Syllabus
For
Bachelor of Computer Application

Dibrugarh University

Under

Choice Based Credit System

Bachelor of Computer Application (B.C.A.)

Syllabus Structure

1st Semester:

PART- A (THEORY)					
TH No.	Title of the Paper	Lecture (working hours/ week)	Tutorial (working hours/ week)	Practical (working hours/ week)	Credit
TH 1.1	Fundamental of Computers	3	1	0	4
TH 1.2	Mathematics – I	3	1	0	4
TH 1.3	Digital Design	3	1	0	4
TH 1.4	Communication Skills & Personality Development	3	1	0	4
TH 1.5	Programming with C	2	1	0	3
PART- B (PRACTICAL)					
PR 1.1	Fundamental of Computers	0	0	2	1
PR 1.3	Digital Design	0	0	2	1
PR 1.5	Programming with C	0	0	4	2
				Total Credits	**23**

2nd Semester:

PART- A (THEORY)					
TH No.	Subject	Lecture (working hours/ week)	Tutorial (working hours/ week)	Practical (working hours/ week)	Credit
TH 2.1	Mathematics -II	3	1	0	4
TH 2.2	Data Structure	3	0	0	3
TH 2.3	Accounting & Financial Management	2	1	0	3
TH 2.4	Computer Architecture & Organization	2	1	0	3
TH 2.5	Object Oriented Programming using JAVA	3	0	0	3
PART- B (PRACTICAL)					
PR 2.2	Data Structure	0	0	4	2
PR 2.3	Accounting & Financial Management	0	0	2	1
PR 2.4	Computer Architecture & Organization	0	0	2	1

PR 2.5	Java Programming	0	0	4	2
				Total Credits	**22**
COMPULSORY PAPER					
ENVS	**Environmental Studies**				

3rd Semester:

PART- A (THEORY)					
TH No.	Subject	Lecture (working hours/ week)	Tutorial (working hours/ week)	Practical (working hours/ week)	Credit
TH 3.1	Mathematics - III	3	1	0	4
TH 3.2	Formal Language & Automata	3	1	0	4
TH 3.3	Software Engineering	3	0	0	3
TH 3.4	Introduction to System Software	2	1	0	3
TH 3.5	Operating System	3	0	0	3
PART- B (PRACTICAL)					
PR 3.3	Software Engineering	0	0	4	2
PR 3.4	Introduction to System Software	0	0	2	1
PR 3.5	Operating System	0	0	4	2
				Total Credits	**22**

4th Semester:

PART- A (THEORY)					
TH No.	Subject	Lecture (working hours/ week)	Tutorial (working hours/ week)	Practical (working hours/ week)	Credit
TH 4.1	Introduction to Artificial Intelligence	2	1	0	3
TH 4.2	Database Management System	3	0	0	3
TH 4.3	Data Communication & Computer Networks	3	1	0	4
TH 4.4	Scientific Computing using Mathematical Software	2	0	0	2
PART- B (PRACTICAL/ MINOR PROJECT -I)					
PR 4.2	Database Management System	0	0	4	2

PR 4.3	Data Communication & Computer Networks	0	0	2	1
PR 4.4	Scientific Computing using Mathematical Software	0	0	4	2
PR 4.5	Minor Project	0	0	8	4
				Total Credits	**21**

5th Semester:

PART- A (THEORY)					
TH No.	Subject	Lecture (working hours/ week)	Tutorial (working hours/ week)	Practical (working hours/ week)	Credit
TH 5.1	Introduction to Computer Graphics	2	1	0	3
TH 5.2	Operations Research	2	1	0	3
TH 5.3	Internet & Web Programming	2	1	0	3
TH 5.4	Cloud Computing	2	1	0	3
PART- B (PRACTICAL/ MINOR PROJECT -II)					
PR 5.1	Computer Graphics	0	0	2	1
PR 5.2	Operations Research	0	0	2	1
PR 5.3	Internet and Web Programming	0	0	4	2
PR 5.5	Minor Project II	0	0	10	5
				Total Credits	**21**

6th Semester:

PART- A (MAJOR PROJCT)					
TH No.	Subject	Lecture (working hours/ week)	Tutorial (working hours/ week)	Practical (working hours/ week)	Credit
TH 6.1	Major Project	-	-	-	20
Total Credits					**20**

Detailed Syllabus

Course no :1.1	Course Name: Fundamental Of Computers	Credits			
		L-3	T-1	P-0	Total-4

Objective:

This course is designed with an objective so that the students will be able to

- Discuss about computers and their applications.
- Explain fundamental concepts of computer hardware and software and become familiar with a variety of computer applications, including word processing, spreadsheets, databases, and multimedia presentations.
- Explore about computer viruses and the operating system environment, both Windows and Linux.

Learning Outcome:

At the end of the course, students are expected to be able to:

- Identify computer hardware and peripheral devices
- Familiar with software applications
- Discuss about file management
- Accomplish creating basic documents, worksheets, presentations and databases
- Distinguish the advantages and disadvantages of different operating systems
- Explore about the computer viruses.
- Identify computer risks and safety.

PART-A Theory (TH:1.1)

Total Marks: 100
(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit 1: Introduction to computer and information technology. **Marks: 15**

Brief history of development of computers, computer system concepts, capabilities and limitations, types of computers: Analog, Digital, Hybrid, general, special purpose, Micro, mini, mainframe, super computers, generations of computers, personal computers, types of personal computers – Laptop, Palmtop etc.

Unit 2: Computer Organization and working: **Marks: 15**

Basic components of computer system, Input devices, output devices, storage devices.

Unit 3: Computer software: **Marks: 15**

Need of software, types of software, system software and application software, programming languages, machine, assembly, high level, 4GL, their merits and demerits. Application software-word processing, spread sheet, presentation graphics, database management software.

Unit4: Operating System **Marks: 15**

Introduction to Computer virus, Introduction to Operating Systems (Disk operating system, Windows, Linux, Unix)

Part-B Practical (PR:1.1)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total Marks: 50
(In Semester Evaluation –20 & End Semester Evaluation –30)

- Basics of Ms-Word, Ms-Excel, Ms-PowerPoint and Ms-Access
- Basics of DOS and Unix commands, SHELL PROGRAMMING
- Basic Windows and Linux operations.

Text Books:

1. Sinha P.K., "*Computer Fundamentals",* 2012, Sixth Edition, BPB Publication
2. Rajaraman,V.,"*Computer Fundamentals",* 2012,Sixth Edition, PHI
3. Sirivastava S.S,"*Ms-Office*",2015, Laxmi Publication

Reference Books:

1. Ram.B., "*Computer Fundamentals:Architecture and Organization*",2013,5th Edition, New Age Publication
2. Goel.A.,,"*Computer Fundamentals*",2011 Reprint, Pearson Education

Discussion:

- Organization of the computers
- Generation of languages
- Ms-Office
- DOS, Windows, Linux and Unix

Course no: 1.2	**Course Name**: Mathematics-I	**Credits**			
		L: 3	T: 1	P: 0	Total: 4

Objective:

This course is designed with an objective to

- Illustrate the ideas and techniques from discrete mathematics which are widely used in computer science.
- Introduce mathematical logic among students of Computer Science.
- Introduce set, function, relations, permutation and combinations which are used in database management, Programming Techniques, Turing Machine etc.
- Develop the use of matrix algebra techniques used in analyzing the relationship between the vertices of a graph and movement of robots and many other areas.

Learning outcomes

On completion of the course, the students will be able to:

- Define and explain various methods pertaining to Combinatorics, Matrix Algebra, Determinants and apply them through computer programs.
- Explain and apply the basic methods of discrete mathematics in Computer Science.

Theory (TH:1.2)

Total Marks: 100

(In Semester Evaluation **–** 40& End Semester Evaluation –60**)**

Unit I – Mathematical Logic: **Marks: 12**

Propositional logic – syntax, semantics, laws of deduction, normal forms-conjunctive normal form and disjunctive normal form, First order logic – universal and existential quantifiers, syntax.

Unit II – Discrete Structures: **Marks: 12**

Sets; Cartesian product, Relations – their types; Functions, Fuzzy set –concept.

Unit III –Complex Numbers: **Marks: 12**

Complex number as an ordered pair, operations on complex numbers, De-Moivre's Theorem, roots of complex numbers

Unit IV – Matrix Algebra: **Marks: 12**

Elementary concept of matrix and determinants, Rank and inverse of a matrix, solution of algebraic equations – consistency conditions.

Unit V – Mathematical Statistics: **Marks: 12**

Permutations, Combinations, Probability, Collection of data, frequency distribution, measures of central tendency and dispersion.

Text Books:

1. Biggs N.L., "*Discrete Mathematics"*, 2nd Edition, Oxford University Press, 2009.
2. Goldberg J. L., Potter M. C., Edward A. "*Advanced Engineering Mathematics"*; Third Edition, Oxford University Press, 2005.

Reference Books:

1. Lipschutz S., Lipson M. L., Patil V. H., *"Discrete Mathematics (Schaums Outlines)*",3rd Edition, Tata McGraw Hill,2013.

2. Grimaldi R.P., "*Discrete and Combinatorial Mathematics, An Applied Introduction*", 5th Edition, Pearson,2003.
3. Sharma K.J., *"Discrete Mathematics*", 3rd Edition, Macmillan India Limited,2010

Discussion

- Basics of Mathematical logic,
- Example oriented.

Course no : 1.3	**Course Name**: **Digital Design**	**Credits**			
		L 2	T 1	P 1	Total 4

Objective:

This course is designed with an objective, so that the students will be able to

- Describe the fundamental principles of digital design.
- Represent and manipulate decimal numbers in different coding systems.
- Gaining experience with several levels of digital systems, from simple logic circuits to programmable logic devices and hardware description language, analysis and design is another likely outcome

Learning Outcome:

After completion of this course ,the students will be able to

- Differentiate different number systems.
- Write Boolean algebra and the *operation* of logic components.
- *Construct logic circuit using logic gates.*
- Design both combinational and sequential logic circuits.

PART-A Theory (TH:1.3)

Total Marks: 100

(In Semester Evaluation **–**40 & End Semester Evaluation –60**)**

Unit I: Representation of information: **Marks: 10**

Review of number systems and their conversions: Binary, decimal, octal and hexadecimal; Positive and negative numbers, Gray codes.

Unit II: Arithmetic operations and **Character codes**: **Marks: 10**

Addition, subtraction, multiplication, division of numbers,1's complement 2's complement of binary numbers, subtraction by using 1's complement and 2's complement methods.

BCD, ASCII, codes for error detection and correction, concept of hamming distance

Unit III: Logic Design: **Marks: 12**

Boolean algebra & Switching functions, minimization and realization using logic gates. Representation of logic functions-SOP and POS form, K-map presentation.

Unit IV: Combinational circuits **Marks: 14**

Designing of Combinational circuits: Adder, subtractor, multiplexers, de multiplexers, decoders, encoders.

Unit V: Sequential circuits **Marks: 14**

Sequential logic: Latch, Flip flops, Registers and Counters.

PART-B Practical (PR 1.3)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total marks:50

(In Semester Evaluation –20 & End Semester Evaluation –30)

- Implementation of logic circuit using logic gates.
- Experiments on different logic circuits like Half adder, Full subtractor .

Text Books:

1. Mano.M.M, "*Digital Logic and Computer Design"*, Pearson ,2004
2. Wakerly J.F.,"*Digital Design: Principles And Practices"*,Pearson,4th Edition,2008

Reference Books:

1. Kohavi,Z, "*Switching Finite automata theory,2/e"* Tata Mcgraw Hill,1995.
2. Salivahanan.S and Arivazhagan.S, "*Digital Circuits and Design*" ,Vikas Publishing House PVT LTD,4th Edition,2012

Course No:	Course Name:	Credits			
1.4	Communicative English and Personality Development	L :3	T:1	P:0	Total: 4

Objective:

The course is designed with an objective to

- Acquire better communication skills.
- Have a better personality which can help in dealing with different situations.
- Have a positive attitude and constructive professional mind
- Listen for different needs and ideas

Prerequisite: Course : Nil

Learning Outcome:

On completion of the course, students will be able to:

- Exhibit professional attitude in their career perspectives.
- Show better communication skills
- Develop grooming techniques
- Build a constructive professional personality

Theory (TH:1.4)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit I: General Introduction: Marks :15

Importance of English its Position, Communicating in English: Difference between the spoken and the written form, How to start dealing with hesitation and shyness.

Pronunciation:

English vowels and consonants (RP), Getting to know the IPA, Words generally mispronounced-she, see, seat, cheat, etc, Difference between spelling and pronunciation, Choice of a proper model, Practical exercises

Unit II: Conversation: Marks :15

Starting a conversation, Things to be kept in mind while engaging in conversation-fluency, accuracy, appropriateness, Planning, Turn taking, Practical exercises.

Situational Conversation:

Facing an interview board, Telephone talk, Wishes etc., Conversation with elders, friends, strangers etc., Terms related to different professions (Banking, Travel agency, Business etc.), Public speaking (Addressing a meeting; Debate; Group Discussion etc.), Practical exercises.

Unit III: Personality Meaning Marks :10

Personality determinants, personality traits –theory of personality – development of personality from infancy to maturity, emotions and personality

Unit IV : A**ttitude** **Marks :10**

Concepts of attitude, formation of attitude, types of attitude, change of attitude values: concepts of values, types of values and behavior habits learning and unlearning of habits.

Unit V: Motivation **Marks :10**

Meaning of motivation, nature of motivation, need of motivation personality development self development steps of personality developments.

Text Books :

1. Bansal, R.K. and J.B. Harrison, "*Spoken English for India*", Orient Longman.
2. Thorat, Ashok et al., "*Enriching Your Competence in English*", Orient Longman
3. Singh, Vandana., "*The Written Word*", Oxford Publication

Discussion:

- How to write curriculum vitae
- Group discussion
- Mock interview

Course no: 1.5	**Course Name:** **Programming with C**	**Credits**			
		L: 2	T: 1	P: 0	Total: 3

Objective: The course is designed with an objective to

- Developing programming logic using C.

Prerequisites:

- Basic reasoning abilities.

Learning Outcome: On completion of the course, students will be able to:

- Write programs using C as a language.
- Write the basic terminology used in computer programming
- Write, compile and debug programs in C language.
- Use different data types in a computer program.
- Design programs involving decision structures, loops and functions.

Part A :Theory (TH:1.5)

Total Marks: 100

(In semester evaluation 40 & End semester evaluation 60)

Unit 1: Introduction to 'C' Language **Marks: 12**

Character set, Variables and Identifiers, Built-in Data Types, Variable Definition. Arithmetic operators and Expressions, Constants and Literals , Simple assignment statement, Basic input/output statement, Simple 'C' programs

Unit 2: Conditional Statements and Loops **Marks: 12**

Decision making within a program, conditions, Relational Operators, Logical Connectives ,if statement, if-else statement ,Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement, structures Programming.

Unit 3: Arrays & Functions **Marks:12**

One dimensional arrays: Array manipulation; Two dimensional arrays,
Top-down approach of problem solving, Modular programming and functions, Return Type, Function call, Block structure, Passing arguments to a Function: call by reference; call by value, Recursive Functions, arrays as function arguments.

Unit 4: Structures **Marks: 12**

Structure variables, initialization, structure assignment, nested structure, structures and functions, structures and arrays: arrays of structures, structures containing arrays.

Unit 5: Pointers & File Processing **Marks: 12**

Address operators, pointer type declaration, pointer assignment, pointer initialization, pointer arithmetic, functions and pointers, Arrays and Pointers, pointer arrays.Concept of Files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file.

Part B :Practical (PR:1.5)

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50
(In semester evaluation 20 & End semester evaluation 30)

- Introduction to vi editor
- Program combining control structure and array.
- Searching, Insertion, Deletion. Finding the largest/smallest element in an array.
- Basic matrix operations.
- Programs using functions & pointers.
- Programs using structures.

Discussion:
Emphasis should be given to develop programming logic.

Text Books:

1. Gottfried Byron "*Programming with C*" 3rd edition,Tata McGrawhill, 2010
2. Balaguruswami, D "*Programming with ANSI-C*" 6th Edition, Tata McGrow Hill,2012.

Reference Books:

1. Brian W. Kernighan, Dennis M. Ritchie,"*The C Programming Language (Ansi C Version)* "latest reprint, Prentice Hall India Learning,1990.
2. Dromey, R.G. "*How to solve it by Computer*",latest reprint, Prentice,2011.

Course no: 2.1	**Course Name**: **Mathematics-II**	**Credits**			
		L: 3	T: 1	P: 0	Total:4

Objective:

This course is designed with an objective to

- Describe problems of differential calculus and integral calculus.
- Introduce the idea of double and triple integral.
- Appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

Learning outcome

On completion of the course, students will be able to:

- Solve problems of differential calculus and integral calculus.
- Explain the idea of definite and multiple integrals.
- Find the Laplace and its inverse transforms of a function.

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Theory (TH:2.1)

Total Marks: 100

(In Semester Evaluation **–** 40& End Semester Evaluation –60**)**

Unit I – Introduction to Differential Calculus: **Marks: 12**

Limits, continuity and differentiability, ordinary differentiation, partial differentiation, indeterminate forms.

Unit II-Expansion of functions: **Marks: 12**

Rolle's Theorem, MVTs, Taylor's and Maclaurin's theorems, Euler's theorem on homogeneous functions.

Unit III-Maxima and Minima: **Marks: 12**

Maxima and minima of functions of single variable and two variables.

Unit IV - Integral Calculus: **Marks: 12**

Indefinite integral, definite integrals, reduction formulae, application of integral calculus – length, area, volume. Idea of multiple integrals.

Unit V - Transform Calculus: **Marks: 12**

Laplace Transforms, Inverse Laplace Transform.

Text Books:

1. Kreyszig E. "Advanced Engineering Mathematics",Tenth Edition, Wiley,2010.

2. Ayres F., Mendelson E. "*Schaum's Outline of Calculus*", 6th Edition, McGraw Hill Education,2013.

Reference Books:

1. Silverman R.A., "*Essential Calculus with Applications"*,5th Edition, Dover Publications,2014.
2. Garg R.L., Gupta N., "Engineering Mathematics", 1st Edition, Pearson,2015.

Discussion

- Example oriented.
- Proof of theorems not required.

Course Code:	Course Name:	Credits			
2.2	**Data Structures**	L:3	T:0	P:0	Total:3

Objective: The course is designed with an objective to

- Demonstrate the major algorithms in data structures.
- Analyze performance of algorithms.
- Discuss which algorithm or data structure to use in different scenarios.
- Demonstrate the properties of various data structures such as stacks, queues, lists, trees.
- Demonstrate various sorting algorithms, including bubble sort, insertion sort, selection sort, heap sort, merge sort, quick sort.
- Demonstrate understanding of various searching algorithms.

Learning Outcome: On completion of the course, students will be able to:

- Distinguish between linear and non-linear data structure.
- Apply non-linear data structure in appropriate areas.
- Apply various sorting and searching algorithms in different problems.

Part A :Theory (TH:2.2)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit 1:Introduction & Basic of Data Structure **Marks:12**

Data structure, algorithms, Primitive and Composite data types, Time and Space Complexity of Algorithms, Linked List, Stack, Queues implementation using Array and linked list, Insertion, Deletion and Traversal of linked list. Recursion and its implementation with reference to stack.

Unit 2:Sorting& Searching Algorithms **Marks:12**

Introduction to Sorting and its practical use, Sorting Algorithms and its implementation Bubble sort, Insertion sort, Selection Sort, Quick sort, Merge sort and Radix Sort.
Introduction to Searching algorithms, Linear search, Binary search, depth first search and breadth first search techniques.

Unit 3:Introduction to Trees **Marks: 12**

Introduction to Trees, properties of Trees, Binary Tree, Complete Binary Trees, Binary search Trees, Tree traversal methods(pre order, in order, post order),Infix, Postfix and Prefix Notations, basic concept of Heap.

Unit 4:Hashing and Collision **Marks: 12**

Hash tables, Hash functions, collisions, collision resolution.

Unit 5:File Structure **Marks: 12**

Concept of Fields, Records and Files, Blocks, Clusters, Sectors. Indexed Sequential Access Method(ISAM)

Text Books:

1. Tenenbaum A. M.,"*Data Structures Using C*",Pearson,2nd Edition,2009.
2. Baluja, G. S."*Data Structure through C++*", Dhanpat Rai Publication,2012.

Reference Books:

1. Lipschutz, Seymour"*Data Structures*", T. M. Hill,2010.
2. Weiss, Mark Allen "*Data Structures and Algorithm Analysis in C++",*Pearson,4th Edition,2012

Part B: Practical (PR:2.2)

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50

(In semester evaluation 20 & End semester evaluation 30)

- Write programs to implement different operations on 1-D and 2-D arrays.
- Write programs to implement stack, queue, linked-lists.
- Write programs to implement sorting and searching algorithms.
- Write programs to implement BST.

Discussion:

Emphasis should be given to linked list, stack and queue, tree, searching and sorting algorithms.

Course No: 2.3	**Course Name:** Accounting And Financial Management	**Credits**			
		L- 2	T- 1	P- 0	Total: 3

Objective:

This course is designed with an objective so that the students will be able to

- Discuss basics of accounts and accounting.
- Explain basics of finance and financial management.
- Apply financial tools for taking certain decisions.
- Describe application of computer in accounting and finance

Learning Outcome:

At the end of the course, students are expected to be able to discuss the concept of Accounting and Financial Management with practical Approach.

SYLLABUS

Total Marks: 100
(In Semester Evaluation –25 & End Semester Evaluation –75)

Unit-1: **Marks: 20**

Meaning and definition of accounting, parties or users interested in accounting, branches of accounting. Accounting concepts and conventions. Basic accounting terminologies, Classification of accounts, Journal entry, ledger posting and balancing of ledger. Subsidiary books – meaning and importance, preparation of cash book (Triple Column).

Unit-2: **Marks: 20**

Trial Balance-concept, objectives: Financial statements-meaning, objectives, preparation of Trading and Profit and Loss Accounts, Balance Sheet of sole trading concern. Classification of Assets and Liabilities. Depreciation-meaning, causes, accounting for depreciation. Accounting software-Tally (introductory part).

Unit-3: **Marks: 20**

Financial Management-meaning and objectives, functions of financial management. Concept of capital structure-computation of Cost of Capital; Management of Working capital-need of working capital, operating cycle, sources of working capital.

Unit-4: **Marks: 15**

Budget and Budgetary Control-definition, objectives of budget, classification, advantage, characteristics of budget. Preparation of production/sales and cash budget. Capital Budgeting-meaning, importance and methods of capital budgeting. Concept of Marginal costing; Cost-Volume-Profit analysis, Break-even Point.

Part-B Practical (PR:2.3)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total Marks: 50

(In Semester Evaluation –20 & End Semester Evaluation –30)

- Practical implementation using TALLY.

Text Books:

1. B.B.Dam; R.A.Sarda; R.Barman; B.Kalita: "*Theory and Practice of Accountancy (V-I)*", Capital Publishing Company, Guwahati.
2. C.M.Juneja; R.C.Chowla; K.K.Saxena; "*Book-Keeping and Accountancy (V-I)*", Kalyani Publishers, Ludhiana..

Reference Books:

1. R.K.Sharma; S.K.Gupta: "*Management Accounting*". Kalyani Publishers, Ludhiana.
2. M.Y. Khan; P.K.Jain: "*Principles of Financial Management*". Tata McGraw Hills, New Delhi

Course Code :2.4	Course Name: Computer Architecture & Organisation	Credits			
		L:2	T:1	P: 0	Total:3

Objective:

This course is designed with an objective to

- Describe the basic structure and operation of a digital computer.
- Describe the different ways of communicating with I/O devices and standard I/O interfaces.

Learning outcome:

After completion of this course ,the students will be able to

- Describe different components of computer.
- Identify high performance architecture design.
- Develop independent learning skills and be able to illustrate more about different computer architectures and hardware.
- Create an assembly language program to program a microprocessor system.

PART-A Theory (TH:2.4)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit I: Introduction to Computers: **Marks :10**

Von Neumann Architecture, generation of computers.

Marks :12

Unit II: Organization of a Computer:

Central Progressing Unit (CPU), Register, Stack, Simple ALU organization, Control Unit**:** Hardwired and Micro-programmed Control.

Unit III: Memory Organization: **Marks: 12**

Primary memory, Secondary memory, Cache Memory, Mapping, virtual memory: address translation virtual to physical.

Unit IV: I/O Organization: **Marks :12**

Modes Of Transfer: Programme driven, Interrupt driven I/O, DMA, Input Output Processor (IOP), Peripherals, Buses: Bus arbitration.

Unit V: Assembly language programming: **Marks :14**

Addressing modes, Instruction formats, Instruction types, Assembly language programming of microprocessor 8085.

PART-B Practical (PR:2.4)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total marks-50

(Insem-20 & Endsem-30)

Write Assembly language programming of 8085

- Using arithmetic and logical instructions
- Memory related operations
- Data transfer operations

Text Books:

1. Mano M.M, "*Computer System Architecture*",Pearson,3rd Edition,2007 .
2. Hamacher.V.C.,Vranestic, Z.G. and Zaky, S.G. "*Computer Organization"*, McGraw-Hill,5th Edition, 2011.

Reference Books:

1. Hamachar C, Vranesic Z , Zaky S, Manjikian N, "*Computer organization & Embedded Systems*", Mc Graw Hill International Edition , 6th Edition, 2007.
2. Ram B, "*Fundamentals of Microprocessors and Microcomputers*", 5th edition, Dhanpat Rai Publications, 2012.
3. Gaonkar R.S.,"*Microprocessor Architecture, Programming and Applications with 8085A*",Penram International Publishing,5th Edition, 2000.

Discussion:

Microprocessor 8085.

Course Code:	Course Name:	Credits:			
2.5	Object Oriented Programming Using Java	L: 3	T: 0	P: 0	Total: 3

Objective:

The course is designed with an objective to:

- Explain Object-Oriented programming concepts and techniques using Java Programs.
- Explain exception handling and multithreading in Java,
- Demonstrate core Java Programs.

Prerequisite:

Basic knowledge of coding.

Learning Outcome:

On completion of the course, students will be able to:

- Implement the OOP concepts of encapsulation, inheritance and polymorphism in java.
- Apply Java programming syntax, control structures and Java programming concepts.
- Develop Java programs.
- Differentiate Object Oriented approach from Procedural Approach

PART-A Theory (TH:2.5)

Total Marks: 100
(In Semester Evaluation –40 & End Semester Evaluation-60)

Unit I: Introduction to Java **Marks: 12**

Java overview, Difference between JDK, JRE and JVM , Internal Details of JVM, Variable and Data Type, Naming Convention, Garbage collection mechanism, Advantage of OOP, Encapsulation, Object and Class, Method Overloading, Constructor static variable, method and block, this keyword

Unit II: Inheritance, Packages and Interfaces **Marks: 12**

Inheritance, Method Overriding, super keyword, final keyword, Runtime Polymorphism, Abstract class, Wrapper classes, Java Array, String, String Buffer, String Builder, Interface, Package and Access modifiers.

Unit III: Exception Handling **Marks: 12**

Types of Exception, try and catch block, Multiple catch block, Nested try, finally block, throw keyword, Exception Propagation, throws keyword, Exception Handling with Method Overriding, Custom Exception

Unit IV: Multithreading **Marks: 12**

Multithreading, Life Cycle of a Thread, Creating Thread, Thread Scheduler, Sleeping a thread, Joining a thread, Thread Priority, Thread synchronization, wait, notify, notifyAll

Unit V: Collection **Marks: 12**

Collection Framework, ArrayList class, LinkedList class, ListIterator interface, HashSet class, LinkedHashSet class, TreeSet class, PriorityQueue class, ArrayDeque class, Map interface, HashMap class, Comparable and Comparator

PART-B Practical (PR:2.5)

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50
(In Semester Evaluation -20 & End Semester Evaluation-30)

Basic Java Programs covering:

- Encapsulation
- Inheritance
- Polymorphism
- Exception handling
- Multithreading

Text Books:

1. Herbert, S,"*The Complete Reference to Java*", 9th edition, Tata McGraw Hill, 2014
2. Malhotra, S. and Choudhary, S, '*Programming in Java*', Second Edition, Oxford University Press, 2015.

Reference Books:

1. Eckel B, "*Thinking in Java"*, Pearson,Reprint:2014.
2. Blaha, M. R. and Rumbaugh, J., "*Object Oriented Modeling and Design with UML"*, 2nd Edition, Pearson Education, Reprint-2015

Course no: 3.1	**Course Name: Mathematics III**	**Credits**			
		L: 3	T: 1	P: 0	Total: 4

Objective:

This course is designed with an objective to

- Introduce the basic notions of groups, rings, fields.
- Demonstrate graphs as a modeling tool in computer science.
- Describe graph & tree concepts and their applications in network security.
-

Learning outcome

On completion of the course, students will be able to:

- Describe algebraic structures like groups, ring and field.
- Define the notion of vector space and describe its various properties.
- Solve problems by applying *graph* theoretic results and algorithms.

Theory (TH:3.1)

Total Marks: 100

(In Semester Evaluation **–** 40& End Semester Evaluation –60**)**

Unit I-Groups **Marks: 12**

Groups-groupoid, semigroup, subgroup, cyclic group, examples.

Unit II-Rings **Marks: 12**

Rings-definition, elementary properties of a ring, theorems (without proof), rings with or without zero divisor, Integral Domain.

Unit-III Fields **Marks: 12**

Fields-definition, theorems (without proof), examples.

Unit IV-Vector Spaces **Marks: 12**

Vector spaces –definition, general properties of vector spaces, Eigen Values and Eigen Vectors.

Unit V-Graph Theory **Marks: 12**

Graphs: Basic terminologies, simple graph, multigraphs and weighted graphs, paths and circuits, shortest path in weighted graph(Dijkstra's Algorithm), Eulerian paths and circuits, Hamiltonian paths and circuits.

Text Books:

1. Satyanarayana B., "*Discrete Mathematics and Graph Theory",* 2nd Edition, PHI,1996.
2. Tremblay P. J., Manohar R. *"Discrete Mathematical Structure with Application to Computer Science*", 1st Edition, McGraw-Hill, 2014.

Reference Books:

1. Lipschutz S. & Lipson M., *, "Discrete Mathematics"*, 3rd Edition, Schaum's Outlines, Tata McGraw-Hill,2009.
2. Narsingh, Deo, "*Graph Theory with Applications to Engineering and Computer Science (English)",* New Edition PHI,2013.
3. Herstein I.N.,*"Abstract Algebra",*3rd Edition, John Wiley & Sons,2014.

Discussion

- Basic Ideas.
- Illustrative Examples.
- Proof of theorems not required.

Course Code: 3.2	**Course Name: Formal Language and Automata Theory**	**Credits**			
		L: 3	T: 1	P: 0	Total: 4

Objective:

This course is designed with an objective to

- Identify different formal language classes and their relationships
- Design grammars and recognizers for different formal languages

Learning Outcomes:

On completion of this course, the students will be able to:

- Design automata, regular expressions and context-free grammars accepting or generating a certain language;
- Make transformation between equivalent deterministic and non-deterministic finite automata, and regular expressions;
- Simplify automata and context-free grammars;
- Determine if a certain word belongs to a language or not.

PART-A Theory (TH:3.2)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation-60)

Unit I: Finite Automata **Marks: 20**

Finite Automata, Introduction to NFA, equivalence of NFA and DFA, Finite Automata with output devices, Minimization of finite Automata

Unit II: Regular Expression **Marks: 10**

Introduction, Kleene closure, Formal definition, Algebra of regular expression, Regular languages, closure properties of regular set.

Unit III: Context Free Grammar **Marks: 20**

Grammar and its classification, CFG, Normal Forms of Context free Grammar, Ambiguity in CFG and Parsing.

Push down automata (PDA), Basic Structure of PDA, Correspondence between PDA and CFL

Unit IV: Chomsky Hierarchy and Turing Machine **Marks: 10**

CSL and LBA , Formal definition of Turing Machine, Transition diagram, Basic structure and Working of Turing Machine, language of Turing Machine, Types of Turing Machine, universal Turing Machine, Chomsky Hierarchy.

Text Books:

1. Linz P ,"*An Introduction to Formal Language and Automata*", Jones and Bartlett Publishers, Inc. , USA, 2011.
2. Misha, K. L. P. "*Theory of Computer Science: Automata, Languages and Computation*" PHI, 3rd Edition, 2009

Reference Books:

1. Nagpal C. K, "*Formal Languages And Automata Theory*" ,Oxford University Press, 2011
2. Hopcroft, J. E.; Motwani, R; Ullman, J.D, "*Introduction To Automata Theory, Language And Computation"*, Addison –Weisley, 3rd edition, 2013.

Discussion:

- Finite Automata
- Regular Language and Expression
- Context free Grammar, Push Down Automata (PDA)

Course no.:	Course Name:	Credits			
3.3	**Software Engineering**	L:3	T:0	P:0	Total:3

Objective:
The course is designed with an objective to:

- Demonstrate software process models such as the waterfall and evolutionary models.
- Discuss the role of project management including planning, scheduling, risk management, etc.
- Define software engineering andexplain its importance.

Learning Outcome:
On completion of the course, students will be able to:

- Create software from the root level starting from requirement gathering to maintenance with the appropriate SDLC.
- Define software engineering and explain its importance.
- Identify the processes to be followed in the software development life cycle.
- Test software using testing approaches such as unit testing and integration testing.

Part A :Theory (TH:3.3)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit I: Introduction to Software Engineering: **Marks: 12**

Concept of a software project, size factor, quality and productivity factor, software process models, different phases of software development life cycle.

Unit II: Software Project Management **Marks: 12**

Software project management: Planning, scheduling, monitoring, controlling , requirement specifications.

Unit III: Software Design **Marks: 12**

Software design: Function oriented, object oriented approaches, user interfaces.
Software programming: Structured coding techniques, coding styles, standard.

Unit IV: Verification, Validation & Testing **Marks: 12**

Software verification and validation, black box and white box approaches, integration and system testing.

Unit V: Software reliability& Maintenance **Marks: 12**

Definition and concept of reliability, software faults, errors, Repair and availability.
Categories of Maintenance, Problem during maintenance.

Part B :Practical (PR :3.3)

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50
(In semester evaluation 20 & End semester evaluation 30)

- Automated Testing of web pages using Selenium.
- Any other Laboratory work will be set in consonance with the material covered in the course.

Text Books:

3. Rajiv M.,"*Fundamentals Of Software Engineering*", PHI Learning,4th Edition,2014.
4. Pankaj J, "*An Integrated Approach to Software Engineering*", Narosa Publishing House,3rd edition, 2014

Reference Books:

5. James K.L."*Software Engineering*",PHI Learning,2nd Edition,2012.
- Roger S. P., "*Software Engineering: A Practitioner's Approach*", McGraw Hill Publication, 8th edition 2014.

Discussion:

Emphasis should be given to the following topics:

- SDLC models.
- Software project management.
- Functional vs Non-Functional requirements.
- Data flow diagrams.
- Software Metrics.
- Blackbox - Whitebox Testing.
- COCOMO model.

Course No: 3.4	**Course Name:** **Introduction to System Software**	**Credits**			
		L: 2	T:1	P: 0	Total: 3

Objective:

This course is designed with an objective to

- Explain the relationship between system software and machine architecture, design and implementation of assemblers, linkers and loaders.
- Describe the design, function and implementation of assemblers, linkers and loaders.
- Define macro processors and system software tools.
- Describe the design of a compiler and the phases of program translation from source code to executable code and the files produced by these phases.
- Explain lexical analysis phase and its underlying formal models such as finite state automata, push-down automata and their connection to language definition through regular expressions and grammars.
- Explain the syntax analysis phase and identify the similarities and differences among various parsing techniques and grammar transformation techniques.

Learning Outcome:

At the end of the course, students are expected to be able to:

- Identify the path of a source code to object code and to executable file.
- Design the front end of the compiler-scanner, parser.
- Identify the relationship between system software architecture and machine.
- Analyze the functions of assembler, compiler, linker, and loaders.
- Design and implement loaders and linkers.

PART-A Theory (TH:3.4)

Total Marks: 100
(In Semester Evaluation –40 & End Semester Evaluation –60)

UNIT I: Overview: **Marks: 12**

Definition and classification of System Software, Distinction between System Software and Application Software, Layered organization of System Software.

UNIT II: Assembler: **Marks: 12**

Overview of the Assembly process, Design of Assembler: Two Pass Assembler & Single Pass Assemble

UNIT III: Macro **Marks: 12**

Introduction to Macros, Various types of Macros, Design of Macro Processor: Single Pass & Double Pass, Debugger and its features.

UNIT IV: Linkers & Loaders: **Marks: 12**

Introduction to Linkers & Loaders, Functions of a loader, Types of Loaders, Databases used in Loaders, Design of Loaders - Absolute & DLL.

UNIT V: Basics of Compiler: **Marks: 12**

A Simple Compiler, Difference between Interpreter, Assembler and Compiler, Types of Compiler, Analysis - Synthesis Model of compilation, The Phases of a Compiler, The Grouping of Phases, and Compiler - Construction Tools.

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Part-B Practical (PR:3.4)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total Marks: 50
(In Semester Evaluation –20 & End Semester Evaluation –30)

- Demonstration on:Lex,Yacc and Make Utility
- Macro Coding, Debugger Exercise, Analysis of Executable Code

Reference Books:

1. Donovan, John J. "*Systems Programming*", Tata McGraw Hill Company, Second Edition, 2000.
2. Raghavan, V "*Principles of Compiler Design*", Tata McGraw Hill Education Publishers, 2010.

Course No: 3.5	**Course Name:** **Operating System**	**Credits**			
		L: 3	T: 0	P: 0	Total: 3

Objective:

This course is designed with an objective to

Discuss and explain the basic concepts of Operating System, process management, memory management, file management, Input / Output management and the potential problem of deadlocks.

Prerequisite: Nill

Learning Outcome:

At the end of the course, students are expected to be able to:

- Describe the general architecture of computers,
- Describe, contrast and compare differing structures for operating systems,
- Analyze theory of processes, resource control (concurrency etc.), physical and virtual memory, scheduling, I/O and files.

PART-A Theory (TH:3.5)

Total Marks: 100
(In Semester Evaluation –40 & End Semester Evaluation-60)

Unit I: Overview of Operating System **Marks:8**

Operating System Concepts (Processes, Memory Management, Files, Deadlocks, Input/Output), System Structure

Unit II: Process Management **Marks:20**

Introduction to Processes (The Process Model, Process Creation, Process Termination, Process States, Implementation of Processes, Process Control Block), Threads (The Thread Model, Thread Usage, Implementing Threads, Interprocess Communication (Race Condition, Critical Section, Mutual Exclusion, Semaphores)), Process Scheduling, Synchronization, Deadlock (Conditions for Deadlock, Deadlock Modeling), Deadlock detection and Recovery, Deadlock avoidance, Deadlock prevention.

Unit III: Memory Management **Marks:12**

Memory management, Swapping, Allocation, Paging, Virtual Memory, Page replacement, Segmentation, TLB

Unit IV: Input/Output **Marks:10**

I/O Systems overview, Principles of I/O hardware (I/O devices, Device Controllers, Direct Memory Access), Clocks and Timers, I/O scheduling

Unit V: File Systems **Marks:10**

File System Structure, Layout (Implementing files, Implementing directories), File allocation, Free-Space Management

PART-B **Practical (PR:3.5)**

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50

(In Semester Evaluation –20 & End Semester Evaluation-30)

- Introduction to Linux
- File systems
- Simple Linux commands
- Shell programming
- Programming on process management

Text Books:

1. Stallings W., "*Operating systems"* 2/e, Prentice Hall, 1995.
2. Silberschatz A., Galvin P.B, "*Operating System Concepts"* 5/e, Addison-Wesley Publishing Company, 1998.
3. Deitel H.M., "*Operating System"* 2/e Addison-Wesley Publishing Company 1990.

Reference Books:

1. Tanenbaum A.S., "*Modern Operating Systems"*, 2/e, Prentice Hall of India, New Delhi, 2002.
2. Chandra P., Bhatt P., "*An Introduction to Operating Systems Concept"*, Prentice Hall of India,2006.

Discussion:

1. Operating System concepts
2. Process Management
3. Conditions for deadlock, recovery of deadlock and deadlock avoidance

4. I/O scheduling, Device Controller, DMA
5. File allocation and Free Space Management

Course No:4.1	Course Name: Introduction to Artificial Intelligence	Credits			
		L-2	T-1	P-0	Total-3

Objective:

The course is designed with an objective to

- Discuss about Artificial Intelligence and its importance.
- Explain Problems and Heuristic Searches.
- Illustrate Knowledge representation and Predicate logic.

Learning Outcome:

On completion of the course, students will be able to:

- Identify different types of AI agents.
- Apply various AI search algorithm
- Comprehend fundamentals of knowledge representation
- Apply predicate logic

PART-A : Theory (TH:4.1)

Total Marks: 100
(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit I: Overview of A.I: **Marks 12**
Introduction to AI, Importance of AI, AI and its related field (Machine Learning), AI techniques, Criteria for success.

Unit II: Problems, problem space and search: **Marks 12**
Defining the problem as a state space search, Production system and its characteristics, Issues in the design of the search problem.

Unit III: Heuristic search techniques : **Marks 12**
Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction.

Unit IV: Predicate Logic : **Marks 12**
Representing Simple Facts in logic, Representing instances and is_a relationship, Computable function and predicate.

Unit V: Knowledge Representation: **Marks 12**
Definition and importance of knowledge, Knowledge representation, Various approaches used in knowledge representation, Issues in knowledge representation.

Text Books:

4. David W. Rolston, “Principles of Artificial Intelligence and Expert System Development”, McGraw Hill, 2012.
5. Elaine Rich, Kevin Knight : “Artificial Intelligence”, Tata McGraw Hill, 2013.

Reference Books:

1. D.W. Patterson, "Introduction to AI and Expert Systems", PHI, 2012.
2. Nils J Nilsson ,"Artificial Intelligence -A new Synthesis" ,2nd Edition , Harcourt Asia Ltd. ,2011.

Discussion:

- **AI general problem solving**
- **Fundamentals of AI Searches**
- **Basics of Knowledge Representation**
- **Basics of Logic**

Course No: 4.2	Course Name: Database Management System	Credits			
		L: 3	T:0	P:0	Total: 3

Objective:

The course is designed with an objective to

- Construct simple and moderately advanced database queries using Structured Query Language (SQL)
- Apply logical database design principles, including E-R diagrams and database normalization.

Learning Outcomes:

On completion of this course, the student will be able to:

- Describe the principles of the relational database Access
- Define and manipulate data using SQL
- Construct and normalize conceptual data models.

PART-A Theory (TH:4.2)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation-60)

Unit I: Database System Concepts and Architecture **Marks:10**

Data models: Network data model, hierarchical data model, schemas and instances, DBMS architecture, database languages and interfaces, classification of DBMS, Three schema architecture, DBA

Unit II: Data Modeling Using E-R Model: **Marks:10**

E-R model concept, E-R diagram

Unit III: Relational Data Models: **Marks:20**

Relational model concepts, relational model constraints, update operations on relations, defining relations, Relational algebra, Relational database languages: SQL

Unit IV: Database Design: **Marks:10**

Functional dependencies and normalization for relational database

Unit V: Transaction Processing Concept: **Marks:10**

Introduction, transaction and system concept, properties, schedules and recoverability, serializability of schedules, Concurrency control, error recovery and security.

PART-A Practical (PR:4.2)

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50

(In Semester Evaluation –20 & End Semester Evaluation-30)

- Retrieving, Updating, Inserting Data, Deleting Data from Table
- Sorting and Grouping Data
- Joining Tables
- Using Views
- Grant and Revoke

Text Books:

1. Elmasri R, Navathe S.B., "*Fundamentals of Database Systems"*, Benjamin Cummings Publishing Company, 7th edition, 2015.
2. Silberschats, Korth and Sudershan, "*Principles of Database Systems*", McGraw Hill Publication, 2011.

Reference Books:

1. Ramakrishnan R., Gehrke J., "*Database Management System"*, second edition, McGraw-Hill (IE), 3rd edition, 2014
2. C.S.R. Prabhu, " *Object Oriented Database System:* Approaches and Architecture", Prentice Hall, 3rd edition, 2010

Discussion:

- E-R Modeling
- SQL and Relational Algebra
- Transaction Processing

Course no:4.3	**Course Name:** **Data Communication and Computer Network**	**Credits**			
		L: 3	T:1	P: 0	Total: 4

Objective:

The course is designed with an objective to

- Introduce Data Communications and Computer Networks.
- Enable students to design and deployment of networks.

Prerequisite:

Course : Nil

Learning Outcome:

On completion of the course, students will be able to:

- Describe various concepts of data communication and computer networks.
- Illustrate the Layers of ISO/OSI and TCP/IP reference model.
- Design , install and deploy networks

PART-A Theory (TH:4.3)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit I: **Marks:14**

Introduction to computer networks, analog and digital transmission, parallel and serial communication, Asynchronous and synchronous communication, modes of communication: simplex, half duplex & full duplex. Multiplexing,

Transmission media: guided and unguided media

Types of networks, Network topologies, Network reference models.

Unit II: **Marks: 14**

Switching technologies,
Error control & detection mechanisms.
Data link layer : flow control and access protocol, MAC

Unit III: **Marks: 22**

Network layer : Routing protocols, Internet protocol, IP addresses.
Transport layer : TCP & UDP

Unit IV: **Marks:10**

Presentation layer : Character code translation, Data conversion, Data compression, Data encryption.

Application layer : Resource sharing ,Remote file access, Remote printer access, Inter-process communication, Directory services, Electronic messaging (such as mail),Network virtual terminals

Part-B Practical (PR:4.3)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total Marks: 50
(In Semester Evaluation –20 & End Semester Evaluation –30)

- LAN setup
- Network Configuration and Settings
- Network Management

Text Books

1. Tenanbaum A.S., "*Computer Networks*", Pearson Education Asia, 4th Ed., 2011.
2. Behrouz A. F, "*Data Communication and Networking*",Tata Mc Graw Hill, 6th edition,2014

Reference Books

1. Bhusan T," *Data Communication and Networks* ",Oxford University Press 1st Edition, 2016
2. William S, "*Data and computer communications*", Pearson education Asia, 7th Edition , 2011.

Discussion

- Application : FTP, Telnet , Internet
- Hands on practice to develop small application with the available lab devices

Course no: 4.4	**Course Name:** **Scientific Computing using Mathematical Software**	**Credits**			
		L: 2	T: 0	P:0	Total:2

Objective:

This course is designed with an objective to

- Introduce numerical techniques that can be used on computers.
- Make the students develop computer programs.
- Interpret the reliability of numerical results,
- Explain the possible uses of numerical methods, matrices .

Learning Outcomes:

On completion of the course the student will be able to

- Develop numerical methods that account for accuracy, convergence and stability.
- Design algorithms to solve numerical problems.
- Develop codes for numerical methods.

PART-A Theory (TH:4.4)

Total Marks: 50

(In Semester Evaluation **–**20 & End Semester Evaluation –30**)**

Unit I – Matlab Basics **Marks:10**

Introduction, Syntax, Variables, Commands, M-Files, Data Types, Operators, Accessing elements of Arrays.

Unit II– Functions and Loops **Marks:10**

Mathematical functions, Creating and Scripts and functions, Looping structure.

Unit III – Root Finding **Marks:10**

Iterative methods – bisection, false-position, Newton- Raphson; Roots of a Polynomial.

Unit IV – Interpolation **Marks:10**

Newton's Forward Differences and Lagrange's Polynomials-Linear interpolation.

Unit V – Matrices **Marks:10**

Initializing matrices within MATLAB, Matrix operations and functions, Operations on elements of Matrices.

PART-B Practical (PR 4.4)

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total marks:50

(In Semester Evaluation –20 & End Semester Evaluation –30)

- Solving Mathematical Problems using Matlab

Text Books:

1. Chapra S. C., Canale R.P., " *Numerical Methods for Engineers"*,6th Edition, McGraw Hill Higher Education,2009.
2. Bansal R.K., Goel A.K., Sharma M.K., *"Matlab and its applications in Engineering"* Kindle Edition, Pearson, 2009.

Reference Books:

1. Haribhaskaran G., *"Numerical Methods",* 2nd edition, Laxmi Publications, 2011.
2. T. Sauer., " *Numerical Analysis",*2nd Edition, Pearson New International Edition,2013.

Course Code: 5.1	Course Name: Introduction to Computer Graphics	Credits			
		L: 2	T: 1	P: 0	Total:3

Objective:

The Course is design with an objective to:

- Discuss different graphics packages, demonstrate functionality of display devices.
- Explain all aspects of computer graphics including hardware, software and applications.
- Illustrate how an animation is created.
- Write program functions in C to implement different graphics primitives

Prerequisites:

- Basic knowledge of display devices

Learning outcome:

On completion of this course students will able to:

- Develop graphical algorithm to design different graphical pattern
- Design simple graphical pattern using C
- Resolve programming problem using graphics packages.

PART-A Theory (TH:5.1)

Total Marks: 100

(In semester evaluation 40 & End semester evaluation 60)

Unit I: *Introduction* **Marks: 15**

Overview of graphics system: Video display devices, input devices, hard copy devices, graphics software , color look - up tables, Pointing and positioning devices (cursor, light pen, digitizing tablet, the mouse , track balls)

Unit II: *Output primitives* **Marks: 15**

Points and lines, line drawing algorithms, circle and ellipse generating algorithms

Unit III: *Geometrical transformations* **Marks: 15**

Basic transformations, translations, rotation and scaling, viewing Clipping Operations: Point clipping, line clipping ,Text clipping.

Unit IV: Animation and Multimedia **Marks: 15**

Introduction to computer animation and virtual reality

Introduction to multimedia and its components, Basic concept of Image, Different multimedia components and file formats, Animation components, morphing and application, Graphics tools, image editing tools.

Text Books:

3. *Hearn D and Baker M.P. ,"Computer Graphics" , PHI 2/e, 2011*
4. *Godse, A. P.* "*Computer Graphics And Multimedia (English)", Technical Publication ,1st Edition* ,2011

Reference Books:

1. *Chopra* R*," Computer Graphics", Kindle 2nd Edition ,2010*
2. *Harrington S,"Computer Graphics",Indian Edition,2014*

PART-B Practical (PR:5.1)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

(In semester evaluation 20 & End semester evaluation 30)

- Implement of the line ,circle drawing algorithm using "C"
- Implement of polygon and ellipse algorithms using "C"
- Implementation of clipping algorithm

Discussion:

- Functionality of Display devices
- Graphical algorithms
- 3-D and 2-D graphical representation

Course Code: 5.2	Course Name: Operations Research	Credits			
		L:2	T: 1	P:0	Total:3

Objective:

This course is designed with an objective to

- Discuss definition, scope, objectives, phases, models & limitations of operations research
- Analyze managerial problems in industry so that they are able to use resources (capitals, materials, staffing, and machines) more effectively
- Explain graphical method, simplex method and duality.
- Solve transportation problem.
- Describe how to write case study report.

Learning outcome

On completion of the course students will be able to:

- Discuss the importance and value of Operations Research and mathematical modeling involving practical problems in industry.
- Model mathematically real life managerial decision making problems.
- Use computer tools to solve a mathematical model for a practical problem.
- Construct case study report.

PART-A Theory (TH:5.2)

Total Marks: 100

(In Semester Evaluation **–**40 & End Semester Evaluation –60**)**

Unit I Model Formulation **Marks: 12**

Introduction, Structure and assumption of an Linear Programming problem(LP), General mathematical model of linear programming problem.

Unit II Graphical Solution Method **Marks: 12**

Introduction, Definitions, graphical solution method of an LP problem, multiple optimal solution, unbounded solution, Infeasible solution.

Unit III Simplex Method **Marks: 12**

Introduction, standard form of LP problem, simplex algorithm (maximization case), Simple

Algorithm (Minimization case), multiple Optimal solution, Unbounded Solution

Unit IV Duality **Marks: 12**

Introduction, Formulation of dual linear problem, standard results on duality, advantage of duality.

Unit V Transportation Problem **Marks: 12**

Introduction, Loops in transportation table and their properties, transportation method, Linear programming formulation of the transportation problem.

PART-B Practical (PR 5.2)

Credit			
L:0	**T:0**	**P:2**	**Total:1**

Total marks:50

(In Semester Evaluation –20 & End Semester Evaluation –30)

- Computer application of Operations Research methods
- Case studies.

Text Books:

1. Sharma K. J., "*Operation Research – Theory and Application", 3rd Edition,* MacMillan India Ltd.2014.
2. Havinal V. "*Introduction to Operations Research"*, 1st Edition, New Age International Publishers.2012

Reference Books:

1. Bronson R., *Operation Research*; 2nd Edition, McGraw Hill.1997.
2. Sharma K.J., " *Operation Research: Problems and Solutions",*3rd Edition, Macmillan Publishers ,2016.

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Course Code:	Course Name:	Credits			
5.3	**Internet & Web Programming Technology**	L:2	T: 1	P:0	Total:3

Objective: The course is designed with an objective to

- Design a webpage using HTML and CSS.
- Make an interactive webpage using JavaScript.
- Use Server side scripting language to make a dynamic webpage.

Learning Outcome: On completion of the course, students will be able to:

- Design dynamic and interactive web pages by embedding Java Script code in HTML and using Java Script to validate user input.
- Apply CSS in WebPages.
- Recognize the HTML and XML DOM.
- Create website using Server Side Scripting language.
- Apply AJAX in WebPages.

PART-A Theory (TH:5.3)

Total Marks: 100
(In semester evaluation 40 & End semester evaluation 60)

Unit 1: Introduction to Internet **Marks: 12**

History of Internet, Structure of Internet (include client server architecture), Internet Terminologies (www, URL, search engine, bandwidth, browser, cookies, domain name service, IP address, website and its components, telnet etc.), protocols, types of protocols(http, https, ftp).

Unit 2: DOM & XML **Marks: 12**

Introduction to Document Object Model(DOM),hierarchy of objects in DOM. Introduction to XML. Applications of XML.

Unit 3: HTML & CSS **Marks:12**

Introduction to HTML. Webpage Elements, attributes, heading, paragraphs, images, tables, lists, forms. Basic of CSS, Add style to document, Creating Style sheet rules, Style sheet properties, Font, Text, List, Color and background color, Box, Display properties.

Unit 4: Introduction to Client-Side Scripting language **Marks: 12**

Introduction to Client side scripting language, Javascript, Advantage of Javascript, Javascript Syntax, Datatype, Variable, Array, Operator and Expression, Loop, Function, Dialog box, event handling using javascript, form validation. Introduction to Ajax and VB Script.

Unit 5:Introduction to Server-Side Scripting language **Marks: 12**

Introduction to Server side scripting language, Introduction to ASP, JSP, PHP. Development of WebPages using javascript and any one server side scripting language.

Text Books:

1. Hahn, H, "*The Internet Complete Reference*", Mcgraw-Hill Osborne Media,2nd Edition,2002
2. Roy U.K ,"*Web Technologies*", Oxford University Press,1st edition, 2010.

Reference Books:

1. Robin N, *"Learning PHP, MySQL & JavaScript with jQuery, CSS & HTML5*",O'Reilly,2014,4th Edition.
2. Phillip H,"*JSP 2.0: The Complete Reference*", Mcgraw Hill.2nd Edition,2003.
3. Bill E, Scott H, Farhan M, *"Professional ASP.NET 2.0*",4th Edition,2005.

Part B(Practical) PR:5.3

Credit			
L:0	**T:0**	**P:4**	**Total:2**

Total Marks: 50

(In semester evaluation 20 & End semester evaluation 30)

- Design dynamic and interactive web pages to validate user input.
- Apply CSS,Ajax in WebPages.
- Apply PHP in a webpage.

Discussion:

Emphasis should be given on designing web pages uding JavaScript and any one server side scripting language.

Course no:	Course Name:	Credits			
TH:5.4	**Cloud Computing**	L: 2	T:1	P: 0	Total: 3

Objective:

The course is designed with an objective to

- To introduce the broad perceptive of cloud architecture and model
- To understand the concept of Virtualization.
- To be familiar with the lead players in cloud.
- To understand the features of cloud simulator
- To apply different cloud programming model as per need.
- To be able to set up a private cloud.
- To understand the design of cloud Services.
- To learn to design the trusted cloud Computing system

Learning Outcome:

On completion of the course, students will be able to:

- Compare the strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Apply suitable virtualization concept.
- Choose the appropriate cloud player.
- Choose the appropriate Programming Models and approach.
- Address the core issues of cloud computing such as security, privacy and interoperability Design Cloud Services
- Set a private cloud

PART-A Theory (TH:5.4)

Total Marks: 100

(In Semester Evaluation –40 & End Semester Evaluation –60)

Unit I : Cloud Architecture And Model **Marks:12**

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

Unit II: Virtualization **Marks:12**

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

Unit III: Cloud Infrastructure **Marks:12**

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources.

Unit IV : Programming Model **Marks:12**

Parallel and Distributed Programming Paradigms – MapReduce , Twister and Iterative MapReduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, OpenStack, Aneka, CloudSim

Unit V : Security In The Cloud **Marks:12**

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

Text Books

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

Reference Books

1. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", TMH, 2009.
2. Kumar Saurabh, " Cloud Computing – insights into New-Era Infrastructure", Wiley India,2011

PART- A (MAJOR PROJCT)						
TH No.	Subject	Project Work	Viva-Voce	Presentation/ Report	Total	Credit
TH 6.1	Major Project	200	50	50	300	20