



Dr. Bhimrao Ambedkar University, Agra

A State University of Uttar Pradesh (Paliwal Park, Agra -282004)

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A Documentary Support
for
Matric No. – 1.1.1
Programme Outcomes & Course Outcomes

under the
Criteria – I
(Curriculum Design and Development)

Key Indicator - 1.1

in
Matric No. – 1.1.1

B. Sc. (COMPUTER SCIENCE)

2022


Registrar
Dr. B.R.A. University, Agra

Mapping:

 *Local Need*  *Regional*  *National*  *Global Need*

**Year wise Structure
of
B.Sc. (Computer Science)**

| | |
|---|--|
| Subject prerequisites | |
| To study the Computer Science, a student must have had the subject(s) computer science OR Mathematics in class/12 th . | |
| Programme outcomes (POs): Students taking admission to B.Sc. program are expected to get prepared with following outcomes: | |
| PO 1 | Explaining the basic scientific principles and methods. |
| PO 2 | Inculcating scientific thinking and awareness among the student. |
| Programme specific outcomes (PSOs) | |
| PEO 1 | To prepare students for career in computer science and its applications in professional career |
| PEO 2 | To develop the student to cope up with the advancements in respective science field |
| PEO 3 | The student will determine the appropriate level of technology for use in: a) experimental design and implementation, b) analysis of experimental data, and c) numerical and mathematical methods in problem solutions. |
| PEO 4 | Investigate and apply mathematical problems and solutions in a variety of contexts related to science, technology, business and industry, and illustrate these solutions using symbolic, numeric, or graphical methods |

| Year wise Structure of B.Sc. for subject Computer Science | | | | | | | | | | | |
|---|---------------------------|------|--|--------|-----------------------------|---|--|--------|---------------------|--------|------------------------------|
| Type of Award | Subject: Computer Science | | | | | | | | | | Total Credits of the subject |
| | Year | Sem. | Paper 1 Theory | credit | Paper 2 Theory | | Paper 3 Practical | credit | Research Project | credit | |
| Certificate in Computer | 1 | I | Problem Solving using Computer | 4 | -- | | Software Lab using Python | 2 | Nil | Nil | 6 |
| | | II | Database Management Systems | 4 | -- | | Database Management Systems Lab | 2 | Nil | Nil | 6 |
| Diploma in Computer | 2 | III | Operating Systems | 4 | -- | | Operating Systems Lab | 2 | Nil | Nil | 6 |
| | | IV | Computer System Architecture | 4 | -- | | Computer System Architecture Lab | 2 | Nil | Nil | 6 |
| Bachelor of Science | 3 | V | Analysis of Algorithms and Data Structures | 4 | Soft Computing | 4 | Lab on Algorithms and Data Structures with C++ | 2 | Research Project-I | 3 | 13 |
| | | VI | Data Communication and Computer Networks | 4 | Cyber Security & Cyber Laws | 4 | Lab on Computer Networks | 2 | Research Project-II | 3 | 13 |
| Total Credits: | | | | | | | | | | | 50 |

| Practical Evaluation & Assessment | | | |
|-----------------------------------|-----------|-------------------------|-----------|
| Internal Assessment | Marks | External Assessment | Marks |
| Class Interaction | 05 | Viva Voce | 25 |
| Quiz 1 | 10 | Execution/Demonstration | 20 |
| Quiz 2 | 10 | Write up/theory work | 20 |
| | | Practical Record File | 10 |
| | 25 | | 75 |

Syllabus for B.Sc.: Subject: Computer Science

| Programme/Class: Certificate | Year: First | Semester: First |
|--|---|------------------------|
| Subject: Computer Science | | |
| Course Code: B070101T | Course Title: Problem Solving using Computer | |
| Course outcomes: | | |
| CO 1: Understand hardware components of computer system such as memory system organization, input/output devices, aware of software components of computer system, and windows operating system concepts. | | |
| CO 2: Develops basic understanding of computers, the concept of algorithm and algorithmic thinking. | | |
| CO3: Develops the ability to analyze a problem, develop an algorithm to solve it. | | |
| CO4: Develops the use of the Python programming language to implement various algorithms, and develops the basic concepts and terminology of programming in general. | | |
| CO5: Introduces the more advanced features of the Python language | | |
| Credits: 4 | Core Compulsory | |
| Max. Marks: 25+75 | Min. Passing Marks: | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Computer Fundamentals: Introduction to Computers: Characteristics of Computers, Uses of computers, Types and generations of Computers. | 7 |
| II | Basic Computer Organization - Units of a computer, CPU, ALU, memory hierarchy, registers, I/O devices. Planning the Computer Program: Concept of problem solving, Problem definition, Program design, Debugging, Types of errors in programming, Documentation. | 8 |
| III | Techniques of Problem Solving: Flowcharting, decision table, algorithms, Structured programming concepts, Programming methodologies viz. top-down and bottom-up programming. | 7 |
| IV | Overview of Programming: Structure of a Python Program, Elements of Python, IDEs for python, Python Interpreter, Using Python as calculator, Python shell, Indentation. | 8 |
| V | Introduction to Python: Atoms, Identifiers and keywords, Literals, Strings, Operators (Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment or Decrement operator). | 8 |

| | | |
|-------------|--|---|
| VI | Creating Python Programs: Input and Output Statements, Control statements (Looping- while Loop, for Loop, Loop Control, Conditional Statement- if...else, Difference between break, continue and pass). | 7 |
| VII | Structures: Numbers, Strings, Lists, Tuples, Dictionary, Date & Time, Modules, Defining Functions, Exit function, default arguments. File handling in python. | 7 |
| VIII | Introduction to Advanced Python: Objects and Classes, Inheritance, Regular Expressions, Event Driven Programming, GUI Programming. Basic concepts of concepts of Package and modules | 8 |

Suggested Readings:

1. P. K. Sinha & Priti Sinha , “Computer Fundamentals”, BPB Publications, 2007.
2. Dr. Anita Goel, Computer Fundamentals, Pearson Education, 2010.
3. T. Budd, Exploring Python, TMH, 1st Ed, 2011
4. Python Tutorial/Documentation www.python.org 2010
5. Allen Downey, Jeffrey Elkner, Chris Meyers , How to think like a computer scientist : learning with Python , Freely available online.2012
6. Rober Sedgewick, K Wayne -Introduction to Programming in Python: An interdisciplinary Approach" Pearson India

Suggestive digital platforms web links-

<https://www.pearsoned.co.in/prc/book/anita-goel-computer-fundamentals-1e-1/9788131733097>

<http://docs.python.org/3/tutorial/index.html>

<http://interactivepython.org/courselib/static/pythonds>

<http://www.ibiblio.org/g2swap/byteofpython/read/>

This course can be opted as an elective by the students of following subjects:

“Skill Based Elective”

“Elective”

Suggested Continuous Evaluation Methods: **Max. Marks: 25**

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

| | | |
|--|--|------------------------|
| Programme/Class: Certificate | Year: First | Semester: First |
| Subject: Computer Science | | |
| Course Code: B070102P | Course Title: Software Lab using Python | |
| Course outcomes: | | |
| <ol style="list-style-type: none"> 1. To learn and understand Python programming basics. 2. To learn and understand python looping, control statements and string manipulations. 3. Students should be made familiar with the concepts of GUI controls and designing GUI applications. 4. To learn and know the concepts of file handling, exception handling and database connectivity. | | |
| Credits: 2 | Max. Marks: 25+75 | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4 | | |
| Suggested Readings: | | |
| <ol style="list-style-type: none"> 1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/) 2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011. 3. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013. 4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press , 2013 5. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012. | | |

Section: A (Simple programs)

1. Write a menu driven program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice.
2. WAP to calculate total marks, percentage and grade of a student. Marks obtained in each of the three subjects are to be input by the user. Assign grades according to the following criteria :
 - Grade A: Percentage ≥ 80
 - Grade B: Percentage ≥ 70 and < 80
 - Grade C: Percentage ≥ 60 and < 70
 - Grade D: Percentage ≥ 40 and < 60
 - Grade E: Percentage < 40
3. Write a menu-driven program, using user-defined functions to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.
4. WAP to display the first n terms of Fibonacci series.
5. WAP to find factorial of the given number.
6. WAP to find sum of the following series for n terms: $1 - 2/2! + 3/3! - \dots - n/n!$

| Programme/Class: Certificate | Year: First | Semester: Second |
|---|---|-------------------------|
| Subject: Computer Science | | |
| Course Code: B070201T | Course Title: Database Management System | |
| Course outcomes: | | |
| After the completion of the course the students will be able to: | | |
| <ol style="list-style-type: none"> 1. Understands the basic concepts of data base management systems. 2. Design E-R diagrams for real world applications. 3. Formulate relational algebraic expressions using relational data models and languages. 4. Apply normalization transaction properties and concurrency control to design database. 5. Analyze the security algorithms for database protection. | | |
| Credits: 4 | Core Compulsory | |
| Max. Marks: 25+75 | Min. Passing Marks: | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Introduction: Database System Concepts, File system vs. database system, Database system architecture, Data models and their types, Data base scheme and instances, Data independence, Database Languages and Interfaces. | 7 |
| II | Data Modeling Concepts ER model concepts: Notations for ER diagram, Extended E-R diagram, Extended E-R model, E-R model design issues, constraints, and keys: Weak entity set strong entity set, Relationships of higher degree. | 8 |
| III | Relational model concepts: code rules, constraints, Relational Algebra operations, Extended relational algebra operations, Relational Calculus, Tuple and Domain relational calculus. | 7 |
| IV | Database Design Functional dependencies, Normal forms, First, second, and third normal forms, BCNF, Multi-valued dependencies and Fourth Normal form, Join Dependencies and Fifth Normal form. | 8 |
| V | Transaction, Query Processing Transaction and system concepts: transaction states, ACID properties of transactions, concurrent execution schedules and Recoverability, Serializability of schedules. Query Processing and Optimization: Measures of Query cost, Cost, Evaluation of expression. Optimization: Transformation of relational expression, Choice of evaluation plan. | 7 |
| VI | Concurrency Control: Concurrency Control Techniques: Two phase Locking Techniques for Concurrency Control; Time stamping in Concurrency control. | 8 |
| VII | Introduction to SQL Basic Structure of SQL Query, Set operators, SELECT, UNION, INTERSECT, and EXCEPT, Nested queries, Aggregate function, Null values, Derived Relations, Modification of the Database, Joined relations and up-dates in SQL. | 8 |
| VIII | Database Security | |

| | | |
|---|---|---|
| | Importance of data, Threats and risks, Users and database privileges, Access Control, Security for Internet Applications, Role of Database Administrator. | 7 |
| <p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. Henry F. Korth and Abraham Silberschatz, "Database System Concepts," Second Edition, McGraw Hill, 1991. 2. AtulKahate, "Introduction to Database Management Systems," Pearson India, 2004. 3. Raghu Ramakrishnan and Johannes Gehrike, "Database Management Systems," Third McGraw Hill, Edition, 2003. 4. R. Elmasri, S.B. Navathe Database Systems Models, Languages, Design and application Programming, 6 Edition, Pearson Education,2013. 5. A. Silberschatz, H.F. Korth, S. Sudarshan, Database System Concepts 6th Edition, McGraw Hill, 2010. 6. C.J Date " An Introduction to Database Systems", Addison Wesley | | |
| <p>This course can be opted as an elective by the students of following subjects: B. Sc in Engineering and BCA</p> | | |
| <p>Suggested Continuous Evaluation Methods:</p> <ol style="list-style-type: none"> 1. Assessment Type: Class Tests (Max. Marks 14) <p>Suggested Usage: Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.</p> <p>After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted. After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted. If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.</p> 2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5) <p>Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be “End of the class quiz”.</p> 3. Assessment Type: Assignments (Max Marks: 4) <p>Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.</p> 4. Assessment Type: Class Interaction (Max. marks: 2) | | |

| | | |
|--|---|-------------------------|
| Programme/Class: Certificate | Year: First | Semester: Second |
| Subject: Computer Science | | |
| Course Code: B070202P | Course Title: Database Management Systems Lab | |
| Course outcomes: | | |
| Ability to: | | |
| <ol style="list-style-type: none"> 1. Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations. 2. Design and implement a database schema for a given problem. 3. Do connectivity of PHP and MySQL to develop applications. | | |
| Credits: 2 | Max. Marks: 25+75 | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4 | | |
| Suggested Readings: | | |
| <ol style="list-style-type: none"> 1. Paul DuBois, "MySQL Cookbook: Solutions for Database Developers and Administrators," Third Edition, O'Reilly Media, 2014. 2. Frank M. Kromann, "Beginning PHP and MySQL: From Novice to Professional," Fifth Edition, Apress, 2018. 3. Joel Murach and Ray Harris, "Murach's PHP and MySQL," First Edition, Mike Murach & Associates, 2010. 4. Luke Welling, Laura Thomson, "PHP and MySQL Web Development," Fourth Edition, Addison-Wesley, 2008. | | |

Software Lab based on Database Management Systems

Note: PHP/MySQL may be used

List of Experiments

1. Creation of databases and execution of SQL queries.
2. Creation of Tables using MySQL: Data types, Creating Tables (along with Primary and Foreign keys), Altering Tables and Dropping Tables.
3. Practicing DML commands- Insert, Select, Update, Delete.
4. Practicing Queries using ANY, ALL, IN, EXISTS, NOT, EXISTS, UNION, INTERSECT, and CONSTRAINTS, etc.
5. Practice Queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING, VIEWS Creation and Dropping.
6. Use of COMMIT, ROLLBACK and SAVEPOINT.
7. Practicing on Triggers - creation of trigger, Insertion using trigger, Deletion using trigger, Updating using trigger.
8. To remove the redundancies and anomalies in the above relational tables, Normalize up to Third Normal Form.

| Programme/Class: Diploma | Year: Second | Semester: Third |
|--|--|------------------------|
| Subject: Computer Science | | |
| Course Code: B070301T | Course Title: Operating System | |
| Course outcomes: | | |
| After the completion of the course the students will be able: | | |
| <ol style="list-style-type: none"> 1. Understand role, responsibilities, features, and design of operating system. 2. Analyze memory management schemes and process scheduling algorithms. 3. Apply process synchronization techniques to formulate solution for critical section problems. 4. Illustrate concept of disk scheduling. 5. Evaluate process deadlock handling techniques. | | |
| Credits: 4 | Core Compulsory | |
| Max. Marks: 25+75 | Min. Passing Marks: | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Introduction Operating system and functions, Classification of Operating systems: Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multithreaded Systems, Operating System Structure, System Components, Operating System Services, Kernels, Monolithic and Microkernel Systems. | 7 |
| II | Process Management Process Concept, Process States, Process Synchronization, Critical Section, Mutual Exclusion, Classical Synchronization Problems, Process Scheduling, Process States, Process Transitions, Scheduling Algorithms Interprocess Communication, Threads and their management, Security Issues. | 8 |
| III | CPU Scheduling Scheduling Concepts, Techniques of Scheduling, Preemptive and Non-Preemptive Scheduling: First-Come-First-Serve, Shortest Request Next, Highest Response Ration Next, Round Robin, Least Complete Next, Shortest Time to Go, Long, Medium, Short Scheduling, Priority Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock. | 8 |
| IV | Memory Management Memory allocation, Relocation, Protection, Sharing, Paging, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing. | 7 |
| V | I/O Management and Disk Scheduling I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. | 8 |

| | | |
|---|---|---|
| | | |
| VI | File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security. | 7 |
| VII | Shell introduction and Shell Scripting: What is shell and various type of shell, Various editors present in linux, Different modes of operation in vi editor, | 7 |
| VIII | What is shell script, Writing and executing the shell script, Shell variable (user defined and system variables) System calls, Using system calls, Pipes and Filters, Decision making in Shell Scripts (If else, switch), Loops in shell, Functions, Utility programs (cut, paste, join, tr , uniq utilities), Pattern matching utility (grep) | 8 |
| Suggested Readings: | | |
| <ol style="list-style-type: none"> 1. Andrew S. Tanenbaum and Herbert Bos, "Modern Operating Systems," Fourth Edition, Pearson, 2014. 2. Abraham Silberschatz, Greg Gagne, and Peter B. Galvin, "Operating System Concepts," Tenth Edition, Wiley, 2018. 3. William Stallings, "Operating Systems: Internals and Design Principles," Seventh Edition, Prentice Hall, 2011. 4. Dhanjay Dhamdhere, "Operating Systems," First Edition, McGraw-Hill, 2008 5. Milan Milankovic "Operating systems, Concepts and Design" McGraw Hill | | |
| <p>This course can be opted as an elective by the students of following subjects: B. Sc in Engineering and BCA</p> | | |
| <p>Suggested Continuous Evaluation Methods:</p> <p>1. Assessment Type: Class Tests (Max. Marks 14)</p> <p>Suggested Usage: Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.</p> <p>After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted. After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted. If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.</p> <p>2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase</p> | | |

| | | |
|--|-------------------------------------|------------------------|
| Programme/Class: Diploma | Year: Second | Semester: Third |
| Subject: Computer Science | | |
| Course Code: B070302P | Course Title: Operating Systems Lab | |
| Course outcomes: | | |
| Ability to: | | |
| <ol style="list-style-type: none"> 1. Use of Linux operating system and able to write shell programs. 2. Simulate and demonstrate the concepts of operating systems. | | |
| Credits: 2 | Max. Marks: 25+75 | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4 | | |
| Suggested Readings: | | |
| <ol style="list-style-type: none"> 1. Sumitabh Das, "Your Unix/Linux: The Ultimate Guide," McGraw Hill, 2012. 2. Richard Blum and Christine Bresnahan, "Linux Command Line and Shell Scripting Bible," Wiley, 2015. 3. Stroustrup, Bjarne, Programming: Principles and Practice Using C++, Addison Wesley, USA, 2014, 2nd ed. 4. E Balagurusamy, Object Oriented Programming with C++, McGraw Hill Education (India) Pvt. Ltd., India, 2013, 6th ed. | | |

Lab on Operating Systems

Note: Following exercises can be performed using Linux or Unix

1. Usage of following commands:
ls, pwd, tty, cat, who, who am I, rm, mkdir, rmdir, touch, cd.
2. Usage of following commands:
cal, cat(append), cat(concatenate), mv, cp, man, date.
3. Usage of following commands: chmod, grep, tput
(clear, highlight), bc.
4. Write a shell script to check if the number entered at the command line is prime or not.
5. Write a shell script to modify "cal" command to display calendars of the specified months.
6. Write a shell script to modify "cal" command to display calendars of the specified range of months.
7. Write a shell script to accept a login name. If not a valid login name display message – "Entered login name is invalid".
8. Write a shell script to display date in the mm/dd/yy format.
9. Write a shell script to display on the screen sorted output of "who" command along with the total number of users .
10. Write a shell script to display the multiplication table any number,

| Programme/Class: Diploma | Year: Second | Semester: Fourth |
|---|---|-------------------------|
| Subject: Computer Science | | |
| Course Code: B070401T | Course Title: Computer System Architecture | |
| Course outcomes: | | |
| The student will be able to understand the basic arithmetic of a Computer System; how the data is represented, how the various operation are performed on the data, the basic circuits to perform these operations, how instructions are formatted and how these instructions are executed to accomplish a particular operation. Student can also learn the organization of the peripheral devices, the interface between these devices to the system. Student can also understand the architecture of a basic computer, its registers, bus system and the interaction flow among them. | | |
| Credits: 4 | Core Compulsory | |
| Max. Marks: 25+75 | Min. Passing Marks: | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Data Representation and basic Computer Arithmetic: Number systems, complements, fixed and floating point representation, character representation, addition, subtraction, magnitude comparison. | 7 |
| II | Logic gates and circuits: logic gates, boolean algebra, combinational circuits, circuit simplification, introduction to flip-flops and sequential circuits, decoders, multiplexers, registers, counters. | 8 |
| III | Basic Computer Organization and Design: Computer registers, bus system, instruction set, timing and control, instruction cycle, memory reference, input-output and interrupt. | 7 |
| IV | Central Processing Unit: Register organization, arithmetic and logical micro-operations, stack organization, Hardwired vs. micro programmed control. Pipeline control: Instruction pipelines, pipeline performance, super scalar processing, Pipelining, RISC & CISC | 8 |
| V | Programming the Basic Computer: Instruction formats, addressing modes, instruction codes, assembly language | 7 |
| VI | Memory Organization: Memory device characteristics, random access memories, serial access memories, Multilevel memories, address translation, memory allocation, Main features, address mapping, structure versus performance. | 8 |
| VII | Input-output Organization: Peripheral devices, I/O interface, Modes of data transfer: Programmed, Interrupt Driven and Direct Memory Access. | 8 |

| | | |
|--|--|---|
| VIII | Parallel processing: Processor-level parallelism, multiprocessor architecture | 7 |
| <p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. M. Mano, “Computer System Architecture”, Pearson Education, New Jersey, 2017, Third Edition. 2. W. Stallings, “Computer Organization and Architecture Designing for Performance”, Prentice Hall of India, 2015, Tenth Edition. 3. M. Mano, “Digital Design”, Pearson Education, New Jersey, 2018, Sixth Edition. 4. Vranasic and Hamacher, Computer Organization, TMH" | | |
| <p>This course can be opted as an elective by the students of following subjects: B.Sc. in Electronics, B.Sc. in Physics, B.Sc. in Engineering, BCA, B.E, B.Tech.</p> | | |
| <p>Suggested Continuous Evaluation Methods:</p> <p>1. Assessment Type: Class Tests (Max. Marks 14) Suggested Usage: Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.</p> <p>After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted. After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted. If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.</p> <p>2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5) Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be “End of the class quiz”.</p> <p>3. Assessment Type: Assignments (Max Marks: 4) Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.</p> <p>4. Assessment Type: Class Interaction (Max. marks: 2)</p> | | |
| <p>Course prerequisites: To study this course, a student must have had the subject Mathematics in class 12th and Operating system.</p> | | |

| | | |
|---|--|-------------------------|
| Programme/Class: Diploma | Year: Second | Semester: Fourth |
| Subject: Computer Science | | |
| Course Code: B070402P | Course Title: Computer System Architecture Lab | |
| Course outcomes: An ability to understand: | | |
| C01 The functions of various hardware components and their building blocks C02 Boolean algebraic expressions to digital design C03 And implementation of different sequential and Combinational circuits C04 computer buses and input/output peripherals C05 memory hierarchy and design of primary memory | | |
| Credits: 2 | Max. Marks: 25+75 | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4 | | |

Practical: 60 Lab Periods

| | | |
|---|--|---------|
| Memory 4096 words 16 bits per word | Instruction format | |
| | 0 3 4 15 | |
| | Opcode | Address |

Basic Computer Instructions

| | | |
|------------------|--------------------|--------------|
| Memory Reference | Register Reference | Input-Output |
|------------------|--------------------|--------------|

1. Create a machine based on the following architecture:

Register Set

| | | | | | | | | | |
|------|------|------|-----|-----|-------|-------|-------|-------|-------|
| IR | DR | AC | AR | PC | FGI | FGO | S | I | E |
| 0 15 | 0 15 | 0 15 | 011 | 011 | 1 Bit | 1 Bit | 1 Bit | 1 bit | 1 Bit |

| Symbol | Hex | | Symbol | Hex | Symbol | Hex |
|--------|------|--|--------|------|--------|----------|
| AND | 0xxx | | CLA | E800 | INP | F80 0 |
| ADD | 2xxx | | CLE | E400 | OUT | F40 0 |
| ISZ | Cxxx | | INC | E020 | | |

| | | | | | | |
|-------|------|------------------------|-----|------|--|--|
| AND_I | 1xxx | Indirect Addressing | SPA | E010 | | |
| ADD_I | 3xxx | | SNA | E008 | | |
| LDA_I | 5xxx | | SZA | E004 | | |
| STA_I | 7xxx | | SZE | E002 | | |
| BUN_I | 9xxx | | HLT | E001 | | |
| BSA_I | Bxxx | | | | | |
| ISZ_I | Dxxx | | | | | |
| | | | | | | |

Refer to Chapter-5 of Morris Mano for description of instructions.

- ii) Create the micro operations and associate with instructions as given in the chapter (except interrupts). Design the register set, memory and the instruction set. Use this machine for the assignments of this section.
- iii) Create a Fetch routine of the instruction cycle.
- iv) Simulate the machine to determine the contents of AC, E, PC, AR and IR registers in hexadecimal after the execution of each of following register reference instructions:

- | | | |
|--------|--------|--------|
| a. CLA | e. CIR | i. SNA |
| b. CLE | f. CIL | j. SZA |
| c. CMA | g. INC | k. SZE |
| d. CME | h. SPA | l. HLT |

Initialize the contents of AC to $(A937)_{16}$, that of PC to $(022)_{16}$ and E to 1.

5. Simulate the machine for the following memory-reference instructions with I= 0 and address part = 082. The instruction to be stored at address 022 in RAM. Initialize the memory word at address 082 with the operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
 - a. ADD
 - b. AND
 - c. LDA
 - d. STA
 - e. BUN
 - f. BSA
 - g. ISZ
6. Simulate the machine for the memory-reference instructions referred in above question with I= 1 and address part = 082. The instruction to be stored at address 026 in RAM. Initialize the memory word at address 082 with the value 298. Initialize the memory word at address 298 with operand B8F2 and AC with A937. Determine the contents of AC, DR, PC, AR and IR in hexadecimal after the execution.
7. Modify the machine created in Practical 1 according to the following instruction format:

| Programme/Class: Bachelor in Science | Year: Third | Semester: Fifth |
|---|--|------------------------|
| Subject: Computer Science | | |
| Course Code: B070501T | Course Title: Analysis of Algorithm and Data Structures | |
| Course outcomes: | | |
| CO 1: Understand that various problem solving categories exist such as; iterative technique, divide and conquer, dynamic programming, greedy algorithms, and understand various searching and sorting algorithms | | |
| CO 2: Employ a deep knowledge of various data structures when constructing a program.. | | |
| CO 3: Design and construct simple object-oriented software with an appreciation for data abstraction and information hiding. | | |
| CO 4: Effectively use software development tools including libraries, compilers, editors, linkers and debuggers to write and troubleshoot programs. | | |
| Credits: 4 | | Core Compulsory |
| Max. Marks: 25+75 | | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Introduction: Basic Design and Analysis techniques of Algorithms, time and space complexity, Correctness of Algorithm, Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms. | 7 |
| II | Sorting Techniques: Elementary sorting techniques-Bubble Sort, Insertion Sort, Merge Sort, Advanced Sorting techniques-Heap Sort, Quick Sort, Sorting in Linear Time-Bucket Sort, Radix Sort and Count Sort | 8 |
| III | Searching Techniques and Complexity Analysis:: Linear and Binary search, Medians & Order Statistics. | 7 |
| IV | Arrays Arrays: Single and Multi-dimensional Arrays, Sparse Matrices; | 7 |
| V | Stacks and Queues : Implementing stack using array and linked list, Prefix, Infix and Postfix expressions, Utility and conversion of these expressions from one to another; Array and Linked representation of Queue, De-queue, Priority Queues | 8 |
| VI | Linked Lists: Singly, Doubly and Circular Lists, representation of Stack and Queue as Linked Lists. | 8 |
| VII | Recursion: Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; | 7 |
| VIII | Trees: Introduction to Tree as a data structure; Binary Trees, | 8 |

Binary Search Tree, (Creation, and Traversals of Binary Search Trees)

Suggested Readings:

1. Cormen T.H., Leiserson Charles E., Rivest Ronald L., Stein Clifford, Introduction to Algorithms, PHI Learning Pvt. Ltd., 2009, 3rd Edition.
2. Basse Sara & A.V. Gelder, Computer Algorithm: Introduction to Design and Analysis, Pearson, 2000, 3rd Edition.
3. Drozdek Adam, "Data Structures and algorithm in C++", Cengage Learning, 2012, Third Edition.
4. Tenenbaum Aaron M., Augenstein Moshe J., Langsam Yedidyah, "Data Structures Using C and C++", PHI, 2009, Second edition.
5. Kruse Robert L., "Data Structures and Program Design in C++", Pearson.
6. **Suggestive digital platforms web links or online course-**
<https://www.oercommons.org/authoring/14873-data-structure/view>
<https://www.oercommons.org/courses/data-structure-and-algorithms>
https://onlinecourses.swayam2.ac.in/cec19_cs04/preview (**online course**)

This course can be opted as an elective by the students of following subjects:

B. Sc in Mathematics, Physics, Electronics, Statistics, Engineering and BCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

| Programme/Class: Bachelor In Science | Year: Third | Semester: Fifth |
|---|--|------------------------|
| Subject: Computer Science | | |
| Course Code: B070502T | Course Title: Soft Computing | |
| Course outcomes: Upon the completion of this course the student will have the knowledge of soft computing concepts and he can apply them for practical applications. He would be able to choose and design suitable Neural Network for real time problems. He can appropriately use fuzzy rules and reasoning to develop decision making and expert systems. He would know the importance of optimization techniques and genetic programming. | | |
| Credits: 4 | Core Compulsory | |
| Max. Marks: 25+75 | Min. Passing Marks: | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Introduction To Neural Networks: Neural Networks Neuron, Nerve Structure And Synapse, Artificial Neuron And Its Model, Activation Functions. | 7 |
| II | Neural Network Architecture: Single Layer And Multilayer Feed Forward Networks, Recurrent Networks. Perception And Convergence Rule. Supervised Learning Network & Unsupervised Learning Network. | 8 |
| III | Back Propagation Networks-I: Perceptron Model, Solution, Single Layer, Multilayer Perception Model; | 7 |
| IV | Back Propagation Networks-II: Back Propagation Learning Methods, Effect Of Learning Rule Co-Efficient ; Back Propagation Algorithm, Applications. | 8 |
| V | Fuzzy Logic Introduction-I: Basic Concepts Of Fuzzy Logic, Fuzzy Sets And Crisp Sets, Fuzzy Set Theory And Operations, Properties Of Fuzzy Sets | 7 |
| VI | Fuzzy Logic Introduction-II: Fuzzy And Crisp Relations, Fuzzy To Crisp Conversion, Membership Functions, Inference In Fuzzy Logic, Fuzzy If-Then Rules, Fuzzyfication & Defuzzification. | 8 |
| VII | Genetic Algorithm-I: Basic Concepts, Working Principle, Procedures Of GA, Flow Chart Of GA | 7 |

| | | |
|--|--|---|
| VIII | Genetic Algorithm-II: Genetic Representations, (Encoding), Genetic Operators, Mutation, Generational Cycle. | 8 |
| <p>Suggested Readings:</p> <ol style="list-style-type: none"> 1. S. Rajsekaran& G.A. VijayalakshmiPai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India,2003 2. Anderson, James, “Introduction to Neural Networks”, PHI Publication, Delhi, India 3. N.P.Padhy,”Artificial Intelligence and Intelligent Systems” Oxford University Press, USA, 2005. 4. Simon Haykin,”Neural Netowrks and Learning Machines ”Prentice Hall of India, 2005, Third Edition. | | |
| <p>This course can be opted as an elective by the students of following subjects: B.Sc. in Electronics, B.Sc. in Physics, B.Sc. in Statistics, B.Sc. in Mathematics, B.Sc. in Engineering, B.Sc. Vocational, BCA, B.E. , B.Tech, B.A.(Maths)</p> | | |
| <p>Suggested Continuous Evaluation Methods:</p> <p>1. Assessment Type: Class Tests (Max. Marks 14)</p> <p>Suggested Usage: Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.</p> <p>After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted. After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted. If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.</p> <p>2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)</p> <p>Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be “End of the class quiz”.</p> <p>3. Assessment Type: Assignments (Max Marks: 4) Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes, but application analysis and synthesis of that knowledge.</p> | | |

| | | |
|--|--|------------------------|
| Programme/Class: Bachelor of Science | Year: Third | Semester: Fifth |
| Subject: Computer Science | | |
| Course Code: B070503P | Course Title: Lab on Algorithm and Data Structures with C++ | |
| Course outcomes: | | |
| <p>CO 1: Optimize the solution with respect to time complexity & memory usage</p> <p>CO 2: Assess how the choice of data structures and algorithm design methods impacts the performance of programs.</p> <p>CO 3: Choose the appropriate data structure and algorithm design method for a specified application.</p> <p>CO 4: Solve problems using data structures such as linear lists, stacks, queues, binary trees, binary search trees and writing programs for these solutions</p> | | |
| Credits: 2 | Max. Marks: 25+75 | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4 | | |

Practical List of on Analysis of Algorithms and Data Structures with C++:

1. Write a program that uses functions to perform the following:
 - a) Create a singly linked list of integers.
 - b) Delete a given integer from the above linked list.
 - c) Display the contents of the above list after deletion.
2. Write a program that uses functions to perform the following:
 - a) Create a doubly linked list of integers.
 - b) Delete a given integer from the above doubly linked list.
 - c) Display the contents of the above list after deletion.
3. Write a program that uses stack operations to convert a given infix expression into its postfix Equivalent, implement the stack using an array.
4. Write program to implement a double ended queue using
 - i) array and
 - ii) doubly linked list respectively.
5. Write a program that uses functions to perform the following:
 - a) Create a binary search tree of characters.
 - b) Traverse the above Binary search tree recursively in Postorder.
6. Write a program that uses functions to perform the following:
 - a) Create a binary search tree of integers.
 - b) Traverse the above Binary search tree non recursively in inorder.

| Programme/Class: Bachelor of Science | Year: Third | Semester: Six |
|--|--|----------------------|
| Subject: Computer Science | | |
| Course Code: B070601T | Course Title: Data Communication and Computer Network | |
| Course outcomes: After the completion of the course the students will be able: <ol style="list-style-type: none"> To develop understanding of computer networks and communication basics. To understand design issues and services at different layers of reference models. To learn various error detection/correction techniques, routing protocols, congestion control algorithms, and connection establishment/release. To describe and analyze related technical, administrative, and social aspects of networking. | | |
| Credits: 4 | Core Compulsory | |
| Max. Marks: 25+75 | Min. Passing Marks: | |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Introduction to Signals Data and Information, Data communication, Characteristics of data communication, Components of data communication, Data Representation, Data Flow, Simplex, Half Duplex, Full Duplex, Analog and Digital Signals, Periodic and Aperiodic signals, Time and Frequency Domain, Composite Signals | 7 |
| II | Basic concepts of Networks: Components of data communication, standards and organizations, Network Classification, Network Topologies ; network protocol; layered network architecture; overview of OSI reference model; overview of TCP/IP protocol suite. | 8 |
| III | Physical Layer : Cabling, Network Interface Card, Transmission Media Devices- Repeater, Hub, Bridge, Switch, Router, Gateway. | 7 |
| IV | Data Link Layer Designing issues, Framing and Data Link Control, Error detection schemes (parity, checksums, CRCs), Error correction schemes (Hamming codes, binary convolution codes), Data link layer protocols (Simplex, Stop & Wait ARQ, Go-Back-N ARQ, Selective Repeat ARQ, Sliding Window), MAC sublayer (Ethernet, ALOHA, CSMA family, Contention-free access/Token Ring). | 8 |
| V | Network Layer Design issues, Switching, Routing algorithms (Shortest path, Link state, Flooding, Broadcast, Multicast), Packet Scheduling, Internetworking, Internet Protocol (IPv4, IPv6), IP addressing, Internet Control Protocols (IMCP, ARP, DHCP), Mobile IP. | 8 |

| | | |
|-------------|--|---|
| VI | Transport Layer Transport layer services, Connection establishment and teardown, TCP, UDP, Congestion Control, Quality of Service, Domain Name System, World Wide Web. | 8 |
| VII | Application Layer : Application layer protocols and services – Domain name system, HTTP, WWW, telnet, FTP, SMTP | 7 |
| VIII | Network Security : Common Terms, Firewalls, Virtual Private Networks | 7 |

Suggested Readings:

1. Andrew S. Tanenbaum and David J. Wetherall, "Computer Networks," Fifth Edition, Pearson, 2014.
2. William Stallings, "Data and Computer Communications", Tenth Edition, Pearson, 2013.
3. Behrouz A. Forouzan, "Data Communications and Networking," Fourth Edition, McGraw-Hill Higher Education, 2007

This course can be opted as an elective by the students of following subjects:

B. Sc in Engineering and BCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers , not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be “End of the class quiz”.

3. Assessment Type: Assignments (Max Marks: 4)

Suggested Usage: Some class assignments shall be given to students at the end of each Unit. Note making techniques be taught to students; Not just direct questions from notes,

| Programme/Class: Bachelor In Science | Year: Third | Semester: Six |
|--|---|------------------------|
| Subject: Computer Science | | |
| Course Code: B070602T | Course Title: Cyber Security & Cyber Laws | |
| <p>Course outcomes: After the completion of the course the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand types of information, cyber threats, and national/international cyber security standards. 2. Do mathematical modeling and development of security techniques and information system. 3. Develop understanding of legal issues related to cyber security. 4. Apply ethical principles/responsibilities in cyber practices. | | |
| Credits: 4 | | Core Compulsory |
| Max. Marks: 25+75 | | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0 | | |
| Unit | Topic | No. of Lectures |
| I | Introduction: Introduction to Information System, Type of information system, Development of information system, CIA model of Information Characteristics, Introduction to Information Security, Need of Information Security, Cyber Security, Business need, Ethical and Professional issues of security. | 7 |
| II | Information Security Model, Component of an Information security, Aspect of information security, Security attacks (Active and Passive Attacks), Security mechanism and Security Services (X.800). | 8 |
| III | Information Security Techniques, Introduction to Cryptography: Terminology, cryptanalysis, Security of algorithms, Substitution Cipher and Transposition Cipher, Single XOR , One-way Pad, | 7 |
| IV | Cryptographic Protocols-I: Arbitrated and Adjudicated Protocol, One- Way Hash function, | 8 |
| V | Cryptographic Protocols-II: Public key cryptography, Digital Signature, Digital Watermarking Technique: Characteristics and Types. | 7 |
| VI | Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies- Sample Security Policies. | 8 |

| | | |
|-------------|--|---|
| VII | Cyber Laws I: Information Security Standards, IT act 2000 Provisions, Introduction to digital laws, | 7 |
| VIII | Cyber Laws II: cyber laws, intellectual property rights, copyright laws, patent laws, software license. | 8 |

Suggested Readings:

1. Michael E. Whitman and Herbert J. Mattord, "Principles of Information Security," Sixth Edition, Cengage Learning, 2017.
2. Douglas J. Landoll, "Information Security Policies, Procedure, and Standards: A Practitioner's Reference," CRC Press, 2016.
3. Harold F. Tipton, and Micki Krause, "Hand book of information security management," Sixth Edition, Archtech Publication, 2007.
4. William Stallings, "Cryptography and Network Security: Principles and Practice," Sixth Edition, Pearson, 2014.

This course can be opted as an elective by the students of following subjects:

B. Sc in Electronics, Physics, mathematics, Engineering, B.Sc. Vocational, BCA and MCA

Suggested Continuous Evaluation Methods:

1. Assessment Type: Class Tests (Max. Marks 14)

Suggested Usage:

Include all types of questions-essay, short answer, objective; Design to test all levels of domain; Exam Blue Print be prepared to ensure inclusion of all types & levels of questions and proper sampling of content; Marking Criteria made known to students; Teacher should provide written feedback selectively and discuss answers in the class; Only Role/Code numbers, not names be written to avoid bias in marking; Display of model answer copies.

After Completion of Unit I and Unit II, a first class test of max. marks of 7 shall be conducted.

After Completion of Unit III and IV, a second class test of max. marks of 7 shall be conducted.

If any student does not appear in any one or both class test, a makeup test shall be conducted of max. marks of 5 instead of total 14 marks.

2. Assessment Type: Quizzes/ Objective Tests / Recognition Type (such as MCQs; True or False; Matching; Classifying) /Recall Type -Filling Blanks; One word / Phrase Answers (Max Marks: 5)

Suggested Usage: Teachers be trained in construction, advantages, disadvantages and precautions while preparing different types of objective items; Go beyond factual information to High Order Thinking (HOT) Skills. It shall be "End of the class quiz".

3. Assessment Type: Assignments (Max Marks: 4)

| | | |
|---|---|------------------------|
| Programme/Class: Bachelor of Science | Year: Third | Semester: Six |
| Subject: Computer Science | | |
| Course Code: B070603P | Course Title: Lab on Computer Networks | |
| Course outcomes: | | |
| CO1 | Understand and explain the concept of Data Communication and networks, layered architecture and their applications. | |
| CO2 | Analyze and Set up protocol designing issues for Communication networks. | |
| CO3 | Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction. | |
| CO4 | Apply various network layer techniques for designing subnets and supernets and analyze packet flow on basis of routing protocols. | |
| CO5 | Estimate the congestion control mechanism to improve quality of service of networking application | |
| Credits: 2 | | Core Compulsory |
| Max. Marks: 25+75 | | Min. Passing Marks: |
| Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4 | | |

Software Lab based on Computer Networks:

Implement the concepts of Computer Networks such as:

1. Simulate Checksum Algorithm.
2. Simulate CRC Algorithm
3. Simulate Stop & Wait Protocol.
4. Simulate Go-Back-N Protocol.
5. Simulate Selective Repeat Protocol.

and so on....