Solapur University, Solapur

Faculty of Science

Credit System Structure for
B. Sc. – II (Entire Computer Science)

(w. e. f. June-2015)

Semester – III

Class	Semester	Subject	No. of Papers/Practicals	Hrs/Week			Paper marks	UA	CA
				L	T	P			
B.Sc. II	III	Computer Science	ECS301 – Operating System	3	-	-	100	70	30
			ECS302 – Object Oriented Programming using C++ - I	3	-	-	100	70	30
			ECS303 – Data Structures, Algorithms	3	-	-	100	70	30
			ECS304 – Software Engineering-I	3	-	-	100	70	30
		Electronics	ECS305 – Organization of P.C.	3	-	-	100	70	30
			ECS306 – Microprocessors – I	3	-	-	100	70	30
		Total		**18**			**600**		
		Practical - Computer Science	LAB – I: Laboratory Course in Computer Science	4					
			LAB – II: Laboratory Course in Computer Science	4					
			LAB – III: Laboratory Course in Electronics	4					
		Total		**12**					

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination.

UA (University Assessment): University Theory paper shall be of 70 marks for 3.00 hrs duration.

CA (College Assessment): The internal examination for Theory and Practical course.

Semester – IV

Class	Semester	Subject	Title of papers/practicals	Hrs/Week L	T	P	Paper marks	UA	CA	Practicls Marks	UA	CA
B.Sc. II	IV	Computer Science	ECS401 – Operating System	3	-	-	100	70	30			
			ECS402 – Object Oriented Programming using C++ - II	3	-	-	100	70	30			
			ECS403 – Data Structures, Algorithms Engineering-II	3	-	-	100	70	30			
			ECS404 – Software Engineering-II	3	-	-	100	70	30			
		Electronics	ECS405 – Organization of P.C.	3	-	-	100	70	30			
			ECS406 – Microprocessors – II	3	-	-	100	70	30			
		Total		**18**			**600**					
		Practical - Computer Science	LAB – I: Laboratory Course in Computer Science	-	-	4				100	70	30
			LAB – II: Laboratory Course in Computer Science	-	-	4				100	70	30
			LAB – III: Laboratory Course in Electronics	-	-	4				100	70	30
Total										**300**		

Abbreviations: L: lectures, T: Tutorials, P: Practicals; UA: University Assessment by End Semester Examination; CA: College assessment by Internal Continuous Examination.
UA (University Assessment): University Theory paper shall be of 70 marks for 3.00 hrs duration.
CA (College Assessment): The internal examination for theory and Practical course.

- LAB – I: Laboratory Course in Computer Science is based on papers ECS301, ECS302, ECS401 and ECS402
- LAB – II: Laboratory Course in Electronics is based on papers ECS303, ECS304, ECS403 and ECS404
- LAB – III: Laboratory Course in Mathematics is based on papers ECS305, ECS306, ECS405 and ECS406

B. Sc. – II (Entire Computer Science) Semester – III

ECS301 – Operating System

45 contact hours, **3** credits

Unit 1   [17]
Introduction to O.S.: What is O.S.?, Types of O.S. (Batch, Parallel, Multiprogramming, Time Sharing, Distributed, Real time),Structure of O.S., System Components, Services provided by O.S., Monolithic and Layered Systems, System design and implementation, System Generalization and virtual machine.

Unit 2   [18]
Process Management: Concepts-Process, System calls, Operations on Process, Co-operating Process and threads, Interprocess Communication, Process Scheduling: Basic Concept., Scheduling criteria, Scheduling Algorithms: FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling.

Unit 3   [10]
Process Synchronization: Critical section problem, Semaphores, Critical Regions, Classic Problems of Synchronization

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 calvin.

45 contact hours, **3** credits

Unit 1   [20]
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 in C++, Scope resolution operator, member dereferencing operators, Memory management operators, Manipulators, Type cast operator, Expressions and their types, special assignment expressions, Implicit conversions, Operator precedence, Control structures.

Unit 2   [15]
Introduction of function: The main function, Function prototyping, call by reference, Inline functions, Default arguments, Function Overloading, Math library Functions.
 Classes and Objects: Introduction Structures revisited, specifying a class, Defining member functions, A C++ program with class, Making an outside function inline, Nesting of member functions, Private member functions, Array within a class, Memory allocation for the objects, Static data members. static member functions, Array of objects, objects as Function arguments, Friendly functions, Returning objects, Constant member functions, Local classes.

Unit 3   [10]
Constructors, Parameterized constructors, Multiple Constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructors, Dynamic Constructors, 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.

Reference Books
   1. C++ the Complete Reference By Herbert Schildt – TMH.
   2. C++ By Balguruswami – TMH.
   3. C++ by Kumar-TMH.
   4. Mastering C++ - Venugopal.

45 contact hours, **3** credits

Unit 1 [20]
Introduction: Arrays and structures, pointers and functions, Need of Data Structure, Types of Data Structure, ADT, Algorithm: Definition, characteristics, Space complexity, time complexity, Asymptotic notation (Big O, Omega _), Divide and Conquer, Dynamic programming, Greedy Algorithms, Backtracking, Branch and Bound.

Unit 2 [15]
 Stack: Introduction to stack, Representation-static & dynamic, Operations, Application - infix to postfix & prefix, postfix evaluation, recursion, expression validity.
Queues: Introduction to Queue, Representation -static & dynamic, Operations, Circular queue, Deque, priority queues.

Unit 3 [10]
Introduction to List, Implementation of List – static & dynamic representation, Types of Linked List, Operations on List, Applications of Linked List – polynomial manipulation

Reference Books
1. Aho, Hopcroft, Ulman: Data structures and Algorithms.
2. Nikaulus Wirth: Algorithms, data structures, Programs.
3. Thoms Horbron: 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).

45 contact hours, **3** credits

Unit 1 [10]
System concepts: Introduction, Definition, Elements of system, system concepts, Types of system, What is System Analysis?, Role of System Analyst.
Software Engineering: Definition, Characteristics of software, Qualities of software.

Unit 2 [15]
System Development life cycle, classical model, Spiral model, Waterfall model, Prototyping
Requirement Analysis: Requirement Anticipation, Requirement investigation, requirement specifications, feasibility study.

Unit 3 [20]
Fact finding techniques: Interviews, Questionnaire, Record reviews, Observation, Basic Requirements, study of physical system, Identifying the data used, identifying the controls, User transaction Requirements, User design requirements, Organization Dependant Requirements.
Analysis and Design Tools: Flow charting, Decision tables & Decision Trees, Structure charting Techniques (HIPO).

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.

ECS305 – Organization of P.C.

45 contact hours, **3** credits

Unit 1 [20]

Basic Concept of Architecture: Computer organization, Memories used in PC and microcomputers (μC), Block concept of CPU, classification of signals, Control signals, Interrupts types I/O, Error, detection techniques, organization of PC, boot strap RAM, DOS and IOCS, Basic concept of single user single tasking system, multi user multi tasking system, time sharing and multiprogramming system, concept of virtual memory and memory hierarchy.

Unit 2 [15]

Peripheral Devices: Block Description and principle of operation: Keyboard, CRT monitors, Printers and their types, Floppy disks and drives, Hard disk and Drives, Mouse, Fax, modem, Telephone modem, CD ROM drives, DVD, scanners, Specification of commercially available systems must be introduced.

Unit 3 [10]

PC Hard-Ware: OG and NG machine concepts, Mother Board architecture and component for OG and any one NG system, Memory space, I/O address map, Interrupt maps of IBM PC and IBM PC/AT,DMA mechanism, concept of upward compatibility, Overview of advanced PCs.

Reference Books
1. B Govindrajalu - IBM PC and clones Hard-Ware, Troubleshooting, and Maintenance (second edition) pub-TMH.
2. Student should search for technical and commercial information on internet.

45 contact hours, **3** credits

Unit 1 [15]

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 [15]

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.

Reference Books
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 – Operating System

45 contact hours, **3** credits

Unit 1 [15]
Deadlocks: Definition, Handling Deadlocks, Deadlock detection and Recovery, Deadlock avoidance. Memory Management: Background, Swapping, Continuous Memory Allocation, Paging, Segmentation, Virtual memory Demand Paging, Process criteria, Page replacement.

Unit 2 [10]
 File System: Directory structure, File Structure, File Naming, File Types, File Protection, Allocation of disk space, File operations and File Handling.

Unit 3 [20]
Unix O.S.: Introduction to the kernel, Architecture of the Unix O.S., Introduction to the System concept, Kernel data structure, System administration. The buffer Cache: Buffer header, Structure of Buffer pool, Buffer Retrieval, Reading and writing disks block, Advantages and Disadvantages The Structure of processes: Process states and transitions, Layout of system memory, The context of Process, Saving the context of the process, Manipulating of a process address space, Sleep.

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 calvin.
4. Operating System (Unix) By Bach.

ECS402 – Object Oriented Programming using C++ - II

45 contact hours, **3** credits

Unit 1 [20]

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

Unit 2 [16]

Managing Console I/O Operations: Introduction, C++ Streams, C++ stream classes, Unformatted I/O Operations, Managing output with manipulators, Working With Files: Introduction, classes for file stream operations, Opening and closing a file, Detecting end of file.

More about open( ): File modes, file pointers and their manipulations, sequential input and output operations, Updating a file:Random access, Error handling During file Operations, Command-Line Arguments.

Unit 3 [9]

Exception Handling: Introduction, Try-Catch-Throw, Custom exception, Generic Programming: function template, class template.

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

ECS403 – Data Structures, Algorithms

45 contact hours, **3** credits

Unit 1 [15]
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, Height balance tree- AVL trees-Rotations.

Unit 2 [15]
Graph: Concept & terminologies, Graph Representation, Traversals – BFS & DFS, Applications – AOV network – topological sort, AOE network – critical path, Shortest path with implementation.

Unit 3 [15]
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), Hash function.

Reference Books
1. Aho, Hopcroft, Ulman: Data structures and Algorithms.
2. Nikaulus Wirth: Algorithms, data structures, Programs.
3. Thoms Horbron: 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).

ECS404 – Software Engineering – II
45 contact hours, **3** credits

Unit 1 [20]
System Design: Entity relation Analysis, Normalization, Input output design, Data flow Diagram (Physical, Logical), Structured chart, Structured English, CASE study.
Data Dictionary: Advantages of data Flow Analysis, Features of Data Dictionary, Process Specification Methods.
Configuration of the System: Collection of system statistics, Setting Sub-system Boundaries.
Construction of the system: Fractional Approach, Incremental Approach.

Unit 2 [15]
Software Testing: Need of Testing, White Box, Black Box testing.
Software Implementation and maintenance: Changeover, Pilot, Parallel.
System Development Tools: Role, Benefits and weakness of case Tools, Taxonomy of case tools, Integrated case Environment, Features of TURBO ANALYST.

Unit 3 [10]
Case studies: Pay Roll, Fixed Deposit, Inventory Control, College Admission System, Library 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.

<div align="right">**45** contact hours, **3** credits</div>

Unit 1 [15]
Hard-Ware components: Signal levels of TTL, LS, MUS family logic components, tan-out concept, Basic concepts of PLA, PLD, CPLD and PGAs, SMT and SMDs, Multilayer PCB technology.

Unit 2 [15]
Comparative study of features of µps in PC: 80286, 80486,Pentium,RISC and CISC approaches, examples of RISC and CISC processors, CPU's for embedded systems, Specification of latest mother boards for Pentium e.g. Pentium Mother board with Intel 865 chipset.

Unit 3 [15]
Networking: Peer to Peer and server based network, networking topologies, transmission media, LAN, Repeaters, Hubs, Bridges, Switches, Routers and their Logical functions in LAN, Ethernet technology, FDDI, Block concept of NIC.

Reference Books
1. B Govindrajalu - IBM PC and clones Hard-Ware, Troubleshooting and Maintenance (second edition) pub – TMH.
2. Student should search for technical and commercial information on internet.

45 contact hours, **3** credits

Unit 1   [10]
Architecture of 16Bit Processor (8086): Architecture of 8086 microprocessor, 8086 pin functions, Maximum and minimum mode, Difference between 8086 and 8088.

Unit 2   [15]
Instruction set of 8086: Instruction classification and function, Simple Arithmetic Programs (Addition, Subtraction, division, multiplication, arranging data in ascending and descending order).

Unit 3   [20]
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).
Other 16 bit & 32 bit Microprocessors: Intel 80186, 80286, 80386 & 80486, Pentium microprocessors.

Reference Books
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.

LAB – V: LABORATORY COURSE IN C++

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 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 subject, grade.
 Use any form of constructor.
5. Write a program to calculate root of quadratic equation by using default argument constructor.
6. Write a program to demonstrate friend function,friend class, member function of a class is friend to another class.
7. Write a program to display no. of objects created by using static data member & member function.
8. Write a program to overload unary operators (++, - -, -).
9. Write a program to overload binary operator.(+, -, *, /, %).
10. Write a program to overload binary operator.(+, -, *, /, %) by using friend function.
11. Write a program to concatenate string using operator overloading.
12. Write a program to implement--   a. Simple inheritance.
                      b. Multiple inheritance.
                       c. Multilevel inheritance.
                      d. Multipath inheritance.
                      e. Hybrid inheritance.
                      f. Hierarchical inheritance.

13. Write a program to for hybrid inheritance by using virtual base class
14. Write a program to demonstrate constructor invocation (use 4 classes)
15. Write a program to demonstrate use to virtual function
16. Write a program to implement all manipulators
17. Write a program to implement istream class
18. Write a program to implement ostream class
19. Write a program to copy one file into another file
20. Write a program to append one file into another
21. Write a program to which shows sequential file access
22. Write a program to random file access
23. Write a program to implement command line argument

LAB – VI: LABORATORY COURSE IN DATA STRUCTURES AND ALGORITHMS

1. Write a recursive function
   a. to find the prime number.
   b. to find out face value of given number. (e.g. 5678 -> 26 -> 8)
2. Write a menu driven program to implement stack (using array)
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 (array).
6. Write a program to implement queue dynamically.
7. Write a program to implement stack dynamically.
8. Write a menu driven program to implement singly linked list with operation
   a) insert at beginning of linked list
   b) delete the first node
   c) insert at the end of linked list
   d) delete the last node
   e) display the list
9. 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.
10. Write a program to implement singly circular linked list.
11. Write a menu driven program to implement various operations on doubly linked list with operation.
12. Write a program to create binary search tree and display its contents by using inorder traversal method.
13. Write a program to create binary search tree and display its contents by using preorder traversal & postorder traversal method.
14. 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) binary search tree Technique.
    g) heap sort technique.
    h) address calculation Sort Technique.
    i) Radix Sort Technique.
    j) Merge Sort Technique.
15. Write programs to implement
    a) sequential searching Technique.
    b) indexed searching Technique.
16. Write a program to implement simple hash function.
17. Write a program to traverse a graph through BFS method.
18. Write a program to traverse a graph through DFS method.
19. Write a program to add two polynomials by using array (single variable).
20. Write a program to add two polynomials by using Linked list (single variable).
21. Write a program to subtract two polynomials by using Linked list (single variable).
22. Write a program to represent matrix as sparse matrix.
23. Write a program to transpose sparse matrix.
24. Write a program to add two sparse matrix.

LAB – VII: LABORATORY COURSE IN MICROPROCESSORS

Group A:
1. Crystal Oscillator using Logic Gates
2. SMPS
3. Up-Down Counter
4. Shift Register
5. Characteristics of TTL 74 serial X
6. DAC
7. ADC
8. Analog Multiplexer
9. Trouble shooting and fault finding in PC
10. Stepper Motor

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. Thump wheal 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

Group C: Tutorials
1. Study of PCB design
2. Study of Modem and Internet
3. Study of different memory chips
4. Study of motherboard
5. Study of printers and VDU

B. Sc. (ECS) – II (Semester Pattern)
Nature of Practical Examination

1. No. of questions given 05 (each question carries 20 marks)

  Attempt any 03 questions   : 60 marks

2. Viva   : 10 marks

     Total Marks   **: 70 marks**