Networks:**– Network Hardware –Network software – OSI and TCP/IP Reference models – Example Networks :Internet.				
Unit-II	**The Physical Layer:** Guided Transmission Media – Wireless Transmission– Communication Satellites – Public Switched Telephone Network – The Mobile Telephone System				
Unit -III	**Data Link Layer:** Design Issues – Error Detection and Correction – Elementary Data link Protocols – Sliding Window Protocol - **Medium Access Control Layer:** Channel Allocation Problem – Multiple Access Protocol – Ethernet.				
Unit -IV	**Network Layer:** Design Issues – Routing Algorithms. **Transport Layer:** Transport Services – Elements of Transport Protocols.				
Unit -V	**Application Layer:** DNS– Electronic Mail – World Wide Web Architectural overview. **Network Security:** Cryptography – Symmetric Key Algorithms – Public Key Algorithms				

Text Book:
   Computer Networks, Andrew S Tanenbaum and D. J. Wetherall, 5th Ed, Pearson,2011.

Books for Reference:

UylessD.Black, Computer Networks, PHIE.

Data and Computer Communications, PHI, W.Stallings

Data Communications and Computer Networks, Brijendra Singh ,Second Edition,PHI, 2006.

Data Communications and Computer Networks , Prakash C. Gupta, Prentice Hall of India, 2005.

Data Communications and Networks ,Achyut S Godbole, TMH,2005.

Data Communication and Networking ,Behrouz A. Forouzan, TMH, 2005.

Outcomes	• Students will able to recognize the technological trends of Computer Networking • Students will gain knowledge about technological components of the Network.

Semester - VI					
Course code		**DSE -I**	**T/P**	**C**	**H/W**
22BCE6E2		**(B)NETWORK SECURITY**	**T**	**6**	**6**
Objectives		• To understand the underlying principles of cryptography and network security. • To teach the concepts of securing computer network protocols, based on the application of cryptography techniques.			
Unit -I		**Introduction:** Security trends – Legal, Ethical and Professional Aspects of Security,Need for Security at Multiple levels, Security Policies – Model of network security Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.			
Unit-II		**Symmetric key cryptography:** Mathematics of symmetric key Cryptography: Algebraic structures – Modular arithmetic-Euclid"s algorithm- Congruence and matrices –Groups, Rings, Fields- Finite fields- **SYMMETRIC KEY CIPHERS:** SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis – Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard – RC4 – Key distribution.			
Unit -III		**Public key cryptography:** Mathematics of asymmetric key Cryptography: Primes – Primality Testing – Factorization – Eulers totient function, Fermat,s and Euler,sTheorem – Chinese Remainder Theorem – Exponentiation and logarithm – **ASYMMETRIC KEY CIPHERS:** RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange – ElGamal cryptosystem – Elliptic curve arithmetic- Elliptic curve cryptography.			
Unit -IV		**Message authentication and integrity:** Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA – Digital signature and authentication protocols – DSS **Entity Authentication:** Biometrics, Passwords, Challenge Response protocols-Authentication applications – Kerberos,X.509.			
Unit -V		**Security practice and system security:** Electronic Mail security – PGP, S/MIME – IP security – Web Security – **SYSTEM SECURITY:** Intruders – Malicious software – viruses – Firewalls.			

Text Book:

William Stallings, ―*Cryptography and Network Security: Principles and Practice* ", PHI 3rd Edition, 2006.

Books for Reference:

C K Shyamala, N Harini and Dr. T R Padmanabhan " *Cryptography and Network Security*", Wiley IndiaPvt.Ltd

Behrouz A.Foruzan, "*Cryptography and Network Security",* Tata McGraw Hill2007.

Charlie Kaufman, Radia Perlman, and Mike Speciner, "Network Security: PRIVATE Communication in a PUBLIC World, Prentice Hall", ISBN0-13-046019-2.

Outcomes	• Students will able to understand the most common type of cryptographic algorithm. • Students will understand the Public-Key Infrastructure and security protocols for protecting data on networks

	Semester - VI			
Course code 22BCE6E3	**DSE-II**	**T/P**	**C**	**H/W**
	(C)MOBILE COMPUTING	**T**	**6**	**6**

Objectives	• To develop an understanding of the ways that mobile technologies can be used for teaching and learning. • To understand the impact of mobile computing on the field of education.
Unit -I	**Introduction:** Laptop computing – Wireless Technologies – Mobility and Portability – Overview of IP and Routing – Mobile networking – Example Architectures – The role of IETF in mobile networking.
Unit-II	**Cellular communication concepts:** Wireless transmission – Multiplexing –Modulation – Spread Spectrum – Cellular system – GSM architecture – protocols – handover procedure – security.
Unit -III	**Advertisement and registration :** Agent solicitation and Discovery Mechanism – Router Discovery Protocol – Agent advertisement – Agent operation – Agent discovery – registration overview – Authentication overview – Registration request, reply and extensions – Mobile node registration procedures – Foreign agent registration actions – Home agent Processing
Unit -IV	**Data grams and route optimizations :** Tunneling overview and terminology– Encapsulation – Routing failures – Tunnel management – Decapsulation – Unicast broadcast and multicast data gram routing – Mobile routers – Route optimization – Message format – Extensions – Mobile key requests.
Unit -V	**IP versions and DHCP** : Mobility support in IP version 6 – smooth hand off – Renumbering – DHCP – WAP protocol. **Security and motivation detection**: Ingress filtering – Reverse tunneling – Broadcast preference extensions – Movement detection – Localizing registrations.

Text Books:

Charles E.Perkins, "*Mobile IP: Design Principles and Practices*", Addison Wesley, USA 1999

William Lee, "*Mobile Telecommunications*" McGraw Hill Singapore 2001

Jochen Schiller – "*Mobile Communication*" Pearson Education New Delhi 2003

Reference:

David J Goodman "*Wireless Personal Communication systems*" Addison Wesley Wireless communication series USA 1999

Raj Pandya, "*Mobile and Personal Communication Systems and Services*" IEEE Press, USA 2004.

Outcomes	• Students will able to know about the concepts of Mobile Communication and to analyse next generation Mobile Communication System. • Students will able to know about network and transport layers of Mobile Communication and analyze various protocols of all layers for mobile and ad hoc wireless communication networks.

Semester - V I				
Course code 22BCE6E4	**DSE-II**	**T/P**	**C**	**H/W**
	(D)DATA MINING AND DATA WAREHOUSING	**T**	**6**	**6**
Objectives	• To introduce the concepts of data ware house and data mining, which gives a complete description about the principles, used, architectures, applications, design and implementation of data mining and data ware housing concepts.			
Unit -I	**INTRODUCTION:** What is a data Warehouse? DELIVERY PROCESS: Data warehouse delivery method SYSTEM PROCESSES: Introduction – Overview – Typical process flow within a data warehouse – Extract and load process – Clean and transform data – Backup and archive process – Query management process. PROCESS ARCHITECTURE: Introduction – Load manager – Warehouse manager – Query manager			
Unit-II	**SYSTEM AND DATA WARE HOUSE PROCESS MANAGERS**: Introduction – Why you need tools to manage a data warehouse – system managers – Data warehouse process managers – Load manager – Warehouse manager – Query manager CAPACITY PLANNING, TUNING AND TESTING Introduction – Process – Estimating the load TUNING THE DATA WAREHOUSE Introduction – Assessing performance – Tuning the data load – Tuning queries			
Unit -III	**INTRODUCTION**: Introduction – Basics of Data Mining – Data Mining Versus Knowledge Discovery in Database – Data Mining Issues – Data Mining Metrics – Social Implications of Data Mining – Data Mining from a Database Perspective			
Unit -IV	**RELATED CONCEPTS**: Database/OLTP Systems – Fuzzy Sets and Fuzzy Logic – Information Retrieval – Decision Support Systems – Dimensional Modeling – OLAP – Web Search Engines DATA MINING TECHNIQUES Introduction – A Statistical Perspective on Data Mining – Similarity Measures – Decision Trees – Neural Networks – Genetic Algorithms			
Unit -V	**ASSOCIATION RULES**: Introduction – Large Itemsets – Basic Algorithms – Parallel and Distributed Algorithms –Comparing Approaches – Incremental Rules – Advanced Association Rule Techniques – Measuring the Quality of Rule Techniques – Measuring the Quality of Rules			

Text Books:

Data Warehousing In The Real World,Sam Anahory, Dennis Murray, Pearson Education [LPE], Thirteenth Indian Reprint, 2005.

Data Mining Introductory And Advanced Topics, Margaret H.Dunham, Pearson Education [LPE] First Impression, 2006.

Books for Reference:

Insight Into Data Mining Theory And Practice By K.P.SomanShyamDiwakar V.Vijay PHI Publication

Data Warehousing, Data Mining And Olap By Alex Berson And Stephen J.SmithTMH Publication

Data Mining Introductory And Advanced Topics, Margaret H.Dunham, Pearson Education [LPE] First Impression, 2006

Outcomes	• Students will able to understand the functionality of the various data mining and data warehousing component. • Students will able to Compare different approaches of data ware housing and data mining with various technologies.

Semester - VI					
Course code		**DSE-III**	**T/P**	**C**	**H/W**
22BCE6E5		**(E).Net Technologies**	**T**	**6**	**6**
Objectives	☐ Know about basics of Net Framework and its working ☐ Know about C# basics and its programming concepts ☐ Learn about advanced and latest features of C# ☐ Know about ADO.net basics and its applications ☐ Know about programming aspects of ASP.net and its applications ☐ Design and develop a website using latest features of Asp.net and C# language ☐ Know about programming aspects of MVC and its applications				
Unit -I	Fundamentals of .Net - .NET Framework Essentials - Microsoft .NET - The .NET Platform - NET Framework Design Goals - .NET Framework - The Common Language Runtime - CLR Environment - CLR Executables – Metadata - Assemblies and Manifests - Intermediate Language (IL) - The CTS and CLS - CLR Execution - Common Programming Model - Core Features and Languages - Language Integration				
Unit-II	ADO.NET Data Providers - ADO.NET SQL Server - ADO.NET Connection - ADO.NET Command - ADO.NET Data Reader - ADO.NET Data Set - ADO.NET Data Adapter - ADO.NET Data Tables				
Unit -III	What is Entity Framework - What is ORM? - Entity splitting, table splitting - DB first - Code First - Code First Conventions - Code First Data Annotations - Database Initialisers - Code First Migrations - Loading related entities				
Unit -IV	**ASP.NET:** The System.Web.UI Namespace - Web Form Syntax - ASP.NET Application Development - ASP.NET and Web Services - Data Binding and the Use of Templates - State Management and Scalability **Windows Forms:** Introducing Windows Forms - The System.Windows.Forms Namespace - Windows Forms Development - Windows Forms and Web Services				
Unit -V	MVC - ASP.NET MVC in Context - The MVC Pattern - Essential Language Features - Working with Razor - Essential Tools for MVC - URL Routing - Controllers and Actions – Filters – Views - Helper Method - Model Binding - Model Validation				

Reference and Text Book:-

Thuan L Thai & Hoang Lam, ".NET Framework Essentials", 3rd Edition, O'Reilly. (**Unit 1,2 & 4**)

Stack overflow contributors, ".Learning Entity Framework", eBook, Stack overflow. (**Unit 3**)

Adam Freeman, "Pro ASP.NET MVC 5", 5th Edition, Apress (**Unit 5**)

Outcomes	After Completing this course, the students are able to: • Understanding the basics of .Net Framework • Advanced and latest features of C#, ADO.net basics, Entity Framework, ASP.net, Tier of architecture & MVC5.

		Semester - VI			
Course code		**DSE-III**	**T/P**	**C**	**H/W**
22BCE6E6		**(F)EMBEDDED SYSTEMS**	**T**	**6**	**6**
Objectives	➢ Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system. ➢ Describe the hardware software co-design and firmware design approaches ➢ Know the RTOS internals, multitasking, task scheduling, task communication and synchronisation ➢ Learn the development life cycle of embedded system				
Unit -I	Introduction to Embedded system - Embedded system vs General computing systems - History - Classification - Major Application Areas - Purpose of Embedded systems - Smart running shoes: The innovative bonding of lifestyle with embedded technology - Characteristics and Quality Attributes of Embedded systems.				
Unit-II	Elements of an Embedded system - core of the embedded system: General purpose and domain specific processors, ASICs, PLDs, COTS - Memory - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces - Embedded Firmware - Reset circuit, Brown-out protection circuit, Oscillator unit, Real-time clock, and Watchdog timer - PCB and Passive Components.				
Unit -III	Embedded Systems - Washing machine: Application-specific - Automotive: Domain specific. Hardware Software Co-Design - Computational Models - Embedded Firmware Design Approaches - Embedded Firmware Development Languages - Integration and testing of Embedded Hardware and firmware.				
Unit -IV	RTOS based Embedded System Design: Operating System Basics - Types of operating Systems - Tasks, process and Threads - Multiprocessing and Multitasking - Task Scheduling- Task Communication - Task Synchronization - Device Drivers - choosing an RTOS.				
Unit -V	Components in embedded system development environment, Files generated during compilation, simulators, emulators and debugging - Objectives of Embedded product Development Life Cycle – Different Phases of EDLC - EDLC Approaches - Trends in Embedded Industry - Case Study: Digital Clock.				

Text Book:

K. V. Shibu, "*Introduction to embedded systems*", TMH education Pvt. Ltd. 2009.

Reference Books

Raj Kamal, "*Embedded Systems: Architecture, Programming and Design*", TMH. Second Edition 2009

Frank Vahid, Tony Givargis, "*Embedded System Design*", John Wiley. Third Edition 2006

Cliff Young, Faraboschi Paolo, and Joseph A. Fisher, "*Embedded Computing: A VLIW Approach to Architecture, Compilers and Tools*", Morgan Kaufmann Publishers, An imprint of Elsevier, 2005.

David E. Simon, "*An Embedded Software Primer*" Pearson Education, 1999

Outcomes	➢ Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems. ➢ Become aware of interrupts, hyper threading and software optimization. ➢ Design real time embedded systems using the concepts of RTOS.

Semester - VI				
Course code	**DSE-IV**	**T/P**	**C**	**H/W**
22BCE6E7	**(G)Internet of Things**	**T**	**6**	**6**
Objectives	➢ To understand the characterization and significance of the Internet of Things ➢ To recognize the building block of Internet of Things ➢ To learn about data and analytics for IoT			
Unit -I	Genesis of IoT – IoT and Digitization – IoT Impact –IoT Challenges – IoT Network Architecture and Design – Drivers – IoT Architecture – IoT Functional Stack – IoT Data Management and Compute Stack			
Unit-II	The "Things" of IoT – Sensors, Actuators and Smart Objects – Sensor Networks – Connecting Smart Objects – Communication Criteria – IoT Access Technologies – IEEE 802.15.4 – Standardization and Alliances – Physical Layer – MAC Layer – Topology – Security – Competitive Technologies			
Unit- III	IP as IoT Network Layer – Key advantages of Internet Protocol – Adoption or Adaptation of the Internet Protocol – Need for Optimization – Constrained nodes – Constrained Networks – IP Versions – Optimization IP for IoT – Profiles and Compliances			
Unit -IV	Application Protocols for IoT – Transport Layer – IoT application Transport Methods – SCADA – Generic Web based protocols – IoT application layer protocol – CoAP - MQTT			
Unit -V	Data and Analytics for IoT - Introduction to Data Analytics for IoT - Machine Learning - Big Data Analytics Tools and Technology - Edge Streaming Analytics - Network Analytics			

Text Books:

Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., & Henry, J. (2017). *IoT fundamentals: Networking technologies, protocols, and use cases for the internet of things*. Cisco Press.

Reference Books:

Raj, P., & Raman, A. C. (2017). *The Internet of Things: Enabling technologies, platforms, and use cases*. Auerbach Publications.

Kranz, M. (2016). *Building the internet of things: Implement new business models, disrupt competitors, transform your industry*. John Wiley & Sons.

McEwen, A., &Cassimally, H. (2013). *Designing the internet of things*. John Wiley & Sons.

Outcomes	➢ The student will understand the characterization and significance of the Internet of Things ➢ The student is capable to recognize the building block of Internet of Things ➢ The student will get better insight about data and analytics for IoT

Semester - VI					
Course code		**DSE-IV**	**T/P**	**C**	**H/W**
22BCE6E8		**(H)CLOUD COMPUTING**	**T**	**6**	**6**
Objectives	• To know about the basics of cloud computing. • To know about cloud and virtualization along with it how one can migrate over it.				
Unit -I	**Understanding Cloud Computing** : Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services				
Unit-II	**Developing Cloud Services** : Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds				
Unit -III	**Cloud Computing For Everyone** : Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation				
Unit -IV	**Using Cloud Services** : Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files				
Unit -V	**Other Ways To Collaborate Online** : Collaborating via Web-Based Communication Tools – Evaluating Web Mail Services – Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware – Collaborating via Blogs and Wikis				

Text Book:

Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.

Book for Reference:

Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

Outcomes	➢ Students will able to learn the main concepts, key technologies, strengths and limitations of cloud computing. ➢ Students will able to understand and use the architecture of compute and storage cloud, service and delivery models.

Semester - VI			
Course code 22BCE6PR	**Project**	**C**	**H/W**
		6	**10**
Objectives	1. The students will be allowed to work on any project based on the concepts studied in core/elective courses. 2. The project work should be compulsorily done in the college only under the supervision of the department staffs. 3. The combined project shall be undertaken by the students as a team of two. 4. The number of teams should be equally assigned to existing Staff members. 5. The following list of parameters taken into account for the evaluation of Project work and Viva-voce. *Total Marks: 100 (Internal: 40 marks, External: 60 Marks)*		
	Parameters: **For Internal Marks:** Two review meetings - 2×10 = 20 Marks Overall Performance = 5 Marks _____ **Total** = 25 Marks _____ **For External Marks:** Project Report = 25 Marks Project demo &Presentation = 25Marks Viva-Voce = 25 Marks _____ **Total** = 75 Marks _____ ♣♣♣♣♣♣♣♣♣		
Outcomes	● Students will able to recognize the technological trends of Computer Networking • Students will gain knowledge about technological components of the Network.		