Solapur University, Solapur
Semester Pattern Revised Syllabus of B.Sc.-II
Entire Computer Science
(w. e. f. June-2014)

Semester - III

Paper Code	Paper Name	Theory / Practical	Marks
ECS301	Operating System – I	Theory	50
ECS302	Object Oriented Programming using C++ - I	Theory	50
ECS303	Data Structures and Algorithms - I	Theory	50
ECS304	Software Engineering – I	Theory	50
ECS305	Organization of P.C. – I	Theory	50
ECS306	Microprocessors – I	Theory	50
ECS307	English-I	Theory	50
LAB-V	Laboratory Course in C++	Practical	---
LAB-VI	Laboratory Course in Data Structure and Algorithms	Practical	---
LAB-VII	Laboratory Course in Microprocessors	Practical	---
Total Marks			**350**

Semester – IV

Paper Code	Paper Name	Theory / Practical	Marks
ECS401	Operating System – II	Theory	50
ECS402	Object Oriented Programming Using C++ - II	Theory	50
ECS403	Data Structures and Algorithms - II	Theory	50
ECS404	Software Engineering – II	Theory	50
ECS405	Organization of P.C. – II	Theory	50
ECS406	Microprocessors – II	Theory	50
ECS407	English –II	Theory	50
LAB-V	Laboratory Course in C++	Practical	100
LAB-VI	Laboratory Course in Data Structures and Algorithms	Practical	100
LAB-VII	Laboratory Course in Microprocessors	Practical	100
		Total Marks	650

- **LAB-V :** Laboratory Course in C++ is based on papers ECS302, ECS402.

- **LAB-VI :** Laboratory Course in Data Structures and Algorithms is based on papers ECS303, ECS403.

- **LAB-VII :** Laboratory Course in Microprocessors is based on papers ECS305, ECS306, ECS405 and ECS406.

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

ECS301- OPERATING SYSTEM – I

Unit- 1: Introduction to O.S. :   [5]

What is O.S.?, Types of O.S. (Batch, Parallel, Multiprogramming, Time Sharing, Distributed, Real time)

Unit- 2: Structure of O.S.   [6]

System Components, Services provided by O.S., Monolithic and Layered Systems, System design and implementation, System Generalization and virtual machine

Unit- 3: Process Management   [[10]

Concepts-Process, System calls, Operations on Process, Co-operating Process and threads, Inter process Communication

Unit- 4: Process Scheduling: [12]

Basic Concept., Scheduling criteria,

Scheduling Algorithms: FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling .

Unit- 5: Process Synchronization   [12]

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.

ECS302 - OBJECT ORIENTED PROGRAMMING USING C++ - I

Unit- 1: Principles of Object-Oriented-Programming [4]

A Look at Procedure Oriented programming, Object oriented Programming paradigm, Basic concepts of object oriented programming, Benefits of OOP, object oriented Languages, Applications of OOP.

Unit- 2: Tokens, Expressions and Control structures [14]

Introduction, 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 overloading, Operator precedence, Control structures.

Functions in C++ :Introduction, The main function, Function prototyping, call by reference, Inline functions, Default arguments, Function Overloading, Math library Functions.

Unit-3: Classes and Objects [10]

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-4: Constructors and Destructors [7]

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

Unit-5: Operator overloading and Type Conversions [10]

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.

ECS303 – DATA STRUCTURES AND ALGORITHMS - I

Unit- 1: Introduction   [7]
Arrays and structures, pointers and functions, Need of Data Structure, Types of Data Structure, ADT,

Unit- 2 : Algorithm   [10]
   Definition, characteristics,   Space complexity, time complexity,   Asymptotic notation (Big O, Omega _), Divide and Conquer, Dynamic programming ,Greedy Algorithms, Backtracking, Branch and Bound

Unit- 3 : Linked List   [8]
   Introduction to List, Implementation of List – static & dynamic representation, Types of Linked List, Operations on List, Applications of Linked List – polynomial manipulation

Unit- 4 : Stack   [10]
   Introduction, Representation-static & dynamic, Operations, Application - infix to postfix & prefix, postfix evaluation, recursion, expression validity

Unit- 5 : Queues   [10]
   Introduction, Representation -static & dynamic, Operations, Circular queue, Deque, priority queues

Text Books: Tanenbaum: Data structures using C and C++(PHI).

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

ECS304 – SOFTWARE ENGINEERING – I

Unit- 1 : System concepts   [12]
Definition, Elements of system, system concepts, Types of system, What is System Analysis?, Role of System Analyst

Definition of Software Engineering, Characteristics of software, Qualities of software

Unit- 2 : System Development life cycle   [8]
System Development life cycle, classical model, Spiral model, Waterfall model, Prototyping

Unit- 3 : Requirement Analysis   [8]
Requirement Anticipation, Requirement investigation, requirement specifications, feasibility study

Unit- 4 : Fact finding techniques   [9]
Interviews : Questinnaire, 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

Unit- 5 : Analysis and Design Tools: [8]
  • Flow charting, Decision tables & Decision Trees, Structure charting Techniques(HIPO)

   Books Recommended:

   1)Analysis and Design of Information Systems By James Senn.
   2)System analysis and Business application (for case studies) By Rajesh Nik / 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. – I

Unit- 1 : Basic Concept of Architecture [8]
   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,

Unit-2 : Types of System [8]
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-3 : Peripheral Devices [14]
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-4: PC Hard-Ware [15]
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.

Books recommended:
1. B Govindrajalu-IBM PC and clones Hard-Ware,Troubleshooting,and
   Maintainance (second edition)pub-TMH

2. Student should search for technical and commercial information on internet.

ECS306- MICROPROCESSORS – I

Unit- 1: CPU Organization   [18]

Introduction, General Register Organization, Stack Organization, Instruction formats, Addressing modes, Program Control, Arithmetic and Logic Unit (One bit and multiple bit), Bit Slice Processor

Unit- 2: Memory Organization: [15]

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: I / O Organization peripheral devices   [12]

Input output Interface, Asynchronous data transfer, Modes of transfer, Priority Interrupts, Direct memory Access, Input Output Processor, Serial Communications.

Books Recommended:

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.

ECS307 – ENGLISH - I

Unit- 1 [15]
Narration : Narrate the event ,narrate the news with different point of view, story writing
Expressing Attitudes & Values : Attitudes-Meaning &Definition, Features. Formation of Attitudes, Functions of Attitudes Values-Meaning & Definition, Formation of Values, Types of Values (Mr. Milton Rokeach's Classification) Five universal values, Truth, Righteous conduct, peace, love and non violence and their sub values
Making Notes : Concept with Example

Unit-2. [10]
Information Transfer and Interpretation of Data : Concept with example like bar diagram , pie diagram , table ,tree diagram ,flow chart etc
Summarizing: Concept with Example

Unit-3. [10]
Mechanism of writing : Space and indention, use of equation, abbreviations, numerals, reference and access devices, capitalization, spelling, punctuation.
Writing Letters : The layout, planning the letter, letter related business inquiries, and Job application and resume.

Unit- 4. [5]
Foundation of Effective Writing : Notice agenda, minutes of the meeting, paper work for regular meetings.

Unit- 5. [5]
Writing Reports : Common features, routing reports and non-routine reports, steps in writing report.

Reference Book :
1) English for Communication published by Shivaji University, Kolhapur, 1996
2) English for Practical Purposes - Z.N. Patil , B.S.Valke, Ashok
Thorat, Zeenath
3)Essentials of Business Communication – Rajendra Pal & L.S.
4)Business Communication – U.S.Rai&S.M.Rai.
5)Communication skill – P.C. Pardesi

B.Sc. – II (Entire Computer Science) Semester - IV

ECS401- OPERATING SYSTEMS – II

Unit- 1: Deadlocks [6]

Definition, Handling Deadlocks, Deadlock detection and Recovery, Deadlock avoidance.

Unit- 2: Memory Management [8]

Background, Swapping, Continuous Memory Allocation, Paging, Segmentation, Virtual memory Demand Paging, Process criteria, Page replacement.

Unit- 3: File System [7]

Directory structure, File Structure, File Naming, File Types, File Protection, Allocation of disk space, File operations and File Handling.

Unit- 4: Unix O.S.
- **Introduction to the kernel** [16]

  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

Unit- 5: The Structure of processes [8]

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

Unit- 1: Inheritance: Extending classes [8]

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

Unit- 2: Pointers, virtual functions and Polymorphism [8]

Introduction, Pointers to objects, *this* pointer, Pointer to derived classes, virtual functions, pure virtual functions

Unit- 3: Managing Console I / O Operations [10]

Introduction, C++ Streams, C++ stream classes, Unformatted I/O Operations, Managing output with manipulators

Unit- 4: Working With Files: [10]

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- 5: Exception Handling and template [9]

Introduction to Exception Handling, Try, catch and throw block, Exception in Constructor and Destructors, Handling of uncaught exception.

Introduction to templates, class templates with multiple parameters, function templates with multiple parameters.

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

ECS403 : DATA STRUCTURES AND ALGORITHMS - II

Unit- 1 : Trees [12]
   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 : Sorting [10]
   Bubble sort, Quick sort, Simple Insertion sort, Shell sort, Address calculation sort, Binary Search Tree, Heap Sort, Merge sort, Radix Sort,

Unit- 3 : Searching [11]

   Linear Search, Binary Search, Indexed Sequential Search, Tree searching

   methods, Multiway search trees (B-tree, B+ tree), Hash function.

Unit- 4 : Graph [12]
   Concept & terminologies, Graph Representation, Traversals – BFS & DFS, Applications – AOV network – topological sort, AOE network – critical path, Shortest path with implementation

Text Books: Tanenbaum: Data structures using C and C++(PHI).

References:
1. Fundamentals of Data Structures ---- By Horowitz Sahani (Galgotia)
2. Data Structures using C --- By ISRD Group (Tata McGraw Hill)
3. Introduction to Data Structures using C---By Ashok Kamthane
4. Data Structures using C --- Bandopadhyay & Dey (Pearson)
5. Data Structure using C – Baluja

ECS404 : SOFTWARE ENGINEERING – II

Unit- 1:   **[12]**
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

Unit- 2:   **[10]**
Configuration of the System : Collection of system statistics, Setting Sub-system Boundaries
Construction of the system :Fractional Approach, Incremental Approach

Unit- 3:   **[9]**
Software Testing :Need of Testing, White Box, Black Box testing
Software Implementation and maintenance : Changeover, Pilot, Parallel

Unit- 4: System Development Tools   **[6]**
Role, Benefits and weakness of case Tools, Taxonomy of case tools, Integrated case Environment, Features of TURBO ANALYST

Unit- 5: Case studies   **[8]**
        Pay Roll
        Fixed Deposit
        Inventory Control
        College Admission System

Books Recommended:

   1) Analysis and Design of Information Systems By James Senn
   2) System analysis and Business application (for case studies) By Rajesh Nik / 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

ECS405 : ORGANIZATION OF P. C. – II

Unit- 1: Hard-Ware components   [14]
   Signal levels of TTL,LS,MOS family, logic components, fan-out concept,
   Basic concepts of PLA,PAL,PLD,CPLD and F PGAs, SMT and SMDs,
   Multilayer PCB technology.

Unit- 2: Advanced Microprocessors in PC   [16]
   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: Networking   [8]
Peer to Peer and server based network, networking topologies, transmission
media, LAN,

Unit-4 : Repeaters, Hubs, Bridges, Switches, Routers and their Logical
functions in LAN, Ethernet technology, FDDI, Block concept of NIC.   [7]

Books recommended:
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.

ECS406: MICROPROCESSORS – II

Unit- 1: Architecture of 16 Bit Processor (8086)   [4]

Architecture of 8086 microprocessor, 8086 pin functions, Maximum and minimum mode, Difference between 8086 and 8088.

Unit- 2: Instruction set of 8086   [14]

- Instruction classification and function.
- Simple Arithmetic Programs (Addition, Subtraction, division, multiplication, arranging data in ascending and descending order)

Unit- 3: Basic Interfacing   [15]

- 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- 4: Other 16 bit & 32 bit Microprocessors   [12]
Intel 80186, 80286, 80386 & 80486, Pentium microprocessors (comparative Study only).

Books Recommended:

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.

ECS407 : ENGLISH – II

Unit- 1   Basics of Human Skills   [5]
Introduction to Human Skills, Types of Human Skills- reading, writing, learning, listening.Basic abilities- muscular, sensor, mental, social and conceptual. How skills are gained.

Unit- 2   Self Discovery and Behavior   [10]
Journey of Self Discovery- SWOT Analysis- concept, how to make use of SWOT analysis, Goal setting to overcome weakness, Learning through reinforcement. Learning through feedback, learning by observing, learning through experience, individual Behavior and process- Thinking, memory, learning, emotions, intelligence and ability.

Unit- 3   [10]
New skills in Management : Creative style – emotional intelligence- leadership skills, work style, sales competencies, sports mental skills, stress management, team role skills, conflict management.

Presentation Skills : Importance of Presentation Skills, Capturing Data, Voice & Picture Integration, Guidelines to make Presentation Interesting, Body Language, Voice Modulation, Audience Awareness, Presentation Plan, Visual Aids, Forms of Layout, Styles of Presentation.

Unit- 4   [10]
Oral Communication : Giving speeches and oral presentation, preparing to speak, developing formal speech, extempore speech.

Seminar : Preparation for seminar, conducting seminar, organizing conference, writing and preparation of paper.

Unit-5   [10]
Interview Preparation : Types of Interview, Preparing for the Interviews, Attending the Interview, Interview Process, Employers Expectations, General Etiquette, Dressing Sense, Postures & Gestures and some examples of interviews.

Group Discussion &Presentation : Definition, Process, Guidelines, Helpful Expressions, Evaluation

Reference Books :
1) Modern business Vol. III, Personnel Management, A.C. Croft
2) Education to human values – Tilak Raj Bhardwaj, A. Mittal Publication
3) Web. Site: http/etesting. Moddwest.com
4) Personnel Management – Edwin Filppo, McGraw Hill International Editions.
5) Group Discussion for admissions and Jobs – AnandGanguly Published by PustakMahal Delhi
6) GD and Interview – ChandreshAgarwal Published by PriyankaPrakashan

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(IC 3524)
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

Note: Minimum 80 percent experiments are compulsory.

B. Sc. (ECS) – II (Semester Pattern)

Nature of Practical Examination

1. No. of questions given 05 (each question carries 25 marks)

   Attempt any 03 questions   : 75 marks

2. Viva   : 15 marks

3. Journal   : 10 marks

   Total Marks   **: 100 marks**