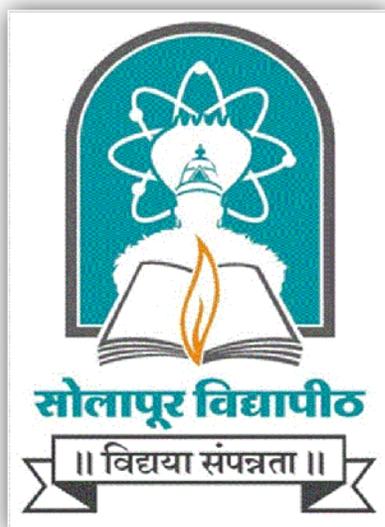


# Solapur University, Solapur



Faculty of Science

B.Sc. (Entire Computer Science)

**Syllabus (Semester- III and IV)**

**With Effect from June 2017-2018**

Choice Based Credit System (CBCS)

Semester-III

Sr. No.	Code	Paper	Hrs/week			Marks			Credits
			L	T	P	Total	UA	CA	
1	ECS301	Object Oriented Programming Using C++	3			100	70	30	3
2	ECS302	Software Engineering	3			100	70	30	3
3	ECS303	Operating System	3			100	70	30	3
4	ECS304	Data Structures	3			100	70	30	3
5	ECS305	Embedded System-I	3			100	70	30	3
6	ECS306	Advanced Microprocessor	3			100	70	30	3
Total (Sem-III Theory)			18	0	0	600	420	180	18

Semester-IV

Sr. No.	Code	Paper	Hrs/week			Marks			Credits
			L	T	P	Total	UA	CA	
1	ECS401	Object Oriented Programming Using Java	3			100	70	30	3
2	ECS402	DBMS Using Oracle	3			100	70	30	3
3	ECS403	Linux Operating System	3			100	70	30	3
4	ECS404	Computer Graphics	3			100	70	30	3
5	ECS405	Embedded System-II	3			100	70	30	3
6	ECS406	Peripherals and Interfacing	3			100	70	30	3
7		Environmental Science	4			100	70	30	
Total (Sem-IV Theory)			22	0	0	700	490	210	18
8	ECS407	Practical (Based on ECS 301, 304 and 404)			8	200	140	60	8
9	ECS408	Practical (Based on ECS 401, 402 and 403)			8	200	140	60	8
10	ECS409	Practical (Based on ECS 305,306, 405 and 406)			8	200	140	60	8
Total (Practical's)					24	600	420	180	24
Grand Total = Sem-III + Sem-IV + Practical			40		24	1900	1330	570	60

**Important Note:** The 30 marks of College level Assessment (CA) may be distributed as , 15 Marks for Internal Test and 15 Marks for Home Assignment/seminars/Viva/industrial visit/Group discussion etc.

**Abbreviations:**

L: Lectures T: Tutorials

P: Practicals UA : University Assessment CA : College

## (ECS 301) Object Oriented Programming using C++

### Unit 1

12

**Introduction to Object-Oriented-Programming:** Comparison with Procedure Oriented programming, Object oriented Programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, object oriented Languages, Applications of OOP.

**Introduction to C++:** Tokens, Keywords, Identifiers and constants, Basic Data types, User defined data types, Derived data types, symbolic constants, Type compatibility, Declaration of variables, Dynamic initialization of variables, reference variables, operators & Expressions in C++, Scope resolution operator, member dereferencing operators, Memory management operators, Type casting, Control structures.

### Unit 2

14

**Introduction of function:-** The main function, Types of Functions, Function prototyping, parameter passing technique, Inline functions, Default arguments, Function Overloading.

**Classes and Objects:** - Structures in C++, specifying a class, Access specifiers, Defining member functions, making an outside function inline, nesting of member functions, Private member functions, Memory allocation for the objects, Static data members. Static member functions, Array of objects, objects as Function arguments, Friend functions, Returning objects, Constant member functions, Local classes.

**Constructors & Destructors:-** Types of Constructors, Multiple Constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Constructing two Dimensional Arrays, Const Objects, Destructors.

**Operator overloading and Type Conversions:** Introduction, Defining operator overloading, Overloading Unary and Binary operators, Manipulation of string using operators, Rules for Overloading operators, Type Conversion.

**Inheritance:** Extending classes, Introduction, Defining derived classes, Single Inheritance, Making private member Inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Virtual base classes, Abstract classes, Constructors in derived classes, Member classes: Nesting of classes, Pointers, virtual functions

**Polymorphism:** Introduction, Pointers to objects, *this* pointer, Pointer to derived classes, virtual functions, pure virtual functions, virtual destructor.

**Managing Console I/O Operations:** Introduction, C++ stream classes, Unformatted I/O Operations, Managing output with manipulators, Working With Files, classes for file stream operations, Opening and closing a file, Detecting end of file, File modes, file pointers and their manipulations, sequential input and output operations, Random access, Error handling During file Operations, Command-Line Arguments.

### Reference Books

1. C++ the Complete Reference by Herbert Schildt – TMH.
2. C++ By Balguruswami – TMH.
3. C++ by Kumar – TMH.

## **ECS302: Software Engineering**

### **Unit 1: 10**

System concepts: Introduction, Definition, Elements of system, system concepts, Types of system, System Analysis, Role of System Analyst. Software Engineering: Definition, Characteristics of software, Qualities of software. System Development life cycle, Process Models-Waterfall model, v shape model, Spiral model, Prototyping, incremental, RAD

### **Unit 2: 15**

Requirement Analysis, Fact finding techniques: Interviews, Questionnaire, Record reviews, Observation, Basic and User design requirements, Organization Dependant Requirements,

Analysis and Design Tools: Flow charting, Decision tables, Decision Trees, Structure charting Techniques (HIPO).

System Design: Data flow Diagram (Physical, Logical), Entity relation diagram, Input output design, structured chart, Data Dictionary, Dependencies, Normalization (1NF, 2NF, 3NF, BCNF, 4NF, 5NF)

### **Unit 3: 15**

Configuration of the System: Collection of system statistics, Setting Sub-system Boundaries. Construction of the system: traditional and incremental approaches, conversion methods,

Software Testing: Need of Testing, types of testing, Software Implementation and maintenance, System Development Tools: Role, Benefits and weakness of case Tools, Taxonomy of case tools

Case studies: Pay Roll, Fixed Deposit, Inventory system, College Admission System, Library System, Loan system.

#### Reference Books

1. Analysis and Design of Information Systems By James Senn.
2. System analysis and Business application (for case studies) By Rajesh Nike / swapna kishore.
3. Software Engineering By Pressman.
4. System Analysis and Design By Parthsarty / Khalkar.
5. Practical guide to structure System Design By Miller/Page/jones.

## (ECS 303) - OPERATING SYSTEM

**Unit 1:** **10**

**Introduction Operating System:-** Definition Operating systems, Types of Operating Systems-Batch, Multiprogramming, Time-Sharing, Real-Time, Distributed, Parallel., OS Service, System components, System Calls.

**Unit 2:** **15**

**Process Management:-**Concept of Process, Process states, Process Control Block, Context switching, Operations on Process, Co-operating Process, Threads – Types of threads, Benefits of threads.

**Concept of Process Scheduling-** Types of Schedulers ,Scheduling criteria , Scheduling algorithms : Preemptive and Non-pre emptive , FCFS, SJF, Round Robin, Priority Scheduling,Multilevel Queue Scheduling, Multilevel- feedback Queue Scheduling.

**Process Synchronization and Deadlocks:-**The Producer Consumer Problem, Race Conditions, Critical Section Problem, Semaphores, and Classical Problems of Synchronization: Reader-Writer Problem, Dining Philosopher Problem, Critical Regions.

Definition, System Model, Dead Lock Characterization, Resource Allocation Graph, Methods of Handling Dead Locks- Deadlock Prevention, Deadlock Avoidance -banker's algorithm,resource-request algorithm, Deadlock detection and Recovery.

**Unit 3:** **15**

**Memory Management:-**Basic Hardware Address Binding, Logical and Physical address Space, Dynamic Loading, Overlays, Swapping,

**Memory allocation: Contiguous** Memory allocation – Fixed and variable partition – Internal and External fragmentation and Compaction, Paging, Segmentation. Basics of Virtual Memory, demand paging, Page fault, Page Replacement policies: Optimal (OPT), First in First Out (FIFO), Least Recently used (LRU), Thrashing.

**Storage Management:-** File Management: File concept, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping).

**Disk Management:** disk structure, disk scheduling (FCFS, SSTF, SCAN,C-SCAN) , disk reliability, disk Formatting, boot block, bad blocks.

Reference Books:

1. System programming and O.S. By D.M. Dhamdhere.
2. Modern O.S. By Andrews Tanenbaum.
3. Operating System Concepts By Siberchatz and Galvin.
4. Operating System(Unix) By Bach

## (ECS 304) - DATA STRUCTURES

### Unit 1

15

**Introduction:** Need of Data Structure, Types of Data Structure, ADT, Algorithm: Definition, characteristics, Space complexity, time complexity, Asymptotic notation (Big O, Omega  $\Omega$ , theta  $\Phi$ )

**Stack:** Introduction to stack, Representation-static & dynamic, stack Operations, Application -infix to postfix & prefix, postfix evaluation, recursion, expression validity.

**Queues:** Introduction to Queue, Representation -static & dynamic, Operations, Circular queue, De-queue, priority queues.

### Unit 2

15

**Linked List:-**Introduction to List, Implementation of List – static & dynamic representation, Types of Linked List, Operations on List, Applications of Linked List – polynomial manipulation

**Trees:** Concept & Terminologies, Binary tree, binary search tree, Representation – static & dynamic, Operations on BST – create, Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes,

### Unit 3

10

**Algorithm design strategies:** Divide and Conquer, Greedy, Dynamic programming, Backtracking, Branch and Bound.

**Sorting:** Bubble sort, Quick sort, Simple Insertion sort, Shell sort, Address calculation sort, Binary Search Tree, Heap Sort, Merge sort, Radix Sort.

**Searching:** Linear Search, Binary Search, Tree searching methods, Multiway search tree (B-tree, B+ tree), Height balance tree- AVL trees-Rotations. Hash function(open and close ).

#### Reference Books

1. Aho, Hopcroft, Ulman: Data structures and Algorithms.
2. Niklaus Wirth: Algorithms, data structures, Programs.
3. ThomsHorbron: File Systems, Structures and Algorithms (PHI).
4. D. E. Kunth: Art of computer Programming Vol – I.
5. Tanenbaum: Data structures using C and C++ (PHI).
6. fundamentals of computer algorithms by ellis horowitz sartaj sahni 2<sup>nd</sup> edition galgotia publication

## **ECS305: EMBEDDED SYSTEM-I**

**Unit 1.Embedded system Introduction:** Definition, History, Design challenges, Optimizing design metrics, hardware and software design and testing , Devices and Communication Buses: I/o types, serial and parallel communication devices, wireless communication devices, timer and counting devices, watchdog timer, real time clock, serial bus communication and parallel communication protocols like SPI, CAN, I2C, ISA, PCI, PCT-X, USB, Bluetooth. Time to market, Application of embedded systems and recent trends in embedded system. **10**

**Unit 2. Memory and processor selection for embedded system:** Memory devices (ROM RAM EPROM EPPROM Flash etc.), memory selection for embedded system, allocation of memory to program segments and blocks, memory mapping, Direct memory access (DMA), different types of processor overview (8085,8086,8051, DSP processor),Processor selection for Embedded System, Interfacing memories Processor and I/O devices **ARM Processor:** Architecture and Programming, RISC and CISC, ARM organization, ARM model, operating modes, Exception Handling, Nomenclature, CoreExtensions.ARM instruction set and Assembly language Programming. **14**

**Unit 3.Interfacing and Programming:** basic Embedded programming in C for on chip peripherals, need of interfacing , interfacing techniques , interfacing of input and output devices as keyboard, touch screen, LCD display, printer. **Real Time Operating System (RTOS) Based Design:** Basics of OS, Kernel, types of OS, RTOS services in contrast with conventional OS, tasks scheduler, ISR, Semaphores, mailbox, Pipes, Event Registers, Signals, Message Queue, processes, Threads, Multitasking and Multiprocessing, , timers, Context switching, memory management, Inter process/task Communication in RTOS: Scheduling Policies, Task Communication, Task Synchronization, shared data problems, Starvation and dead lock . **16**

### **REFERENCE BOOKS:**

1. Embedded Systems - Raj Kamal, TMH.
2. DR.K.V.K.K.Prasad- embedded /real time systems, Dreamtech
3. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
4. Andrew N. Sloss, Dominic Symes, Chris Wright, John Rayfield “ARM System Developer’s Guide, designing and optimizing System Software”, Elsevier 2007.
5. Embedded Systems – Lyla, Pearson, 2013
6. An Embedded Software Primer - David E. Simon, Pearson Education.

## (ECS 306) - ADVANCED MICROPROCESSOR

**Unit 1:** **12**

**CPU Organization:**-Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing modes, Program Control, Arithmetic and Logic Chapter (One bit and multiple bit), Bit Slice Processor

**Unit 2:** **13**

**Memory Organization:**-Introduction, Characteristics of memory system, Main memory design, Popular electrochemical devices, Memory Hierarchy, Cache memories, Associative memory, Virtual memory and memory Management concepts

**Unit 3:** **15**

**I / O Organization peripheral devices:**-Input output Interface, Asynchronous data transfer, Modes of transfer, Priority Interrupts, Direct memory Access, Input Output Processor, Serial Communications

**Control Unit:**-Introduction Hardwired control (Design methods, stable states, Delay element method, Sequence counter method) CPU control unit , Control unit design.

### **Reference Book:**

1. Microprocessors and Interfacing Programming Hardware By Douglas Hall
2. Microprocessors principles and Application By Alit Pal
3. Microprocessors and Microcomputers By Osborne ( vol - I, II)  
Galgotia publication.

## **ECS401: Object Oriented Programming using JAVA**

### **Unit 1**

**10**

**Features of Java :-**Object Oriented Concepts, Platform Independencies, Secure over C++,Introduction to Java Environment, Writing a simple Java program, Class concept and modularity, Data members, methods, constructor syntax, "this" References, Static and non-static data members and methods, Static block, Parameter passing in Java, Array, Garbage collection, Scope specifies public, private and package

### **Unit 2**

**15**

**Inheritance:-**Super, Access/Scope specifies protected, Method overriding, Abstract keyword, Final keyword, Object class and methods in Object class

**Interfaces:-**Comparison with inheritance, Interfaces and runtime polymorphism, Wrapper classes

**Exception handling:-**Try catch finally-flow, Throw and throws keywords, User defined exceptions

**Multithreading:-** Concept, Life cycle of a thread, Thread class, Runnable interface, Methods in thread class-sleep, interrupt, join, priority etc., Sharing data, Synchronization, Usage of wait and notify()

### **Unit 3**

**15**

**IO programming:-**Concept, Binary and text IO, IO streams and Reader / Writers, Console I/O, Data input and data Output usage File I/O, Object Stream and Serializable interface

**Event Handling:-** Event Model, Event Classes, Event Listener Interfaces, Adapter and Inner Classes, Working with windows, graphics and text, using AWT controls, Layout managers and menus, handling Image, animation, sound and video, Java Applet.

**Swing Technology:-** JTextBox, JRadio, JCheckBox, JComboBox, JList, JTree, JOptionPane, JScrollBar, etc.

**Collection framework:-**Collection overview, Collection interfaces, Collection classes Vector, Array list, Hash map, Hash table, Tree map, Tree set, Hash set, Properties, Stack

### **Reference Books**

- 1) "Java-2 the complete Reference" by Patrick Naughton and HerbertzSchidt.
- 2) "Programming with Java" by E Balaguruswamy.
- 3) Horstmann, "Computing Concepts with Java 2 Essentials", John Wiley.
- 4) Decker &Hirshfield, "Programming.Java", Vikas Publication.

## **ECS402: DBMS Using Oracle**

### **Unit 1: 15**

**Introduction to database system:-**Definition, Limitations of traditional file system, indexing, Advantages of DBMS, Components of DBMS, Database Architecture, Database Users, Schemas and instances, 2 tier and 3 tier architecture, Database languages, Types of data models- relational, Network, Hierarchical, Distributed, hybrid

**Relational Model and Database design:-**Relation, Domain, Tuples, types of keys, relational integrity rules, Codd's rules,

**Relational Algebra operations:-** Select, Project, Cartesian Product, Union, Set difference, Natural Join, Outer Join, lossless joins.

### **Unit 2: 10**

**Transaction Management & Concurrency Control: -**Introduction, properties, transaction states, scheduling, conflict and view serializability, Introduction to Concurrency Control, problems of concurrency control., log based protocols, timestamp based protocol, deadlock, deadlock handling.

**Database recovery and Atomicity:-**Introduction, recovery algorithms, log base recovery, shadow paging, recovery with concurrent transaction, checkpoints or syncpoints or savepoints.

### **Unit 3: 15**

**SQL & PL/SQL using oracle 11g :-** Simple Queries, Expressions, Conditions and Operators, Functions, Group by having, Where clause, Joins, Sub queries, Views, indexes, sequences. Blocks, Conditional statement and loops, Cursors and types, procedures and functions, packages, trigger, Exception Handling.

#### **Reference Books:**

1. Database System Concepts By KorthSilberschetz
2. Fundamentals of Database Systems by Elmsari, Navathe
3. Teach Yourself SQL in 14 Days by Jeff Parkins and Bryan Morgan
4. An Introduction to Database Systems by Bipin Desai
5. SQL and PL/SQL Programming by Ivan Bayross
6. SQL and PL/SQL Programming by Oracle Press

## **ECS403: Computer Graphics**

**Unit-I** **15**  
Basics Concept in Computer Graphics Introduction to Computer Graphics, Application of Computer Graphics, Classification of Computer Graphics, Types of Graphics Devices, Video Display Devices, Input Devices, Display File and its Structure, Display file Interpreter, Display Processor, Graphics file Format. Graphics in C: Introduction to graphics in C : initgraph(), detectgraph() and closegraph() function, Drawing object in C , Line, Circle, Rectangle, Ellipse, Changing foreground & background colors, Filling object by color function., drawpoly, fillpoly, floodfill, getcolor, settext, outtext, style, fonts, coloring.

**Unit-II** **10**  
2-D Transformation Translation, Rotation, Scaling, Homogenous Coordinates for Translation, Homogenous Coordinates for Rotation, Homogenous Coordinates for Scaling, Composogation from 2D Transformation, Other Transformation Reflection, Shear, and Inverse Transformation.

**Unit-III** **15**  
Line, Circle and Character Generation Basics concept in line Drawing, Line Drawing Algorithm, Digital Differential Analyzer, Bresenham's Line Algorithm, Antialiasing of Lines, Method of Antialiasing, Increasing Resolution, Unweighted Area Sampling, Pixel Phasing, Representation of Circle ,Polynomial Method, Trigonometric Method, Circle Drawing Algorithm, DDA Circle Drawing Algorithm, Bresenham's Circle Drawing Algorithm, Character Generation, Stroke Method, Starbust Method, Bitmap Method.

### **Books:**

1. Procedural Elements for Computer Graphics: D.F.Rogers
2. Mathematical Elements for Computer Graphics: D.F.Rogers and J.A.Adams
3. Computer Graphics : A.P.Godse, ( IIIrd Edition) ,Technical Publication

### **Reference Books:**

1. Computer Graphics by M. Pauline Baker, Donald Hearn, (2ndEdition) PHI Publication
2. Principles of Interactive Computer Graphics By. William. M. Newman. (IInd Edition) Mc.Graw Hill Publication.
3. Computer Graphics by V.K. Pachghare, (II nd Edition), Laxmi Publication

## **ECS404: Linux Operating System**

### **Unit 1: 10**

**Introduction of Linux:-**History of Linux, Architecture of Linux system & features, Kernel, Shell & its type, Difference between Windows and Linux. Linux Distributions, Working environments: KDE, GNOME, Xface4, Hardware requirement, Installation procedure of Linux, Create partitions, Configuration of X system  
**Users & Groups Management:-** Create Users, Create groups, Special groups, Assigning permissions to users and Groups, File and Directory permissions chmod, chown, chgrp.

**Linux File System:-**Hierarchy of File system, File System parts Boot Block, Super Block, Inode Block, Data Block, File types, Devices and Drives in Linux, Mounting devices (CD/DVD, usb, hard drive partition ), file system

### **Unit 2: 15**

**Linux commands** File and directory Management Commands:-mkdir, rmdir, cd and pwd, file, ls, cat, more, less, File and Directory Operations: find, cp, mv, rm, ln etc, Printing the files lpr, lpq, lprm etc.

**Filter Commands & Editor:-**Filters: head, tail , pr, cut, paste, sort, uniq, tr, grep, egrep, fgrep, sed.

**Communication commands:-**mesg, talk, write, wall, mail.

**Text Editors:** vi, vim Archive and File compression commands

**Shell Programming:-** Shell Variables, Metacharacters, Shell Scripts – Control and Loop structure, I/O and Redirection, Piping,

### **Unit 3: 15**

**Process Management:** Shell process, Parent and children, Process status, System process, Multiple jobs in background and foreground, Changing process priority with nice. Listing processes, ps, kill, premature termination of process.

**Disk management and System Administration:-**Disk Partitioning RAID, LVM etc., disk related Management Tools Fdisk, Parted etc. , Boot Loaders GRUB, LILO, Custom Loaders, System administration – Role of system

administrator, identifying administrative tasks & files, Configuration and log files, Chkconfig, Security Enhanced Linux, Installing and removing packages with rpm command

**Reference Book :**

1. Official Red Hat Linux Users guide by Redhat, Wiley Dreamtech India
2. UNIX for programmers and users by Graham Glass & King Ables, Pearson Education
3. Beginning Linux Programming by Neil Mathew & Richard Stones, Wiley Dreamtech India
4. Red Hat Linux Bible by Cristopher Negus, Wiley Dreamtech India
5. UNIX Shell Programming by Yeswant Kanethkar, BPB
6. UNIX concepts and applications by sumitabha das, mcgraw hill publication

## **ECS405: EMBEDDED SYSTEM-II**

**Unit I:** Classification of embedded Systems, Skills required for an embedded system designer. Program modeling concepts in embedded system: Program models, DFG models. State machine programming models for event-controlled program flow, modeling of multiprocessor system. **10**

**Unit II:** Embedded Software Development Process and Tools: Embedded Software development process and tools, Host and Target Machines, linking and Locating Software, Getting Embedded Software into the Target System, Issues in Hardware- Software Design and Co-design. Testing, simulation and debugging techniques and tools: Testing on Host Machine, Simulators, Laboratory Tools. **14**

**Unit III:** Communication Interface: Need for communication interface, RS232/UART: RS232 communication parameters, RS232 connector configuration, UART, null modem cable connection, , USB: USB device connection, USB physical interface, features of USB, IEEE 802.11, Introduction to Ethernet Controllers: Elements of a network, Inside Ethernet, Building a Network: Hardware options, Cables, Connections and network speed, Design choices: Selecting components . **16**

### **Reference Books:**

1. Raj Kamal, "Embedded Systems – Architecture, Programming and Design" 2nd edition, McGraw Hill.
2. Frank Vahid and Tony Givargis, "Embedded System Design – A Unified hardware/ Software introduction" 3rd edition, Wiley.
3. Dr. K.V. K. K. Prasad- embedded /real time systems, Concepts, Design and Programming Black Book TM Dreamtech Press
4. An Embedded Software Primer - David E. Simon, Pearson Education.
5. Networking Wireless Sensors - Bhaskar Krishnamachari, Cambridge press 2005
6. Embedded Ethernet and Internet Complete - Jan Axelson ,Penram publications, 2003.

## **ECS406: PERIPHARELS AND INTERFACING**

**Unit 1** **14**

**Study of 16 bit microprocessor:-**Architecture of 8086 pin functions, Maximum and minimum moss, Difference between 8086 and 8088

**Instruction set of 8086:-** Instruction classification and function, Simple Arithmetic Programs (Addition, Subtraction, and division, Multiplication, arranging data in ascending and descending order)

**Unit 2:-** **10**

**Basic Interfacing:-** Concepts, Absolute and linear select decoding, Memory mapped I/O and Mapped I/O, Interfacing of Keyboards and Displays, Memory Interfacing and Bus Contention, Interfacing Chips (8255, 8237, 8257, 8253)

**Unit 3** **16**

**Study only the features of other 16 bit & 32 bit Microprocessors:-**Intel 80186, 80286, 80386 & 80486, Pentium microprocessors.

**Microcontrollers:-**Introduction, different types of microcontrollers, processor architectures. CISC vs. RISC architectures, microcontroller memory types, microcontroller features, and Study 8051 microcontroller with architecture, memory types, and timers interrupts

### **Reference Book:**

1. Microprocessors and Interfacing Programming Hardware By Douglas Hall
2. Microprocessors principles and Application By Alit Pal
3. Microprocessors and Microcomputers By Osborne ( vol - I, II)  
Galgotia publication.
4. PIC Microcontrollers, Milan Verle, ,mikroElektronika, 1st edition (2008)

## **ECS407: Lab work based on (ECS301, 304 and 404)**

### **OPP Using C++ (ECS 301)**

1. Write a program to calculate factorial of given number by using recursion.
2. Write a program for addition, subtraction, multiplication and division of two complex numbers by using return by object method.
3. Create 2 distance classes “class A” stores distance in meter and cm and “Class B” stores distance in feet and inches and add two distances by friend function and display the result.
4. Generate the result for 5 students with following data - Name, exam no, Theory marks in 5 subjects, grade. Use array of object concept.
5. Write a program for constructor overloading.
6. Write a program to calculate root of quadratic equation by using default argument constructor.
7. Write a program to demonstrate friend function, friend class, member function of a class is friend to another class.
8. Write a program to count no. of objects created by using static data member & member function.
9. Write a program to overload unary operators (++ , -- , -).
10. Write a program to overload binary operator.(+ , - , \* , / , %) by using member function and friend function.
11. Write a program to implement-- Simple inheritance, Multiple inheritance, Multilevel inheritance, Multipath inheritance, Hybrid inheritance and Hierarchical inheritance.
12. Write a program to use virtual base class.
13. Write a program to demonstrate constructor invocation (use 4 classes)
14. Write a program to demonstrate use to virtual function
15. Write a program to demonstrate Abstract class.
16. Write a program to implement all manipulators

17. Write a program to implement ostream, istream class
18. Write file handling program for following operations
  - a. copy one file into another file
  - b. append one file into another
  - c. read numbers from one file and write only even numbers into another file.
  - d. To counts total numbers of lines, words and characters present in file
  - e. To check whether two files are identical or not
  - f. Write at least 5 employee information in file
19. Write a program to random file access
20. Write a program to implement command line argument
21. Write a program to for parameter passing technique

## Data Structure (ECS304)

1. Write a program on recursive function
2. Write a program to implement stack using array and using list.
3. Write a program to check whether the expression is valid or not.
4. Write a program to convert infix expression to postfix.
5. Write a program to implement queue using static and dynamic method.
6. Write a menu driven program to implement singly, doubly, singly circular , doubly circular linked list with operation
  - a. insert at beginning of linked list
  - b. insert at specific position
  - c. insert at end
  - d. delete the first node
  - e. delete specific node
  - f. delete last node
  - g. display the list
7. Write a menu driven program to implement singly linked list with operation
  - a. sort list
  - b. maximum value
  - c. minimum value
  - d. find & replace a value
  - e. count the number of nodes.
8. Write a program to create binary search tree and display its contents by using inorder, preorder and postorder traversal method.
9. Write programs to implement
  - a) Bubble Sort Technique.
  - b) Straight Selection Sort Technique.
  - c) Simple Insertion Sort Technique.

- d) Shell Sort Technique.
  - e) Quick Sort Technique.
  - f) heap sort technique.
  - g) address calculation Sort Technique.
  - h) Radix Sort Technique.
  - i) Merge Sort Technique.
10. Write programs to implement
- a) sequential searching Technique.
  - b) indexed searching Technique.
  - c) Binary searching technique
11. Write a program to add, subtract two polynomials by using Linked list



- a) To find out area of Circle.
  - b) To find out area of Triangle
  - c) To find out area of Square
  - d) To calculate simple and compound interest
  - e) Fibonacci series up to 40.
  - f) to print multiplication table
12. Write a shell Script to check entered file mode
13. Write a script to find the value of one number raised to the power of another.
14. Write a menu driven shell script that displays the name of the smallest file in the current working directory.
- a) Filename
  - b) Owner
  - c) Size
  - d) No. of Links
15. Write a shell script to calculate the gross salary; the person's basic salary is input through the keyboard. His D.A is 40% of the basic salary, and HRA is 20% of the basic salary.

## **ECS408: Lab work based on (ECS401,402 and 403)**

### **OOP Using Java (ECS401)**

1. Write a program to find area of rectangle by using multiple classes.
2. Write a program for matrix operations like
  - a. Addition b) Subtraction c) Multiplication.
3. Write a program for use of command line argument.
4. Write a program to check parameter passing technique in Java.
5. Write to overload constructor.
6. Write a program which uses objects as a parameter.
7. Write a program which differentiates between mutable object and immutable objects.
8. Write a program to perform following string operations
  - a. To convert upper and lower case
  - b. Reverse of string
  - c. Count length of string
9. Write a program which uses function return object.
10. Write a program for method overloading & overriding.
11. Write a program for that will demonstrate use of final , Finalize & finally.
12. Write a program to implement-- Simple inheritance, Multiple inheritance, Multilevel inheritance, Hybrid inheritance and Hierarchical inheritance.
13. Write a program to demonstrate super and this keywords.
14. Write a program for which demonstrates use of dynamic method dispatch technique.
15. Write a program that will demonstrate package inheritance.
16. Write a program to create multithreading program by using object of thread class.
17. Write a program on thread priorities and thread synchronization.

18. Write a program to read the file student's result & compute & Print total & percentage.
19. Write an applet to make simple applet and display current date and time.
20. Write a applet to draw following shapes
  - a. Cone.
  - b. Cylinder.
  - c. Cube.
  - d. Square.
21. Write a program to check given number is prime, Armstrong, palindrome by using swing components.
22. Write a program to design student registration form which uses all swing components.
23. Write a program for user authentication by using AWT components.
24. Write program on following utility classes
  - a. Vector. b] Array list. c] Hash map. d] Hash table. e] Tree map. f] Properties. g] Resource bundle. h] String tokenizer. i] Gregrian calendar.

## DBMS Using Oracle (ECS402)

1. Create table employee ( eno, name, dept, basic salary, HRA, tax, deduction). Dept are D1, D2, D3 and D4. Use constraints.
  - a. Insert 20 records.
  - b. Display total amount spend by company on salary.
  - c. Display name of dept for which company spend maximum amount.
  - d. Display average salary of employee in company.
  - e. Display average salary of each dept.
  - f. Display total salary for each dept.
  - g. Display highest salary for each dept.
  - h. Display different between average of max salary for each dept and average of each dept.
  - i. Display no of dept in the company.
  - j. Display name of all employee whose basic pay is higher then average salary.
  - k. Display average, minimum, maximum salary of each dept.
  - l. Display dept average of dept whose employee >5.
2. Create following table. Book (id, title, author, publisher, category, year, price) Distributor( did, name, city, discount ) and Order(order\_no, title, did, qty)
  - a. Display title and category of all books.
  - b. Display the total no of books per year.
  - c. Display list of authors.
  - d. Display the books published in 1991,92 and 93.
  - e. Display the books published from 1991 to 95.
  - f. Display the books whose price is greater than200.
  - g. Display the total no of books of each category.
  - h. Display titles of all books whose price is greater than average price.

- i. Display the list of all books whose price is greater than average price of “computer” category.
- j. Show the name of all the distributors who supply “software testing” books.
- k. Display the details of all books whose price is greater than the maximum of the category average.
- l. Display name of all books who are supplying the books whose author is ‘Pressman’.

3. Create the following table & solve given queries.

Table Name : branch

Column_name	Datatype	Constraint	Description
Bno	number(4)	Primary key	Branch number
bname	Varchar2(20)	Not null	
city	Varchar2(15)	Not null	

Table Name : customer

Column_name	Datatype	Constraint	Description
Cust_no	Number(6)	Primary key	
Cust_name	Varchar2(20)	Not null	
City	Varchar2(15)	Not null	

Table Name : deposit

Column_name	Datatype	Constraint	Description
Acc_no	Varchar2(5)	Primary key	Starts from ‘D’ character
Cust_no	Number(6)	Foreign key	references table ‘customer’
Bno	Number(4)	Foreign key	Branch number references from table ‘branch’
Amount	Number(9,2)	Not null	Default amount is 500.00
Adate	Date	Not null	Date of money deposited

Table Name : borrow

Column_name	Datatype	Constraint	Description
Loan_no	Number(5)	Primary key	
Cust_no	Number(6)	Foreign key	references table 'customer'
Bno	Number(4)	Foreign key	references from table 'branch'
Amount	Number(9,2)	Not null	Default amount is 500.00

- a) Give names of depositors having amount greater than 4000.
- b) Give name of customer having living city BOMBAY and branch city DELHI.
- c) Give name of customers who are borrowers as well as depositors and having living city NAGPUR.
- d) Give name of customers who are depositors and have the same branch city as that of sunil.
- e) Give names of depositors having the same living city as that of shivani and having deposit amount greater than 200.
- f) Give names of borrowers having deposit amount greater than 1000 and loan amount greater than 2000.
- g) Give names of borrowers having loan amount greater than the loan amount of anil.
- h) Give loanno and loan amount of borrowers having the same branch as that of depositor sunil.
- i) Give loanno, loan amount, account no, and deposit amount of customers living in city NAGPUR.
- j) Give loanno, loan amount, account no, and deposit amount of customers having deposit branch located in delhi.

4. write a plsql block to find maximum number.

5. Write a program to find grade of marks.

6. write a plsql block for insert 10 rows in table.
7. write a plsql block for display sum of first n numbers.
8. write a function which return multiplication of two numbers.
9. write a plsql block to demonstrate the reverse loop.
10. write a procedure without parameter.
11. Define cursor for display information of student.
12. Write a procedure for addition and subtraction of two numbers.  
(Return result).
13. Create user A and B. create table student (roll\_no, name) by user A.  
Create trigger for avoid update or delete in table by user B.
14. Create a package for addition and multiplication of two numbers.
15. Create trigger for generating primary key.
16. Create trigger for avoiding inserting the records whose address  
'solapur' and deleting the records whose address 'satara'. ( use any  
table with address field).
17. Create overloaded functions for addition of numbers.
18. Create package for addition, multiplication.
19. Implement function overloading.
20. Create function with cursor.
21. Create package which contain procedure, function , cursor.

## **Lab Work On (ECS403) Computer Graphics**

1. Write a program to implement bouncing of a ball over a horizontal plane.
2. Program to create Pie Chart.
3. Program to create Bar Chart.
4. Program to display Circles in Circle.
5. Program to create smiling face.
6. Program to create National Flag.
7. Program to create Solar System.
8. Program to create an analog clock
9. Program to create a digital clock
10. Program to animate a Fan.
11. Program to animate a Flying Kite
12. Program to animate a Traffic light
13. Program to translate an object with respect to origin.
14. Program to rotate an object with respect to origin.
15. Program to scale an object with respect to origin.
16. Program to rotate an object with respect to arbitrary point.
17. Write a program to draw a line by using DDA algorithm.
18. Write a program to draw a line by using Bresenham's algorithm.
19. Write a program to draw a Midpoint Circle algorithm.

## **ECS 409: Lab Work on (ECS-305,306,405 and 406)**

### **Group A:**

1. Crystal Oscillator using Logic Gates
2. Shift Register
3. DAC
4. ADC
5. Data transfer operation using microcontroller
6. Arithmetic operation using microcontroller
7. Thumbwheel and seven segment display using microcontroller
8. Interfacing of stepper motor control using microcontroller
9. Interfacing of ADC/DAC using embedded C
10. Interfacing of LCD display using embedded C
11. Serial communication with PC using embedded C

### **Group B:**

1. Addressing modes of 8086
2. Arithmetic operations of 8086
3. Arrange ascending and descending of given data
4. Interfacing card 8255 (Mode 0)
5. Thumb wheel interfacing using 8255
6. Seven segment interfacing 8253 (Mode 2)
7. Study of single board computer and stack related operations
8. Identification of components on mother board and installation of OS
9. File transfer using network
10. Keyboard interfacing using 8279
11. Trouble shooting and fault finding in PC

### **Group C: Tutorials**

1. Study of PCB design
2. Study of Modem and Internet
3. Study of different memory chips
4. Study of motherboard