ARYAVART INTERNATIONAL UNIVERSITY

Tilthai, Dharmanagar, North Tripura-799250

Syllabus for B Tech (CSE)

Semester 1

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24EG101	Engineering Physics	3	1	0	4	70	30	0	100
24EG102	Engineering Mathematics	3	1	0	4	70	30	0	100
24CS102	C Programming	3	1	0	4	70	30	0	100
24EN102	Business Communication	3	1	0	4	70	30	0	100
24CS101	Fundamentals of IT	4	0	0	4	70	30	0	100
Practical									
24EG191	Engineering Physics Lab	0	0	2	2	0	30	70	100
24CS192	C Programming Lab	0	0	2	2	0	30	70	100
	Total				**24**	**350**	**210**	**140**	**700**

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Detailed Syllabus

ENGINEERING PHYSICS

Code: 24EG101
Max Marks: 70

Course Objectives: This course is designed with some fundamental principle, laws and information to help the students to apply the basic concepts of physics to solve engineering problems. The study of basic principles and concepts of motion, light, electricity, and modern physics will help in understanding the technology courses where emphasis is on the applications of these principles in engineering and technology.

UNIT I **(20 Hrs)**
Mechanics, waves and oscillations
Newton Laws & Equations of Motion, Momentum, Energy, Angular Momentum, Rigid Body Motion, Periodic Motion & Superposition, Free and Forced Vibrations, Resonance and Coupled Oscillators.

UNIT II **(08 Hrs)**
Concepts of Quantum Mechanics
Particle properties of waves, Wave properties of particles, Atomic Structure, Schrödinger's Equation, Particle in a Box, Finite Potential Well, Quantum Harmonic Oscillator.

UNIT III **(08 Hrs)**
Statistical Mechanics
Statistical Distributions, Maxwell-Boltzmann Statistics, Molecular energies in an Ideal Gas Quantum Statistics, Applications of Statistical mechanics.

UNIT IV **(16 Hrs)**
Optics
Wave Optics: Electro Magnetic Radiation and Electro Magnetic Spectrum, Super Position of Waves, Refraction, Reflection, Interference, Diffraction and Polarisation.
Lasers: Characteristics of LASER, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and their significance. Meta-stable State, Pumping, Population Inversion. Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.
Fibre Optics: Principle and construction of optical fibre, Acceptance Angle and Numerical Aperture, Classification of Optical Fibres, Attenuation in Optical Fibers (scattering, absorption and bending losses) Applications of Optical Fibres.

UNIT V **(08 Hrs)**
Semiconductors and Semiconductor devices
Semi-conductors Fermi Level in Intrinsic and Extrinsic Semi-conductors. Carrier concentration of Intrinsic Semi-conductor. Carrier concentration of Extrinsic Semi-conductor (qualitative).
Semiconductor devices - Formation of a PN Junction and working of a PN Junction diode, Energy band Diagram of open circuited PN Diode, I-V Characteristics of PN Junction diode. Applications: LED, Solar Cell and Photo diode.

Text Book:

1. B.K. Pandey & S. Chaturvedi, "Engineering Physics", Cengage Learning.
2. Avadhanulu M. N., Kshirsagar P. G, "A text book of Engineering Physics", S Chand publications Pvt. Ltd, 2014.
3. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford Higher Education press, 2015.

Reference Books:

1. P. K. Palanisamy, "Engineering Physics", Sitech Publications.
2. Charles Kittel, "Introduction to Solid State Physics", John Wiley Publisher.
3. A.S. Vasudeva, "Modern engineering Physics", S Chand.
4. Dekker, "Solid State Physics".

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ENGINEERING MATHEMATICS

Code: 24EG102
Max Marks: 70

Course Objectives: The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course. The skills derived from the course will help the student from a necessary base to develop analytic and design concepts and also to understand the most basic numerical methods to solve simultaneous linear equations.

UNIT I **(12 Hrs)**
Matrices: Rank of a matrix by echelon form, system of homogeneous and non-homogeneous linear equations. Eigen values, Eigen vectors of Matrices, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem.

UNIT II **(12 Hrs)**
Quadratic forms: Symmetric matrix, Orthogonal matrices, Diagonalisation of a matrix by orthogonal process. Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation.

UNIT III **(12 Hrs)**
Mean value theorems: Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof); Properties and Problems.

UNIT IV **(12 Hrs)**
Multivariable calculus: Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT V **(12 Hrs)**
Multiple integrals: Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves. Evaluation of triple integrals, change of variables between Cartesian and spherical polar co-ordinates.

Text Book:
1. E. Kreyszig, "Advanced engineering mathematics", John Wiley & Son's publishers, new edition.
2. B. S. Grewal, "Higher engineering mathematics", Khanna publishers, new edition.

Reference Books:
1. R. K. Jain and S. R. K. Iyengar, "Advanced Engineering Mathematics", 3/e, Alpha Science International Ltd., 2002.
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas, "Calculus", 13/e, Pearson Publishers, 2013.
3. Glyn James, "Advanced Modern Engineering Mathematics", 4/e, Pearson publishers, 2012.

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C PROGRAMMING

Code: 24CS102
Max Marks: 70

Course Objectives: The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

UNIT I **(8 Hrs)**

Computer Programming: Basic Programming concepts, Modular programming and structured programming, Problem solving using Computers, Concept of flowcharts and algorithms.
Overview of C: Introduction, Importance of C, Sample C Programs, Basic structure of C programs, Programming style, executing a C Program.
Constants, Variables and Data types: C Tokens, keywords, and identifiers, constants, variables, datatypes, declaration of variables, assigning values to variables, defining symbolic constants.
Operators and Expressions: Arithmetic operators, Relational operators, Logical operators, Assignment operators, increment and decrement operators, conditional operator, bitwise operators, type conversion in expressions, operator precedence and associability.
Mathematical functions.

UNIT II **(12 Hrs)**

Input and Output statements, reading a character, writing a character, formatted input, formatted output statements.
Decision-making, Branching and Looping: Decision making with IF statement, simple IF statement, The IF-ELSE statement, nesting of IF.. ELSE statements, The ELSE -IF ladder, The switch statement, The?: operator, The GOTO statement, The WHILE statement, The DO statement, The FOR statement, jumps in loops.

UNIT III **(10 Hrs)**

Arrays: one dimensional array, Two-dimensional arrays, initializing arrays, Programs based on arrays such as sorting, Fibonacci sequence, matrix operations, etc.
Handling of Characters and Strings: Declaring and initializing string variables, reading string from terminal, writing string to screen, arithmetic operations on characters, putting strings together. Comparison of two strings, character and string handling functions.

UNIT IV **(8 Hrs)**

User defined functions: Need for user-defined functions, a multi-functional program, the form of 'C' function, Return values and their types, calling a function, category of functions: No arguments and no return values, arguments but no return values, arguments with return values, nesting of functions, recursion, functions with arrays as parameters.

UNIT V **(5 Hrs)**

Structure and Union: Structure definition, giving values to members, structure initialization; comparison of structure variables, array of structures, array within structure, union.
Pointers: Understanding pointers, accessing the address of variables, declaring and initializing pointers, accessing a variable through its pointer.

Text Book:

1. Kamthane, “Programming with ANSI and Turbo C”; Pearson Education 2003

Reference Books:

1. E. Balaguruswamy: “Programming in ANSI C”, Tata McGraw-Hill (1998)
2. Yeshvant Kanetkar: "Let us C”
3. V. Rajaraman: “Programming in C”, PHI (EEE) (2000)
4. Rajesh Hongal: “Computer Concepts & C language”.
5. Brain Kernighan & Dennis M. Ritchie, “ANSI C Programming” (PHI).

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BUSINESS COMMUNICATION

Code: 24EN102
Max Marks: 70

Course Objectives: This course is designed to give students a comprehensive view of communication, its scope and importance in business and the role of communication in establishing a favourable outside the firm environment, as well as an effective internal communications program. The Business Communications course will prepare future entrepreneurs to create effective business communications, present business briefings, produce understandable business documents and examine the impact of the communications process on the business operation.

UNIT I **(10 Hrs)**

Concepts and Fundamentals: Introduction to Technical Communication, Need and importance of communication, channel, Distinction between general and technical communication, nature and features of technical communication, Seven Cs of communication, Types of Technical communication, style in technical communication, technical communication skills, Language as a tool of Communication, History of development of Technical Communication, Computer Aided Technical Communication

UNIT II **(12 Hrs)**

Oral Communication: Principles of effective oral communication, Introduction of Self and others, Greetings, Handling Telephone Calls Interviews: Meaning & Purpose, Art of interviewing, Types of interview, Interview styles, Essential, Techniques of interviewing, Guidelines for Interviewer, Guidelines for interviewee. Meetings: Definition, Kind of meetings, Agenda, Minutes of the Meeting, Advantages and disadvantages of meetings/ committees, Planning and organization of meetings. Project Presentations: Advantages & Disadvantages, Executive Summary, Charts, Distribution of time (presentation, questions & answers, summing up), Visual presentation, Guidelines for using visual aids, Electronic media (power-point presentation). The technique of conducting Group Discussion and JAM session.

UNIT III **(12 Hrs)**

Written Communication: Overview of Technical Writing: Definition and Nature of Technical Writing, Basic Principles of Technical Writing, Styles in Technical Writing.
Note-Making, Notice, E-mail Writing.
Writing Letters: Business letters, Persuasive letters- Sales letters and complaint letters Office memorandum, Good news and bad news letters.
Report Writing: Definition & importance; categories of reports, Elements of a formal report, style and formatting in report.
Special Technical Documents Writing: Project synopsis and report writing, Scientific Article and Research Paper writing, Dissertation writing: Features, Preparation and Elements.
Proposal Writing: Purpose, Types, characteristics and structure.
Job Application: Types of application, Form & Content of an application, drafting the application, Preparation of resume.

UNIT IV **(10 Hrs)**

Soft Skills: Business Etiquettes – Professional Personality, Workplace Protocols, Cubicle. Non-Verbal Communication: Kinesics and Proxemics, Paralanguage.
Inter-personal Skills.
Language Skills: Improving command in English, improving vocabulary, choice of words, Common problems with verbs, adjectives, adverbs, pronouns, tenses, conjunctions, punctuations, prefix, suffix, idiomatic use of prepositions. Sentences and paragraph construction, improve spellings, common errors and misappropriation, Building advanced Vocabulary (Synonyms, Antonyms), introduction to Business English.

Text Book:

1. Kavita Tyagi and Padma Misra , "Advanced Technical Communication", PHI, 2011
2. P. D. Chaturvedi and Mukesh Chaturvedi, "Business Communication – Concepts, Cases and Applications", Pearson, second edition.
3. Rayudu, "C.S- Communication", Himalaya Publishing House, 1994.
4. Asha Kaul , "Business Communication", PHI, second edition.

Reference Books:

1. Raymond Murphy, "Essential English Grammar- A self study reference and practice book for elementary students of English" , Cambridge University Press, second edition.

2. Manalo, E. & Fermin, V. (2007). Technical and Report Writing. ECC Graphics. Quezon City.
3. Kavita Tyagi and Padma Misra , "Basic Technical Communication", PHI, 2011.
4. Herta A Murphy, Herbert W Hildebrandt and Jane P Thomas, "Effective Business Communication", McGraw Hill, seventh edition.

FUNDAMENTALS OF IT

Code: 24CS101
Max Marks: 70

Course Objectives: The main objective is to introduce IT in a simple language to all undergraduate students, regardless of their specialization. It will help them to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. The focus of the subject is on introducing skills relating to IT basics, computer applications, programming, interactive Medias, Internet basics etc.

UNIT I **(12 Hrs)**
Fundamentals of Computers: Definition and Characteristics of Computer System. Computer Generation from First Generation to Fifth Generation. Classifications of Computers: Micro, Mini, Mainframe and super computers.
Computer Hardware: Major Components of a digital computer, Block Diagram of a computer, Input-output devices, Description of Computer Input Units, Output Units, CPU.
Computer Memory: Memory Hierarchy, Primary Memory – RAM and its types, ROM and its types, Secondary Memory, Cache memory. Secondary Storage Devices - Hard Disk, Compact Disk, DVD, Flash memory.

UNIT II **(12 Hrs)**
Interaction with Computers: Computer Software: System software: Assemblers, Compilers, Interpreters, linkers, loaders.
Application Software: Introduction to MS Office (MS-Word, MS Power point, MS-Excel).
Operating Systems: Elementary Operating System concepts, Different types of Operating Systems.
DOS: Booting sequence; Concepts of File and Directory, Types of DOS commands.
Computer Languages: Introduction to Low-Level Languages and High-Level Languages.

UNIT III **(12 Hrs)**
Computer Number System: Positional and Non-positional number systems, Binary, Decimal, Octal and Hexadecimal Number Systems and their inter-conversion.
Binary Arithmetic: Addition, subtraction, multiplication and division. Use of complement method to represent negative binary numbers, 1's complement, 2's complement, subtraction using 1's complement and 2's complement. Introduction to Binary Coded Decimal (BCD), ASCII Codes, EBCDIC codes.

UNIT IV **(10 Hrs)**
Computer Network & Internet: Basic elements of a communication system, Data transmission modes, Data Transmission speed, Data transmission media, Digital and Analogue Transmission, Network topologies, Network Types (LAN, WAN and MAN), Basics of Internet and Intranet.
Internet: Terminologies related to Internet: Protocol, Domain name, Internet Connections, IP address, URL, World Wide Web. Introduction to Client-Server Model, Search Engine, Voice over Internet Protocol (VOIP), Repeater, Bridge, Hub, Switch, Router, Gateway, Firewall, Bluetooth technology.
Advanced Trends in IT Applications: Brief Introduction to Cloud Computing, Internet of Things, Data Analytics, AI and Machine Learning.

Text Book:
1. P. K. Sinha & Priti Sinha, "Computer Fundamentals", BPB Publications, 1992.
2. Anita Goel "Computer Fundamentals", Pearson.

Reference Books:
1. B. Ram, "Computer fundamentals: Architecture and Organization", New Age Intl.
2. Alex Leon & Mathews Leon, "Introduction to Computers", Vikas Publishing.
3. Norton Peter, "Introduction to computers", 4th Ed., TMH, 2001.
4. Vikas Gupta, "Comdex Computer Kit", Wiley Dreamtech, Delhi, 2004.

ENGINEERING PHYSICS LAB

Code: 24CS191
Max Marks: 70

(BASED ON 24EG101) Engineering Physics:
Concepts of Experimental Physics

1. Error-Analysis and Drawing Graph.

Mechanics - waves and Oscillations

1. Compound Pendulum.
2. Estimation of the moment of inertia of a Fly wheel.
3. Estimation of the Young's modulus of a steel wire using a torsion pendulum.
4. Melde's Experiment.
5. Resonance in LCR Circuits.

Optics

1. Determine the thickness of the wire using wedge shape method.
2. Determination of the radius of curvature of the lens by Newton's ring method.
3. Determination of wavelength by plane diffraction grating method.
4. Determination of dispersive power of prism.
5. Determination of wavelength of LASER light using diffraction grating.
6. To determine the numerical aperture and acceptance angle of a given optical fibre.

Semiconductor Physics

1. Energy Gap of a semi-conductor.
2. I-V Characteristics (Resistor, Diode, Solar Cell, LDR).

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C PROGRAMMING LAB

Code: 24CS192
Max Marks: 70

(BASED ON 24CS102) C Programming:
Core Practical (Implement minimum 8 out of 10 practical)

1. Write a program to convert temperature from Celsius to Fahrenheit by taking input from the user.
2. Write a program to find the greatest number among 3 numbers given by the user.
3. Write a program to check if a given number is a prime number or not.
4. Write a program to display the following pattern up to N rows, taking the value of N from the user:

```
1
2   3
4   5   6
7   8   9   10
```

5. Write a program to input marks of 50 students using an array and display the average marks of the class.
6. Write a program to search for a number entered by the user in a given array and display the array in ascending order.
7. Write a program to check if a string is palindrome or not.
8. Write a program to add, subtract, multiply and divide two numbers using pointers.
9. Write a program to create a structure for employees containing the following data members: Employee ID, Employee Name, Age, Address, Department and Salary. Input data for 10 employees and display the details of the employee from the employee ID given by the user.
10. Write a program to create two files with names Even File and Odd File. Input 20 numbers from the user and save even numbers in Even File and odd numbers in Odd File.

Application Based Practical (Implement minimum 5 out of 10 practical)

1. Write a menu driven program to construct a calculator for following arithmetic operations: addition, subtraction, multiplication, division, average and percentage.
2. Write a menu driven program to perform the following operations:
   (i) Print Armstrong numbers up to N,
   (ii) Display prime numbers between 1 to N,
   (iii) Reverse of an integer
3. Write a program to convert a hexadecimal number into a binary number.
4. Write a program to calculate factorial of a number and display fib on acci series up to N terms using recursive functions.
5. Write a program to perform
   (i) Matrix addition,
   (ii) matrix multiplication, and
   (iii) Matrix transpose on 2D arrays.
6. Write a program to make use of arrays with structures in the following ways:
   (i) Use array as a structure data member
   (ii) Create array of structure variables
7. Write a program to compare the contents of two files by taking names of the files through command line arguments.
8. WAP to perform I/O and make use of file positioning functions on Binary files. (using fseek, ftell, rewind functions).
9. Write a menu driven program to implement the following string operations:
   (i) Calculate length of a string
   (ii) Concatenate at the end of a given
   (iii) Copy one string to another
   (iv) Compare contents of two strings
   (v) Copy nth character string to another
10. Write a program to read time in string format and extract hours, minutes and second also check time validity.

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add program as per the requirement of the course.**

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal:30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal:30 Marks

External (Two programs): 70 Marks

- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks

- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

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Syllabus for B Tech (CSE)

Semester 2

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24CS302	Computer Organization and Architecture	3	1	0	4	70	30	0	100
24CS301	Object Oriented Programming with C++	4	0	0	4	70	30	0	100
24CS201	Data Structure and Algorithm Using 'C'	3	1	0	4	70	30	0	100
24CS321	Basics of Python Programming	4	0	0	4	70	30	0	100
24GN401	Indian Constitution	2	0	0	2	70	30	0	100
Practical									
24CS391	C++ Lab	0	0	2	2	0	30	70	100
24CS392	Python Programming Lab	0	0	2	2	0	30	70	100
	Total				**22**	**350**	**210**	**140**	**700**

Detailed Syllabus

COMPUTER ORGANIZATION AND ARCHITECTURE

Code: 24CS302

Max Marks: 70

Course Objectives: The course objectives of *Computer Organization and Architecture* are to discuss and make student familiar with the Principles and the Implementation of Computer Arithmetic, Operations of CPU including RTL, ALU. It also focuses on Instruction Cycle and Busses, Fundamentals of different Instruction Set Architectures and their relationship to the CPU Design, Memory System and I/O Organization and Principles of Multiprocessor Systems.

UNIT I (11 Hrs)

Boolean Algebra and Logic: Basics Laws of Boolean Algebra, Logic Gates, Simplifications of Boolean equations using K-maps SOP and POS, Don't Care condition.

Arithmetic Circuits: Adder, Subtractor, Parallel binary adder/Subtractor.

UNIT II (11 Hrs)

Combinational Circuits: Multiplexers, De-Multiplexers, Decoders, Encoders.

Flip-flops: S-R, D, J-K, T, Clocked Flip-flop, Race around condition, Master slave Flip-Flop, Realisation of one flip-flop using other flip-flop, Applications of flip flop: Latch, Registers, Counters (elementary treatment to be given).

UNIT III (11 Hrs)

Data Transfer Operations: Register Transfer, Bus and Memory Transfer, Registers and micro-operations.

Basic Computer Organizations and Design: Instruction Codes, Computer Registers, Instruction Cycle, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes.

UNIT IV (11 Hrs)

Input-Output Organization: Peripheral Devices, Input-Output Interfaces, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA).

Memory Organization: Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Text Book:

1. Morris Mano, Computer System Architecture, 3rd Edition, Prentice-Hall of India Private Limited, 1999.
2. Moris Mano, "Digital Logic and Computer Design", PHI Publications, 2002

Reference Books:

1. R. P. Jain, "Modern Digital Electronics", TMH, 3rd Edition, 2003.
2. WIliam Stallings, "Computer Organization and Architecture", 4th Edition, Prentice Hall of India Private Limited, 2001
3. Subrata Ghosal, "Computer Architecture and Organization", Pearson 2011.
4. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers", McGraw Hill.

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OBJECT ORIENTED PROGRAMMING WITH C++

Code: 24CS301

Max Marks: 70

Course Objectives: The objectives of the course are to have students identify and practice the object-oriented programming concepts and techniques, practice the use of C++ classes and class libraries, arrays, vectors, inheritance and file I/O stream concepts.

UNIT I (10 Hrs)

Object Oriented Paradigm: Procedural vs. object-oriented development, Basic concepts of object-oriented programming, Applications and benefits of OOP, Comparison between C and C++.
Beginning with C++: Stream based I/O, Literals- constant qualifiers, Operators in C++, Reference variable, Functions, Default arguments, Parameter passing by value, Reference and pointer, Inline functions, Type conversion, Basic C++ programs, New, Delete operators- basic use and dynamic memory allocation for arrays.

UNIT II (11 Hrs)

Classes and Objects: C++ class declaration, Access specifiers, Member functions, Arrays within a class, Array of objects, Memory allocation of objects, Passing objects as arguments, Returning objects from functions, Function overloading, Static data and member functions, Friend function and friend class, This pointer.
Constructors & Destructors: Introduction to constructor and destructor, Parameterized constructor, Constructor with default arguments, Multiple constructors in a class, Copy constructor.

UNIT III (12 Hrs)

Inheritance: Types of inheritance, Derivation – public, private & protected, Ambiguity resolution (function overriding), Aggregation, Composition v/s Classification, Virtual base class, Constructor and destructor in derived classes.
Polymorphism: Types of polymorphism, early v/s late binding, Virtual Functions: Need for virtual functions, Pointer to derived class objects, Pure virtual functions, Abstract classes.
Operator Overloading: Overloading unary operators, Nameless objects, Overloading binary operators, Overloading with friend functions, Conversion between basic types and user-defined types.

UNIT IV (11 Hrs)

Parametric polymorphism: Generic Programming with Templates, Introduction, Function templates/generic functions, Characteristics, Overloading of template functions, Class templates, Template arguments.
Exception Handling: Exception-handling model, Types of exception, Catching and Handling exceptions, Generic catch, Rethrowing an exception, Specifying exceptions for a function.
Streams & Files: C++ Streams, Basic stream classes, C++ predefined streams, I/O operations, Unformatted console I/O operations, Manipulators, Opening and closing a file- different modes and methods, Error handling during file operations, File pointers and their manipulations, Sequential access to file, Random input and output operations, Persistent objects, Command line arguments.

Text Book:

1. K.R. Venugopal, Rajkumar, T. Ravishanker, “Mastering C++”, TMH
2. E. Balagurusamy, “Object Oriented Programming with C++”, McGraw-Hill Education

Reference Books:

1. Ashok N. Kamthane, “Object-Oriented Programming with ANSI And Turbo C++”, Pearson Education.
2. Schildt Herbert, “C++: The Complete Reference”, Tata McGraw Hill.
3. R. Lafore, “Object Oriented Programming using C++”, Galgotia Publications.

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DATA STRUCTURE AND ALGORITHM USING C

Code: 24CS201

Max Marks: 70

Course Objectives: The course is designed to develop skills to design and analyse simple linear and non-linear data structures. It strengthens the ability to the students to identify and apply the suitable data structure for the given real-world problem. It enables them to gain knowledge in practical applications of data structures.

UNIT I (14 Hrs)

Linear Data Structures- Static: Introduction to Algorithms- Attributes, Design Techniques, Time Space Trade Off, Data Structures, Classification and Operations of Data Structures.

Arrays: Single Dimension, Two-Dimension and Introduction to Multi Dimensions, Memory Representation, Address Calculation, Sparse Matrices- Types, Representation.

Searching and Sorting: Linear and Binary Search, Selection Sort, Bubble Sort, Insertion Sort, Merge Sort, Elementary Comparison of Searching and Sorting Algorithms.

Hashing: Hash Table, Hash Functions, and Collision Resolution.

UNIT II (10 Hrs)

Linear Data Structures- Dynamic

Introduction: Dynamic Memory Allocation, Dynamic Memory versus Static Memory Allocation.

Linked List Types: Singly Linked List, Doubly Linked List, Header Linked List, Circular Linked List.

Operations: Creation, Insertion, Deletion, Modification, Searching, Sorting, Reversing, and Merging.

UNIT III (9 Hrs)

Abstract Data Types:

Stacks: Introduction, Static and Dynamic Implementation, Operations, Applications- Evaluation and Conversion between Polish and Reverse Polish Notations.

Queues: Introduction, Static and Dynamic Implementation, Operations, Types- Linear Queue, Circular Queue, Doubly Ended Queue, Priority Queue.

UNIT IV (11 Hrs)

Non Linear Data Structures:

Introduction to Graphs: Notations & Terminologies, Representation of Graphs- Adjacency Matrix, Incidence Matrix and Linked Representation.

Trees: Notations & Terminologies, Memory Representation, Binary Trees Types- Complete, Full, Strict, Expression Binary Tree, Tree Traversals (Recursive), Binary Search Tree and Basic Operations

Introduction and Creation (Excluding Implementation): AVL Tree, Heap Tree, M- Way Tree, and B Tree.

Text Book:

1. Schaum's Outline Series, "Data Structures", TMH, Special Indian Ed., Seventeenth Reprint, 2014.
2. Y. Langsam, M. J. Augenstein and A.M. Tanenebaum, "Data Structures using C and C++", Pearson Education India, Second Edition, 2015.
3. D. Samanta, "Classic Data Structures", PHI, Second Edition, 2009.

Reference Books:

1. Ashok N Kamthane "Introduction to Data Structures in C", Pearson, Third Edition, 2009.
2. E. Horowitz and S. Sahni, "Fundamentals of Data Structures in C". Universities Press, Second edition, 2008.
3. D. Malhotra and N. Malhotra, "Data Structures and Program Design using C", Laxmi Publications, Indian adapted edition from Mercury Learning and Information-USA, First edition, 2018.
4. Y. Kanetkar " Data Structures through C", BPB Publication, Third Edition, 2019.
5. R.F Gilberg, and B A Frouzan- "Data Structures: A Pseudocode Approach with C", Thomson Learning, Second Edition, 2004.

6. A. K. Rath, and A.K. Jagadev, "Data Structures and Program Design Using C", Scitech Publications, Second Edition, 2011.

BASICS OF PYTHON PROGRAMMING

Code: 24CS321
Max Marks: 70

Course Objectives: This course is designed to introduce programming concepts using Python to students. The course aims to develop structured as well as object-oriented programming skills using Python. The course also aims to achieve competence amongst its students to develop correct and efficient Python programs to solve problems spanning multiple disciplines.

UNIT I (12 Hrs)
Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT II (12 Hrs)
Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

UNIT III (12 Hrs)
Data Structures: Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions, strings and basic operations of strings.

UNIT IV (12 Hrs)
Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT V (12 Hrs)
Object Oriented Programming OOP in Python: Classes, 'self-variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding,
Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

Text Book:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

Reference Books:

1. Think Python, Allen Downey, Green Tea Press.
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

INDIAN CONSTITUTION

Code: 24GN401

Max Marks: 70

Course Objectives: The objective of the *Indian Constitution* course is to provide the students with a foundational understanding of the principles, structure, and functioning of the Indian Constitution. The course emphasizes the rights and duties of citizens, governance frameworks, and the role of the Constitution in shaping the democratic and legal structure of India.

UNIT I (07 Hours)

Introduction to Constitution: Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.

UNIT II (06 Hours)

Union Government: Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.

UNIT III (07 Hours)

State and Local Governments: State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.

UNIT IV (06 Hours)

Election provisions, Emergency provisions, Amendment of the constitution: Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.

Text Book:

1. M.V.Pylee, “Introduction to the Constitution of India”,4th Edition, Vikas publication,2005.
2. Durga Das Basu (DD Basu), “Introduction to the constitution of India”, (Student Edition), 19th edition, Prentice-Hall EEE, 2008

Reference Books:

1. Merunandan, “Multiple Choice Questions on Constitution of India”, 2nd Edition, Meraga publication, 2007

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

C++ LAB

Code: 24CS391

Max Marks: 70

(BASED ON 24CS301) Object Oriented Programming with C++

Core Practical (Implement minimum 8 out of 10 practical)

1. WAP to implement 'Inline function'.
2. WAP to implement call by reference and return by reference using class. [Hint. Assume necessary functions].
3. WAP to implement friend function by taking some real-life examples.
4. WAP to implement 'Function Overloading'.
5. WAP to implement Parameterized Constructor, Copy Constructor and Destructor.
6. WAP to show the usage of constructor in base and derived classes, in multiple inheritance.
7. WAP to show the implementation of 'containership'.
8. WAP to show swapping using template function (Generic).
9. WAP to implement 'Exception Handling'.
10. WAP to read and write values through object using file handling.

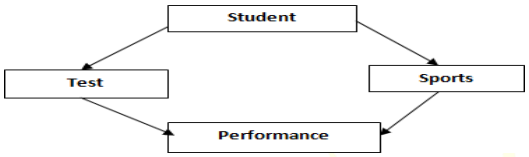
Application Based Practical (Implement minimum 5 out of 10 practical)

11. Create a class employee which have name, age and address of employee, include functions getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format:

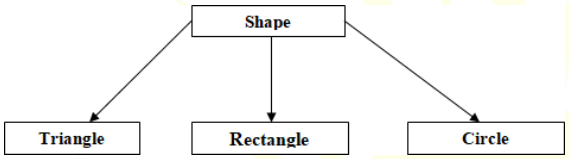
    Name:
    Age:
    Address:

12. Write a class called **C Account** which contains two private data elements, an integer **Account Number** and a floating-point **account Balance** and three member functions:
    - A constructor that allows the user to set initial values for **Account Number** and A**ccount Balance** and a default constructor that prompts for the input of the values for the above data numbers.
    - A function called **Input Transaction**, which reads a character value for **Transaction Type** ('D' for deposit and 'W' for withdrawal) and a floating-point value for **Transaction Amount**, which updates **Account Balance**.
    - A function called **Print Balance**, which prints on the screen the **Account Number** and **Account Balance.**

13. Define a class *Counter* which contains an int variable *count* defined as static and a static function Display () to display the value of *count*. Whenever an o b j e c t of this class is created *count* is incremented by 1. Use this class in main to create multiple objects of this class and display value of count each time.
14. WAP to add and subtract two complex numbers using classes.
15. Write program to overload Binary + to add two similar types of objects. (Both with and without using friend functions)
16. WAP to implement += and = operator
17. Implement the following class hierarchy considering appropriate data members and member functions:



18. Implement the following hierarchy considering appropriate data members and member functions (use Virtual functions).



19. WAP to convert meter to centimetre and vice versa, using data conversions and operator overloading
20. WAP to count digits, alphabets and spaces, stored in a text file, using streams.

Note:

1. **In total 10 practicals to be implemented. 2 additional practicals may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

PYTHON PROGRAMMING LAB

Code: 24CS391

Max Marks: 70

(BASED ON CS201) Basics of Python Programming:

1. Basics & operations

a) Running instructions in Interactive interpreter and a Python Script.

b) Write a program to purposefully raise Indentation Error and correct it.

c) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).

d) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

2. Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10.

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

3. Control Flow - Continued

a) Find the sum of all the primes below 200.

Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89,...

b) By considering the terms in the Fibonacci sequence whose values do not exceed 400, find the sum of the even-valued terms.

4. DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure

b) Write a program to use split and join methods in the string and trace a birthday with a dictionary data structure.

c) Write a program combining lists that combines these lists into a dictionary.

d) Write a program to count the frequency of characters in a given file. Can you use character frequency to tell whether the given file is a Python program file, C program file or a text file?

5. Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

6. Functions

a) Write a function ball collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

7. Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.

b) Write a function dups to find all duplicates in the list.

c) Write a function unique to find all the unique elements of a list.

8. Functions - Problem Solving

a) Write a function cumulative product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write a function to compute gcd,lcm of two numbers. Each function shouldn't exceed one line.

9. Multi-D Lists

a) Write a program that defines a matrix and prints.

b) Write a program to perform addition of two square matrices.

c) Write a program to perform multiplication of two square matrices.

10 - Modules

a) Install packages requests, flask and explore them using (pip).

b) Write a script that imports requests and fetches content from the page Eg. (Wiki).

c) Write a simple script that serves a simple HTTP Response and a simple HTML Page.

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks

10 Question (MCQ): 1 mark each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks

Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks

- **Program Writing**: 10 + 10 Marks
- **Algorithm & Flowchart** : 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)

Internal Assessment Examinations will be conducted, carrying 50 marks

- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY

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Syllabus for B Tech (CSE)

Semester 3

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24MT101	Discrete Mathematical Structure	4	0	0	4	70	30	0	100
24CS304	Design and Analysis of Algorithms	3	1	0	4	70	30	0	100
24CS401	Java Programming	4	0	0	4	70	30	0	100
24CS305	Digital Logic Design	4	0	0	4	70	30	0	100
Discipline Specific Elective (DSE-1) (Choose any one)									
24CS313	Advanced Data Structure	4	0	0	4	70	30	0	100
24CS314	Analog Circuits	4	0	0	4	70	30	0	100
24CS315	Computer Graphics	4	0	0	4	70	30	0	100
Practical									
24CS491	Java Lab	0	0	2	2	0	30	70	100
24CS395	Digital Logic Design Lab	0	0	2	2	0	30	70	100
	Total				**24**	**350**	**210**	**140**	**700**

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

Detailed Syllabus

DISCRETE MATHEMATICAL STRUCTURE

Code: 24MT101
Max Marks: 70

UNIT I (13 Hrs)

SETS: Sets, Subsets, Equal Sets, Universal Sets, Finite and Infinite Sets, Operations on Sets: Union, Intersection difference and Complements of Sets, Algebra of sets, Cartesian product, Simple applications.

RELATION AND FUNCTIONS: Properties of Relations, Equivalence Relation, Partial Order Relation, Composition of relations, and Representation of relations using digraph and Matrix, Function: Domain and Range, onto, into and One to One Functions, Composite and Inverse Functions, Hashing functions, Recursive function.

PROPOSITIONAL LOGIC: Introduction, Proposition, First order logic, Basic logical operations, truth tables, tautologies, contradictions, Algebra of Propositions, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

UNIT II (10 Hrs)

PARTIAL ORDER RELATIONS AND LATTICES: Partial Order Sets, Totally ordered set, Representation of POSETS using Hasse diagram, Chains, Maximal and Minimal elements, Greatest lower bound, least upper bound, Lattices and Algebraic Structure, Principle of Duality, Elementary Properties of Lattices, Atoms. Sub lattices, Bounded lattice, Distributed & Complemented Lattices, Isomorphic lattices. Boolean lattice.

UNIT III (11 Hrs)

COMBINATORICS: Introduction, Basic Counting Principles, Permutations, Permutations of things not all different, Circular Permutations, Combinations, Restricted Permutations and Combinations, Derangement, Pascal's Triangle, Binomial Theorem (only for natural Numbers).

RECURRENCE RELATIONS: Introduction, Order of Recurrence Relations, Degree of Recurrence Relations, Linear Homogeneous Recurrence Relations, Non Homogeneous Recurrence Relations, Solution of linear homogeneous and non-non homogeneous recurrence relations.

UNIT IV (10 Hrs)

GRAPHS: Introduction, Degree of a vertex of a graph, Handshaking Theorem, types of Graphs, sub graph, Matrix representation of a graph: adjacent and incidence matrices, Isomorphic graphs, path and circuit (Floyd's and Warshall algorithms), Connected graph, Hamiltonian graph, Euler graph, Graph colouring (Vertex, Edges and Map).

Text Book:

1. Rosen, K. H., Discrete Mathematics and its Applications, McGraw Hill Education, 8th edition 2021.
2. Kolman, Busby and Ross, "Discrete Mathematical Structures", Pearson, 10th edition 2015.
3. Babu Ram, "Discrete Mathematics", Pearson Education, 1st edition 2010.

Reference Books:

1. D. S. Malik, M. K. Sen, "Discrete Mathematics" Cengage Learning, 2012.
2. S. K. Sarkar "A Text Book of Discrete Mathematics" S. Chand Publications, 9th edition 2019.
3. Singh J. P. "Discrete Mathematics for Undergraduates" ANE Books, 1st edition, 2013.
4. Tremblay J. P. and Manohar, R., "Discrete Mathematical Structures with Applications to Computer Science" Tata McGraw Hill.

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DESIGN AND ANALYSIS OF ALGORITHMS

Code: 24CS304
Max Marks: 70

UNIT I (12 Hrs)

Introduction

Algorithm - Pseudo Code for Expressing Algorithms - Performance Analysis- Space Complexity - Time Complexity- Asymptotic Notation - Big Oh Notation - Omega Notation - Theta Notation and Little Oh Notation. - Recurrences - Substitution method, Recursion-tree method, Master method.

UNIT II (12 Hrs)

Disjoint Sets, Divide and Conquer

Disjoint Sets: Disjoint Set Operations - Union and find Algorithms.
Divide and Conquer: General Method - Applications-Binary Search – Quick Sort - Merge Sort-Strassen's Matrix Multiplication.

UNIT III (12 Hrs)

Dynamic Programming

General Method –Applications-Matrix Chain Multiplication - Optimal Binary Search Trees - 0/1 Knapsack Problem - All Pairs Shortest Path Problem - Travelling Sales Person Problem – Reliability Design Problem.

UNIT IV (12 Hrs)

Greedy Method and Backtracking

Greedy Method: General Method –Applications- Job Sequencing with Deadlines - Knapsack Problem - Minimum Cost Spanning Trees - Single Source Shortest Path Problem - Backtracking: General Method – Applications-N-Queens Problem - Sum of Subsets Problem - Graph Colouring - Hamiltonian Cycles.

UNIT V (12 Hrs)

Branch and Bound, Np-Hard and Np-Complete Problems

Branch and Bound: General Method - Applications - Travelling Sales Person Problem - 0/1 Knapsack Problem- LC Branch and Bound Solution - FIFO Branch and Bound Solution.
NP Hard and NP-Complete Problems: Basic Concepts - Non deterministic algorithms - NP – Hard and NP Complete Classes - Cook's Theorem.

Text Book:

1. Ellis Horowitz, Satraj Sahni, Sanguthevar Rajasekharan, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition, 2015.
2. 2. Alfred V. Aho, John E. Hopcroft, Jeffrey D, "The Design And Analysis Of Computer Algorithms", Pearson India, 1st Edition, 2013.

Reference Books:

1. Knuth Donald E, "Art of Computer Programming: Fundamental Algorithms Volume 1 - Fundamental Algorithms", Third Edition, Pearson Publishers, 2011.
2. Levitin A, "Introduction to the Design and Analysis of Algorithms", Pearson Education, 3rd Edition, 2012.
3. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms , Third edition, MIT Press, 2009.
4. Jon Kleinberg, Éva Tardos , Algorithm Design, Pearson education, 2014.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

JAVA PROGRAMMING

Code: 24CS401
Max Marks: 70

UNIT I (12 Hrs)

Java Basics: Java as Object-oriented Programming Language History of Java, Features of Java, Difference between Java and C++, Java Architecture (JDK, JVM, JRE), Java Tokens: Data types, Literals, Variables, Scope and lifetime of variables, Operators. Control Structures, Arrays.

Introducing Classes: Creating a Class: properties, methods and constructors. Object Access modifiers, Method Overloading, Garbage collection, this keyword, Static (variable, method, block), final keyword, Wrapper Classes, String class and methods.

UNIT II (12 Hrs)

Inheritance: Types, Super keyword, method overriding, covariant return type, abstract class.

Interfaces and Packages: Creation and implementing an interface, difference between abstract class and interface, Packages, and importing a package.

Exception Handling: Exception Class, built-in checked and unchecked exceptions, user-defined exceptions, use of try, catch, throw, throws, finally.

UNIT III (10 Hrs)

Using I/O: Elementary concepts of Input/Output, using the byte streams, reading and writing using byte streams, automatically closing a file, using the character-based streams, File I/O using character streams (using a File Writer and using a File Reader).

Multi-threaded programming: Multithreading fundamentals, Thread class, and Runnable interface, the life cycle of thread, creation of single and multiple threads, implementation of Thread methods, Synchronization (using Synchronized methods, synchronized statement).

UNIT IV (10 Hrs)

Swings Fundamentals: Components (JLabel and ImageIcon, using swing Buttons (JButton, JToggleButton, JCheckBox, JRadioButton), JTextField, JScrollPane, JList, JComboBox) and Containers, Layout managers, event delegation Model, event handling (event sources, event listeners, event classes and interfaces, adapter classes).

JDBC: JDBC Architecture, JDBC Drivers, Connection, Statement, Prepared Statement, Result set, Connecting to the Database using JDBC.

Text Book:

1. Herbert Schildt, "Java 2 -The Complete Reference" – Tata McGraw Hill Education Private Limited, 2010.
2. Trilochan Tarai, "Java Core Concepts and Applications", I.K. International Publishing house pvt. Ltd., 2015.

Reference Books:

1. E. Balaguruswamy, "Programming with Java A Primer", McGraw Hill Education Private Limited, 5th edition.
2. Herbert Schildt, Dale Skrien, "Java Fundamentals A Comprehensive Introduction" – Tata McGraw Hill Education Private Limited, 2013.
3. Cay S. Horstmann, "Core Java Volume 1 – Fundamentals", 10th edition, Pearson, 2017.
4. Ken Arnold, Davis Holmes, James Gosling, Prakash Goteti, "The Java Programming Language", 3rd edition, Pearson, 2008.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

DIGITAL LOGIC DESIGN

Code: 24CS305
Max Marks: 70

UNIT I (8 Hrs)
Number Systems and Codes: Decimal, Binary, Octal, and Hexa-decimal number systems and their conversions, ASCII code, Excess-3 code, Gray code, Complement representation of negative numbers: Signed Magnitude, One's complement method, Two's complement method, Binary Arithmetic.

UNIT II (8 Hrs)
Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 6 variables, Binary codes, Code Conversion

UNIT III (10 Hrs)
Combinational Logic Design: Analysis of combinational circuits, Design Procedure – Binary Adder, Subtractor, BCD Adder, multiplier, comparator, decoders, encoders, multiplexers, demultiplexers, Code Converters.

UNIT IV (10 Hrs)
Sequential Circuits: Latches: RS latch and JK latch, Flip-flops: RS, JK, D, T flip flops, Master-slave flip flops, Edge-triggered flip-flops. Shift registers, Universal Shift register, ripple counters, synchronous counters, Ring counter, Johnson counter, Up-Down counter.

UNIT V (9 Hrs)
VLSI Design flow: Design entry, Schematic, HDL, different modelling styles in VHDL, Data types and objects, Dataflow, Behavioural and Structural Modelling, Synthesis and Simulation VHDL constructs and codes for combinational and sequential circuits.

Text Book:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.
2. D.V. Hall, "Digital Circuits and Systems", Tata McGraw Hill, 1989

Reference Books:

1. Anand Kumar, Switching Theory and Logic Design, 2nd Edition, PHI, 2014.
2. Charles Roth, "Digital System Design using VHDL", Tata McGraw Hill 2nd edition 2012.
3. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009

ADVANCED DATA STRUCTURE

Code: 24CS313
Max Marks: 70

UNIT I (9 Hrs)

Hashing: General Idea, Hash Function, Separate Chaining, Hash Tables without linked lists: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Hash Tables in the Standard Library, Universal Hashing, Extendible Hashing.

UNIT II (8 Hrs)

Priority Queues (Heaps): Model, Simple implementations, Binary Heap: Structure Property, Heap Order Property, Basic Heap Operations: insert, delete, Percolate down, Other Heap Operations.
Binomial Queues: Binomial Queue Structure, Binomial Queue Operations, Implementation of Binomial Queue, Priority Queues in the Standard Library.

UNIT III (11 Hrs)

Trees: AVL: Single Rotation, Double Rotation, B-Trees.
Multi-way Search Trees: 2-3 Trees: Searching for an Element in a 2-3 Tree, Inserting a New Element in a 2-3 Tree, Deleting an Element from a 2-3 Tree.
Red-Black Trees: Properties of red-black trees, Rotations, Insertion, Deletion.

UNIT IV (8 Hrs)

Graphs Algorithms: Elementary Graph Algorithms: Topological sort, Single Source Shortest Path Algorithms: Dijkstra's, Bellman-Ford, All-Pairs Shortest Paths: Floyd-Warshall's Algorithm.

UNIT V (7 Hrs)

Disjoint Sets: Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm.
String Matching: The naive string-matching algorithm, The Rabin-Karp algorithm, The Knuth-Morris-Pratt algorithm.

Text Book:

1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Edition, 2014, Pearson.
2. Introduction to Algorithms, Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, 2009, The MIT Press

Reference Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahani and Rajasekharam, 2nd Edition, 2009, University Press Pvt. Ltd.
2. Advanced Data Structures, Reema Thareja, S. Rama Sree, Oxford University Press, 2018.

ANALOG CIRCUITS

Code: 24CS314
Max Marks: 70

UNIT I (10 Hrs)

Multistage and Differential Amplifiers

Introduction –Recap of Small Signal Amplifiers, Multistage Amplifiers, Cascode amplifier, Darlington pair, the MOS Differential Pair, Small-Signal Operation of the MOS Differential Pair, The BJT Differential Pair, and other Non-ideal Characteristics of the Differential Amplifier.

UNIT II (9 Hrs)

Frequency Response

Low-Frequency Response of the CS and CE Amplifiers, Internal Capacitive Effects and the High-Frequency Model of the MOSFET and the BJT, High-Frequency Response of the CS and CE Amplifiers, High-Frequency Response of the CG and Cascode Amplifiers, High-Frequency Response of the Source and Emitter Followers, High-Frequency Response of Differential Amplifiers and Multistage amplifiers.

UNIT III (11 Hrs)

Feedback Amplifiers & Oscillators

Feedback Amplifiers: Introduction, The General Feedback Structure, Some Properties of Negative Feedback, The Four Basic Feedback Topologies, The Feedback Voltage Amplifier (Series—Shunt), The Feedback Trans-conductance Amplifier (Series—Series), The Feedback Trans-resistance Amplifier (Shunt—Shunt), The Feedback Current Amplifier (Shunt—Series), Summary. Oscillators: General Considerations, Phase Shift Oscillator, Wien-Bridge Oscillator, LC Oscillators, Relaxation Oscillator, Crystal Oscillators, Illustrative Problems.

UNIT IV (8 Hrs)

Power Amplifiers

Introduction, Classification of Output Stages, Class-A Output Stage, Class B Output Stage, Class AB Output Stage, Biasing the Class AB Circuit, CMOS Class AB Output Stages, Power BJTs, Variations on the Class AB Configuration, MOS Power Transistors.

UNIT V (7 Hrs)

Tuned Amplifiers and Multi-vibrators

Tuned Amplifiers: Basic Principle, Use of Transformers, Single Tuned Amplifiers, Amplifiers with multiple Tuned Circuits, Stagger Tuned Amplifiers. Multi-vibrators: Analysis and Design of Bistable, Monostable, and Astable Multi-vibrators.

Text Book:

1. Adel. S. Sedraand Kenneth C. Smith, “Micro Electronic Circuits,” 6thEdition, Oxford University Press, 2011.
2. J. Millman, C Chalkias, “Integrated Electronics”, 4thEdition, McGraw Hill Education (India) Private Ltd., 2015.
3. Millman and Taub, “Pulse, Digital and Switching Waveforms”, 3rd Edition, Tata McGraw-Hill Education, 2011.

Reference Books:

1. Behzad Razavi, “Fundamentals of Micro Electronics”, Wiley, 2010.
2. Donald A Neamen, “Electronic Circuits –Analysis and Design,” 3rdEdition, McGraw Hill (India), 2019.
3. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory”, 9th Edition, Pearson/Prentice Hall, 2006.
4. K. Lal Kishore, “Electronic Circuit Analysis”, 2ndEdition, B S Publications, 2008.

ARYAVART INTERNATIONAL UNIVERSITY
Tilthai, Dharmanagar, North Tripura

COMPUTER GRAPHICS

Code: 24CS315
Max Marks: 70

UNIT I (6 Hrs)
Basic of Computer Graphics: Basic of Computer Graphics, Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards.

UNIT II (8 Hrs)
Graphics Primitives: Points, lines, circles and ellipses as primitives, scan conversion algorithms for primitives, Fill area primitives including scan-line polygon filling, inside-outside test, boundary and flood-fill, character generation, line attributes, area-fill attributes, character attributers.

UNIT III (8 Hrs)
2D transformation and viewing: Transformations (translation, rotation, scaling), matrix representation, homogeneous coordinates, composite transformations, reflection and shearing, viewing pipeline and coordinates system, window-to-viewport transformation, clipping including point clipping, line clipping (cohen-sutherland, liang-bersky, NLN), polygon clipping.

UNIT IV (6 Hrs)
3D concepts and object representation: 3D display methods, polygon surfaces, tables, equations, meshes, curved lies and surfaces, quadric surfaces, spline representation, cubic spline interpolation methods, Bazier curves and surfaces, B-spline curves and surfaces.

UNIT V (8 Hrs)
3D transformation and viewing: 3D scaling, rotation and translation, composite transformation, viewing pipeline and coordinates, parallel and perspective transformation, view volume and general (parallel and perspective) projection transformations.

UNIT VI (6 Hrs)
Advance Topics: visible surface detection concepts, back-face detection, depth buffer method, illumination, light sources, illumination methods (ambient, diffuse reflection, specular reflection), and Colour models: properties of light, XYZ, RGB, YIQ and CMY colour models.

Text Book:

1. Donald Hearn & M. Pauline Baker, “Computer Graphics with OpenGL”, Third Edition, 2004, Pearson Education, Inc. New Delhi.
2. Ze-NianLi and Mark S. Drew, “Fundamentals of Multimedia”, First Edition, 2004, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

1. Computer Graphics, D. Hearn And P. Baker - Pearson Education - C Version
2. Computer Graphics, with OpenGL Hearn and Baker, - Pearson
3. Computer Graphics, Sinha & Udai, - TMH
4. Computer Graphics, Foley and van Dam - Person Education

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JAVA LAB

(BASED ON 24CS401) Java Programming

Core Practicals (Implement minimum 10 out of 15 practical)

1. Write a program declaring a class Rectangle with data member's length and breadth and member functions Input, Output and Calc Area.
2. Write a program to demonstrate use of method overloading to calculate area of square, rectangle and triangle.
3. Write a program to demonstrate the use of static variable, static method and static block.
4. Write a program to demonstrate concept of ``this``.
5. Write a program to demonstrate multi-level and hierarchical inheritance.
6. Write a program to use super() to invoke base class constructor.
7. Write a program to demonstrate run-time polymorphism.
8. Write a program to demonstrate the concept of aggregation.
9. Write a program to demonstrate the concept of abstract class with constructor and ``final`` method.
10. Write a program to demonstrate the concept of interface when two interfaces have unique methods and same data members.
11. Write a program to demonstrate checked exception during file handling.
12. Write a program to demonstrate unchecked exception.
13. Write a program to demonstrate creation of multiple child threads.
14. Write a program to use Byte stream class to read from a text file and display the content on the output screen.
15. Write a program to demonstrate any event handling.

Application Based Practical (Implement minimum 5 out of 10 practical)

1. Create a class employee which have name, age and address of employee, include functions getdata() and showdata(), getdata() takes the input from the user, showdata() display the data in following format:
   Name:
   Age:
   Address:
2. Write a Java program to perform basic Calculator operations. Make a menu driven program to select operation to perform (+ - * /). Take 2 integers and perform operation as chosen by user.
3. Write a program to make use of Buffered Stream to read lines from the keyboard until 'STOP' is typed.
4. Write a program declaring a Java class called Savings Account with members ``account Number`` and ``Balance``. Provide member functions as ``deposit Amount ()`` and ``withdraw Amount ()``. If user tries to withdraw an amount greater than their balance then throw a user-defined exception.
5. Write a program creating 2 threads using Runnable interface. Print your name in ``run ()`` method of first class and "Hello Java" in ``run ()`` method of second thread.
6. Write program that uses swings to display combination of RGB using 3 scrollbars.
7. Write a swing application that uses at least 5 swing controls.
8. Write a program to implement border layout using Swing.
9. Write a java program to insert and update details data in the database.
10. Write a java program to retrieve data from database and display it on GUI.

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

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DIGITAL LOGIC DESIGN LAB

(BASED ON 24CS2305) Digital Logic Design:

LIST OF EXPERIMENTS (Hardware)

1. Realization of Boolean Expressions using Gates.
2. Design and realization of logic gates using universal gates.
3. Design and realization of a 4 – bit Gray to Binary and Binary to Gray Converter.
4. Verify the functionality of Mux and De-Mux ICs.
5. Verify the functionality of Encoder and Decoder ICs.
6. Design and realization of 4-bit comparator.
7. Verify the functionality of D & T Flip-Flop ICs.
8. Verify the functionality of S-R & J-K Flip-Flop ICs.
9. Mod-N counter using 7490 and 74190.
10. Shifts register IC 7495.

LIST OF EXPERIMENTS (Hardware)

VHDL Programming:

1. Write structural and dataflow VHDL models for
    a. Half adder / Half subtractor
    b. Full adder / Full subtractor
2. Write a VHDL program in structural model for
    a. 16:1 mux realization
    b. 3:8 decoder realization through 2:4 decoder
3. Write a VHDL program in behavioural model for
    a. 3:8 decoder
    b. 8:3 encoder
4. Write a VHDL program in structural and behavioural models for 8 bit asynchronous up-down counter
5. Write a VHDL program in structural model for 8-bit Universal Shift Register

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Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks
- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

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Syllabus for B Tech (CSE)

Semester 4

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24MG211	Management for Engineers	4	0	0	4	70	30	0	100
24CS402	Software Engineering	3	1	0	4	70	30	0	100
24CS202	Database Management System	4	0	0	4	70	30	0	100
24GN201	Human Values and Ethics	2	0	0	2	70	30	0	100
Discipline Specific Elective (DSE-2) (Choose any one)									
24CS503	Operating Systems	3	1	0	4	70	30	0	100
24CS404	Principles of Cryptography	3	1	0	4	70	30	0	100
Generic Elective-1 (Choose any one)									
24CM111	Economics for Engineers	2	0	0	2	70	30	0	100
24PS101	Introduction to Political Science	2	0	0	2	70	30	0	100
Practical									
24CS292	Database Management System Lab	0	0	2	2	0	30	70	100
	Total				**22**	**420**	**210**	**70**	**700**

Detailed Syllabus

MANAGEMENT FOR ENGINEERS

Code: 24MG211
Max Marks: 70

UNIT I (12 Hrs)

Introduction to management Theory

Introduction to management theory, Management Defined, Characteristic of Management, and Management as an art-profession, System approaches to Management, Task and Responsibilities of a professional Manager, Levels of Manager and Skill required.

UNIT II (12 Hrs)

Management and Organization

Management Process, Planning types, Mission, Goals, Strategy, Programmes, Procedures, Organising, Principles of Organisation, Delegation, Span of Control, Organisation Structures, Directing, Leadership, Motivation, Controlling.

UNIT III (12 Hrs)

Productivity and decision making

Concept of productivity and its measurement; Competitiveness; Decision making process; decision making under certainty, risk and uncertainty; Decision trees; Models of decision making

UNIT IV (12 Hrs)

Functional areas of management

Introduction to functional areas of management, Operations management, Human resources management, Marketing management, financial management.

UNIT V (12 Hrs)

Entrepreneurship

Introduction to entrepreneurship -Entrepreneurship in India, Role of Government, Business plans, Corporate social responsibility, Patents and Intellectual property rights.

Text Book:

1. H. Koontz, and H. Weihrich, Essentials of Management: An International Perspective. 8th ed., McGraw-Hill, 2009.
2. Robbins, S. P., Judge, T., Vohra, N. (2013). Organizational Behavior. India: Pearson.

Reference Books:

1. P. Kotler, K. L. Keller, A. Koshy, and M. Jha, Marketing Management: A South Asian Perspective. 14th ed., Pearson, 2012.
2. M. Y. Khan, and P. K. Jain, Financial Management, Tata-McGraw Hill, 2008.
3. R. D. Hisrich, and M. P. Peters, Entrepreneurship: Strategy, Developing, and Managing a New Enterprise, 4th ed., McGraw-Hill Education, 1997.
4. D. J. Sumanth, Productivity Engineering and Management, McGraw-Hill Education, 1985.
5. K. Ashwathappa, 'Human Resources and Personnel Management', TMH, 3 rd. edition, 2005.
6. R. B. Chase, Ravi Shankar and F. R. Jacobs, Operations and Supply Chain Management, 14th ed. McGraw Hill Education (India), 2015.
7. P C Tripathi and P N Reddy, Principles of management, TMH, 4th edition, 2008.

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SOFTWARE ENGINEERING

Code: 24CS402
Max Marks: 70

UNIT I (12 Hrs)

Introduction of software engineering: Software Crisis, Software life cycle models, Waterfall, Prototype, Spiral – Models, Agile model.

Software Requirements analysis & specifications: Requirement engineering, requirement elicitation techniques like FAST, QFD, Requirement analysis using (DFD use-case, sequence and class diagram (with case studies), ER Diagrams, Requirements documentation: SRS, Characteristics & organization of SRS.

UNIT II (10 Hrs)

Software Project Planning: Software Metrics-Definition and Need, Types of Metrics-Product, Process and Project Metrics, Size Estimation like lines of Code & Function Count, Halstead Software Science measure, Cost Estimation: Need, Models COCOMO: Basic model, Intermediate model.

Risk Management: Software Risks, Types of risk, risk management activities: risk assessment, risk control.

UNIT III (10 Hrs)

Software Design: Cohesion & Coupling, Classification of Cohesiveness & Coupling.

Quality management: Quality concept, software quality assurance, Total Quality Management (TQM), software review, software inspection.

Software Implementation: Structured coding techniques, coding style, Standards and guidelines, documentation guidelines. Reverse Engineering, Software Re-engineering, Configuration Management.

UNIT IV (12 Hrs)

Software Testing: Testing Process, Levels of Testing: Unit testing, Integration testing and system testing. Types of Testing: Manual testing, Automation Testing. Methods of Testing- , Black box, White box and Grey Box Testing. Validation, Verification, Alpha-Beta testing, Acceptance testing, Functional Testing and its types, Structural Testing Difference between: Testing and Debugging.

Software Maintenance: Management of Maintenance, The Maintenance Process and Types of maintenance: Preventive, Perceptive, Adaptive and Corrective Maintenance. Maintenance tools and techniques.

Text Book:

1. K. K. Aggarwal & Yogesh Singh, “Software Engineering”, 2nd Ed., New Age International, 2005.
2. I. Sommerville, “Software Engineering”, 9th Edition, Pearson Edu

Reference Books:

1. Jibitesh Mishra and Ashok Mohanty, “Software Engineering”, Pearson
2. R. S. Pressman, “Software Engineering – A practitioner’s approach”, 5th Ed., McGraw Hill Int. Ed., 2001.
3. James Peter, W. Pedrycz, “Software Engineering: An Engineering Approach”, John Wiley & Sons.

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DATABASE MANAGEMENT SYSTEM

Code: 24CS202
Max Marks: 70

UNIT I (10 Hrs)

Introduction: An overview of database management system, Characteristics of database approach, DBMS architecture, client/server, data Models, Introduction to Distributed Data processing, schema and instances, data independence.

Data Modelling using Entity Relationship Model: Basic introduction about the terminologies like Entity, Entity types, entity set, notation for ER diagram, attributes and keys, Types of attributes (composite, derived and multi-valued attributes) and keys (Super Key, candidate key, primary key), relationships, relation types, weak entities, enhanced E-R, specialization and generalization.

UNIT II (13 Hrs)

Introduction to SQL: Overview, Characteristics of SQL. Advantage of SQL, SQL data types and literals.
Types of SQL commands: DDL, DML, DCL. Basic SQL Queries.
Logical operators: BETWEEN, IN, AND, OR and NOT.
Null Values: Disallowing Null Values, Comparisons Using Null Values.
Integrity constraints: Primary Key, Not NULL, Unique, Check, Referential key.
Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Aggregate Operators: The GROUP BY and HAVING Clauses.
Joins: Inner joins, Outer Joins, Left outer, Right outer, full outer joins.
Overview of other SQL Objects: Views, Sequences, Indexes, Triggers and stored procedure.

UNIT III (12 Hrs)

Relational Data Models: Relational model terminology domains, Attributes, Tuples, Relations, characteristics of relations, relational constraints domain constraints, key constraints and constraints on null, relational DB schema. Codd's Rules.
Relational algebra: Basic operations selection and projection.
Set Theoretic operations: Union, Intersection, set difference and division (Order, Relational calculus: Domain, Tuple, Well Formed Formula, specification, quantifiers).
Join operations: Inner, Outer, Left outer, Right outer, and full outer join.
ER to relational mapping: Steps to map ER diagram to relational schema.
Data Normalization: Functional dependencies, Armstrong's inference rule, & Normalization (Up to BCNF).

UNIT IV (9 Hrs)

Transaction Processing: Definition of Transaction, Desirable ACID properties.
Database recovery and Database Security: System failure, Backup & recovery Techniques, Authentication, Authorization.
Overview of Query by Language, NoSql databases.

Text Book:

1. R. Elmarsi and SB Navathe, "Fundamentals of Database Systems", Pearson, 5th Ed.
2. Singh S.K., "Database System Concepts, design and application", Pearson Education [TB3] TB3.
3. Ramakrishnan and Gherke, "Database Management Systems", TMH.
4. Bipin Desai, "An Introduction to Database Systems", Galgotia Publications, 1991.

Reference Books:

1. Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database Systems Concepts", 6th Edition, McGraw Hill, 2010.
2. Jim Melton, Alan Simon, "Understanding the new SQL: A complete Guide", Morgan Kaufmann Publishers, 1993.
3. A. K. Majumdar, P. Battacharya, "Database Management Systems', TMH, 2017.

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HUMAN VALUES AND ETHICS

Code: 24GN201

Max Marks: 70

UNIT I (10 Hrs)

Introduction to human values:

- Understanding the need, Basic guidelines, Process of Value Education.
- Understanding the thought provoking issues- Continuous happiness and Prosperity.
- Right understanding- relationship and physical facilities, Choice making- choosing, Cherishing and Acting.
- Understanding values- Personal Values, Social values, Moral values and Spiritual values, Self-Exploration and Awareness leading to Self-Satisfaction; Tools for Self-Exploration.

UNIT II (10 Hrs)

Harmony and role of values in family, society and human relations

- Understanding harmony in the Family- the basic unit of human interaction; Understanding values in human- human relationship; Understanding harmony in the society-human relations.
- Interconnectedness and mutual fulfilment; Coexistence in nature.
- Holistic perception of harmony at all levels of existence-universal harmonious order in society.
- Visualizing a universal harmonium order in society- undivided society (Akhand Samaj), universal order (SarvabhaumVyawastha)- from family to world family.

UNIT III (11 Hrs)

Coexistence and role of Indian Ethos:

- Interconnectedness and mutual fulfilment among the four orders of nature-recyclability and self-regulation in nature.
- Ethos of Vedanta; Application of Indian Ethos in organizations in management; Relevance of Ethics and Values in organizations in current times.

UNIT IV (11 Hrs)

Professional ethics

- Understanding about Professional Integrity, respect and equality, Privacy, Building Trusting relationships, Co-operation, Respecting the competence of other profession.
- Understanding about taking initiative, Promoting the culture of openness, Depicting loyalty towards goals and objectives.
- Ethics at the workplace: - cybercrime, plagiarism, sexual misconduct, fraudulent use of institutional resources, etc.
- Ability to utilize the professional competence for augmenting universal human order.

Text Book:

1. A Textbook on Professional Ethics and Human Values by R S Naagarazan.
2. A Foundation Course in Human Values and Professional Ethics by R.R. Gaur, R. Sangal, G.P. Bagaria.
3. Indian Ethos and Modern Management by B L Bajpai New Royal Book Co., Lucknow., 2004, Reprinted 2008.

Reference Books:

1. A N Tripathy, 2003, Human Values, New Age International Publishers
2. Human Values and Professional Ethics by Vaishali R Khosla, Kavita Bhagat
3. I.C. Sharma. Ethical Philosophy of India Nagin & co Julundhar

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OPERATING SYSTEMS

Code: 24CS503
Max Marks: 70

UNIT I (10 Hrs)

Introduction to OS: Functionality of OS - OS design issues - Structuring methods (monolithic, layered, modular, micro-kernel models) - Abstractions, processes.

OS Principles: System calls, System/Application Call Interface – Protection: User/Kernel modes – Interrupts.

UNIT II (24 Hrs)

Scheduling: Processes Scheduling - CPU Scheduling: Pre-emptive, non-pre-emptive – Multiprocessor scheduling – Deadlocks - Resource allocation and management - Deadlock handling mechanisms: prevention, avoidance, detection, recovery.

Concurrency: Inter-process communication, Synchronization - Implementing synchronization primitives (Peterson's solution, Bakery algorithm, synchronization hardware) - Semaphores – Classical synchronization problems, Monitors: Solution to Dining Philosophers problem.

UNIT III (12 Hrs)

Memory Management: Main memory management, Memory allocation strategies, Virtual memory: Hardware support for virtual memory (caching, TLB) – Paging - Segmentation - Demand Paging - Page Faults – Page Replacement –Thrashing.

UNIT IV (8 Hrs)

Storage Management, Protection and Security : Disk structure and attachment – Disk scheduling algorithms (seek time, rotational latency based)-System threats and security – Policy vs mechanism - Access vs authentication.

UNIT V (6 Hrs)

System protection: Access matrix – Capability based systems - OS: performance, scaling, future directions in mobile OS, Recent Trends.

Text Book:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne-Operating System Concepts, Wiley(2018).
2. Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.

Reference Books:

1. Ramez Elmasri, A.Gil Carrick, David Levine, Operating Systems, A Spiral Approach-McGraw Hill Higher Education (2010).
2. Remzi H. Arpaci-Dusseau, Andrea C. Arpaci-Dusseau, Operating Systems, Three Easy Pieces, Arpaci-Dusseau Books, Inc (2015).
3. Andrew S. Tanenbaum, Modern Operating Systems, Pearson, 4th Edition (2016).
4. William Stallings, Operating Systems: Internals and Design Principles, Pearson, 9th Edition (2018).

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PRINCIPLES OF CRYPTOGRAPHY

Code: 24CS404
Max Marks: 70

UNIT I

Mathematical Foundations Number Theory: Fermat's theorem - Cauchy 's theorem - Chinese remainder theorem - Primality testing algorithm - Euclid's algorithm for integers - quadratic residues - Legendre symbol - Jacobi symbol.

UNIT II

Classical Cryptosystems: Cryptography and cryptanalysis - Classical Cryptography - different type of attack: CMA - CPA - CCA - Shannon perfect secrecy - OTP - Pseudo random bit generators - stream ciphers and RC4.

UNIT III

Symmetric Key Ciphers Block ciphers: Modes of operation - DES and its variants - finite fields (2n) - AES - linear and differential cryptanalysis.

UNIT IV

Asymmetric Key Ciphers: One-way function - trapdoor one-way function - Public key cryptography - RSA cryptosystem - Diffie-Hellman key exchange algorithm - ElGamal Cryptosystem

UNIT V

Message Authentication: Cryptographic hash functions - secure hash algorithm - Message authentication - digital signature - RSA digital signature.

Text Book:

1. Stinson. D., “Cryptography: Theory and Practice”, Third Edition, Chapman & Hall/CRC, 2012.

Reference Books:

1. W. Mao, “Modern Cryptography: Theory & Practice”, Pearson Education, 2010.
2. W. Stallings, “Cryptography and Network Security Principles and practice”, Fifth Edition, Pearson Education Asia, 2013.
3. Behrouz A. Forouzan, Debdeep Mukhopadhyay, “Cryptography and Network Security”, Second Edition, Tata McGraw Hill, 2013.
4. Thomas Koshy, “Elementary Number Theory with Applications”, Elsevier India, 2005.

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ECONOMICS FOR ENGINEERS

Code: 24CM111
Max Marks: 70

UNIT I (08 Hrs)

Economic Decisions Making: Overview, Problems, Role, Decision Making process.

Engineering Costs and Estimation: Fixed, variable, marginal & average costs, Sunk Costs, Opportunity Costs, Recurring and Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs, Types of Estimate, Estimating Models- Per-Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits, Case Study- Price and income elasticity of demand in the real world.

UNIT II (08 Hrs)

Cash Flow, Interest and Equivalence: Cash Flow- Diagrams, Categories and Computation, Time Value of Money, Debt Repayment, Nominal and Effective Interest.

UNIT III (08 Hrs)

Cash Flow & Rate of Return Analysis: Calculations, Treatment of Salvage value, Annual cash flow analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing An Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis, Economic Analysis in the Public Sector- Quantifying and Valuing Benefits & drawbacks.

UNIT IV (08 Hrs)

Inflation and Price Change: Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs. Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis, Cash Flows that inflate at different Rates.

UNIT V (08 Hrs)

Present Worth Analysis: End-of-year Convention, Viewpoint of Economic Analysis Studies, Borrowed Money Viewpoint, Effect of Inflation & Deflation, taxes, Economic criteria, applying present worth techniques, multiple alternatives.

Text Book:

1. James L. Riggs, David D. Bedworth, Sabah U. Randhawa: Economic for Engineers 4e, Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP

Reference Books:

1. John A. White, Kenneth E. Case, David B. Pratt,: Principle of Engineering Economic Analysis, John Wiley
2. Sullivan and Wicks: Engineering Economy, Pearson
3. R. Paneer Seelvan: Engineering Economics, PHI
4. Micheal R Lindeburg: Engineering Economic Analysis, Professional Pub

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INTRODUCTION TO POLITICAL SCIENCE

Code: 24PS101
Max Marks: 70

UNIT I (15 Hrs)

Political Science and Political Theory: Meaning, Nature and Scope of Political Science; Approaches: Traditional, Philosophical, Historical and Marxist; Modern Approaches: Behaviouralism and Post-Behaviouralism; Relationship of Political Science with History, Economics, and Sociology.

UNIT II (15 Hrs)

State: Origin and Nature: Definition and Elements of State; Difference between State, Society, and Association; Theories of Origin of State: Historical and Social Contract; Theories of Nature of State: Liberal and Marxist; Sovereignty: Monistic and Pluralistic theory.

UNIT III (10 Hrs)

Key concepts in Political Science: Equality: Definitions and Dimensions; Liberty: Definitions; Positive and Negative Liberty; Justice: Definitions; Liberal and Marxist; Interrelationship between Liberty and Equality.

UNIT IV (8 Hrs)

Issues in Political Science: Liberalism: Definition and Features; Nationalism: Definition and Features; Multiculturalism: Definition and Features.

Text Book:

1. Alan Ryan, (1993) 'Liberalism' in R. Goodin & P. Petit (eds) A Companion to Contemporary Political Philosophy, Oxford: Blackwell.
2. Anthony Arblaster, (1984) The Rise and Decline of Western Liberalism, Oxford: Blackwell.

Reference Books:

1. Arora, N. D. (2006) Theory of State: Plato to Marx, Delhi: K K Publications.
2. Ashok Acharya, (2008) 'Liberalism' in Rajeev Bhargava & Ashok Acharya, (eds.) Political Theory: An Introduction, New Delhi: Pearson Longman.
3. Barker, Ernest (1951) Principles of Social and Political Theory, New York, Oxford University Press.
4. Barrow, Clyde W. (1993), Critical Theories of the State: Marxist, Neo-Marxist, Post Marxist, London: The University of Wisconsin Press.

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DATABASE MANAGEMENT SYSTEM LAB

Code: 24CS292
Max. Marks: 70
(BASED ON 24CS202) Database Management System:

Core Practical (Implement all the mentioned practical)

The following are two suggestive databases. The students may use any one or both databases for their core practical. However, the instructor may provide any other databases for executing these practical.

1. COLLEGE DATABASE:
STUDENT (USN, SName, Address, Phone, Gender) SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
SUBJECT (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

2. COMPANY DATABASE:
EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo, DLoc)
PROJECT (PNo, PName, PLocation, DNo)
WORKS_ON (SSN, PNo, Hours)

1. Draw an E-R diagram from given entities and their attributes.
2. Convert the E-R diagram into a Relational model with proper constraints.
3. Write queries to execute following DDL commands :
   CREATE: Create the structure of a table with at least five columns
   ALTER: Change the size of a particular column.
   Add a new column to the existing table.
   Remove a column from the table.
   DROP: Destroy the table along with its data.
4. Write queries to execute following DML commands :
   INSERT: Insert five records in each table.
   UPDATE: Modify data in single and multiple columns in a table
   DELETE: Delete selective and all records from a table
5. Write queries to execute following DML command :
   SELECT: Retrieve the entire contents of the table.
   Retrieve the selective contents (based on provided conditions) from a table.
   Retrieve contents from a table based on various operators i.e. string operators, logical operators and conditional operators, Boolean operators.
   Sort the data in ascending and descending order in a table on the basis of one column or more than one column.
6. Create table using following integrity constraints:
   - Primary Key
   - Unique Key
   - Not Null
   - Check Default
   - Foreign Key
7. Write queries to execute following Aggregate functions Sum, Avg, Count, Minimum and Maximum value of a numeric column of a table using aggregate function
8. Retrieve data from a table using alias names.
9. Retrieve data of a table using nested queries.
10. Retrieve data from more than one table using inner join, left outer, right outer and full outer Joins

11. Create view from one table and more than one table.
12. Create index on a column of a table.

Application Based Practical:

1. Consider the Insurance Company's Database given below. The primary keys are underlined and the data types are specified.
    a. PERSON(driver_id# : string, name : string, address : string)
    b. CAR(regno : string, model : string, year : int)
    c. ACCIDENT(report_number:int,acc_date:date,location:string)
    d. OWNS(driver_id# : string, regno : string)
    e. PARTICIPATED(driver_id#: string, regno: string, report_number: int, damage_amount: number(10,2))
2. Create the above tables by properly specified the primary key and the foreign key.
3. Enter at least five tuples for each relation.
4. Demonstrate how you can:
    a. Update the damage amount for the car with a specific reg. no, the accident with report number 12 to 25000.
    b. Add a new accident to the database.
5. Find the total number of people who owned cars that were involved in accident in2002.
6. Find the number of accident in which cars belonging to a specific model were involved.

7. Consider the following schema of a library management system. Write the SQL queries for the questions given below:
    a. Student(Stud_no : integer, Stud_name: string)
    b. Membership(Mem_no: integer, Stud_no: integer)
    c. Book_(book_no: integer, book_name:string, author: string)
    d. lss_rec_(iss_no:integer, iss_date: date, Mem_no: integer, book_no: integer)
8. Create the tables with the appropriate integrity constraints.
9. Insert around 10 records in each of the tables.
10. Display all records for all tables.
11. List all the student names with their membership numbers.
12. List all the issues for the current date with student and Book names.
13. List the details of students who borrowed book whose author is Elmarsi & Navathe.
14. Give account of how many books have been bought by each student.
15. Give a list of books taken by student with stud_no as 1005.
16. Delete the List of books details which are issued as of today.
17. Create a view which lists out the iss_no, iss_date, stud_name, book name.
18. Use the relations below to write SQL queries to solve the business problems specified.
    a. CLIENT (clientno#, name, client_referred_by#)
    b. ORDER(orderno#, clientno#, order_date, empid#)
    c. ORDER_LINE(orderno#,orderlinenumber#,item_number#,no_of_items,item_ cost, shipping_date)
    d. ITEM(item_number#, item_type, cost)
    e. EMPLOYEE(empid#, emp_type#, deptno, salary, firstname, lastname)
    f. Notes:
19. Column followed by # is the primary key of the table.
20. Each client may be referred by another client. If so, the client number of the referring client is stored in referred_by.
21. The total cost for a particular order line= no_of_items*item_cost.c.
22. Write queries for the following
    a. Create all the above tables.
    b. Insert at least five records.
    c. Display all the rows and columns in the CLIENT table. Sort by client name in reverse alphabetical order.
    d. Display the item number and total cost for each order line (total cost= no. of items X item cost). Name the calculated column TOTAL COST.
    e. Display all the client numbers in the ORDER table. Remove duplicates.
    f. Display the order number and client number from the ORDER table. Out put the result in the format. Client <clientno> ordered <orderno>

g. Display full details from the ORDER_LINE table where the item number is (first condition) between 1 and 200 (no > or < operators) OR the item number is greater than 1000 AND (second condition) the item cost is not in the list 1000, 2000, 3000 OR the order number is not equal to 1000.
h. Display the client name and order date for all orders.
i. Repeat query (6) but also display all clients who have never ordered anything.
j. Display the client name and order date for all orders using the join keywords.
k. Display the client name and order date for all orders using the JOIN method.
l. Display the client number, order date and shipping date for all orders where the shipping date is between three and six months after the order date.
m. Display the client number and name and the client number and name of the person who referred that client.
n. Display the client name in uppercase only and in lowercase only.
o. Display the second to fifth characters in each client name.

Note:

1. **In total 15 practical to be implemented. 2 additional practical may be given by the course instructor.**
2. **This is a suggestive list of programs. However, the instructor may add programs as per the requirement of the course.**

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks
Program Writing: 10 + 10 Marks
Algorithm& Flowchart: 5 + 5 Marks
Program Execution: 15 + 15 Marks
Viva: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY

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Syllabus for B Tech (CSE)

Semester 5

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24CS504	Full Stack Web Development	4	0	0	4	70	30	0	100
24CS303	Computer Networks	3	1	0	4	70	30	0	100
24CS601	Data Warehousing and Mining	4	0	0	4	70	30	0	100
Discipline Specific Elective (DSE-3) (Choose any one)									
24CS412	Introduction to Artificial Intelligence	3	1	0	4	70	30	0	100
24CS505	Distributed Computing	3	1	0	4	70	30	0	100
Practical									
24CS593	Full Stack Web Development Lab	0	0	2	2	0	30	70	100
24CS691	Data Warehousing and Mining Lab	0	0	2	2	0	30	70	100
24IN401	Internship-I	0	0	4	4	0	0	100	100
	Total				**24**	**280**	**180**	**240**	**700**

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Detailed Syllabus

FULL STACK WEB DEVELOPMENT

Code: 24CS504
Max Marks: 70

UNIT I (10 Hrs)
Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git & GitHub HTML, CSS.

UNIT II (16 Hrs)
Frontend Development: Java script basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format.

UNIT III (14 Hrs)
REACT JS: Introduction to React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication.

UNIT IV (15 Hrs)
Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application using Maven.

UNIT V (15 Hrs)
Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud.

Text Book:

1. Web Design with HTML, CSS, JavaScript and J Query Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas.
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon.
3. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BY AZAT MARDAN.

Reference Books:

1. Full-Stack JavaScript Development by Eric Bush.
2. Mastering Full Stack React Web Development Paperback – April 28, 2017 by Tomasz Dyl, Kamil Przeorski, Maciej Czarnecki.

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COMPUTER NETWORKS

Code: 24CS303
Max Marks: 70

UNIT I (10 Hrs)

Basic Concepts: Components of data communication, distributed processing, Line configuration, topology, transmission mode, and categories of networks.
OSI and TCP/IP Models: Layers and their functions, comparison of models.
Transmission Media: Guided and unguided, Attenuation, distortion, noise, throughput, propagation speed and time, wavelength, Shannon Capacity.

UNIT II (12 Hrs)

Telephony: Multiplexing, WDM, TDM, FDM, circuit switching, packet switching and message switching.
Data Link Layer: Types of errors, Framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- NARQ, Selective repeat ARQ.

UNIT III (12 Hrs)

Network Layer: Internetworking & Devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway, Modems.
Addressing: IPv4 and IPv6 addressing, IPv4 subnetting; Routing: Unicast Routing Protocols: RIP, OSPF, BGP;
Routing: Routing Methods- Static and Dynamic Routing, Routing basic commands, Distance vector protocol, Link state protocol.

UNIT IV (10 Hrs)

Transport and upper layers in OSI Model: Transport layer functions and Protocols, connection management, functions of session layers, Presentation layer, and Application layer.

Text Book:

1. A. S. Tenanbaum, “Computer Networks”; Pearson Education Asia, 4th Ed., 2003.
2. Behrouz A. Forouzan, “Data Communication and Networking”, 2nd edition, Tata Mc Graw Hill.

Reference Books:

1. D. E. Comer, “Internetworking with TCP/IP”, Pearson Education Asia, 2001.
2. William Stallings, “Data and computer communications”, Pearson education Asia, 7th Ed., 2002.
3. Leinwand, A., Pinsky, B. (2001). Cisco router configuration. United Kingdom: Cisco Press.

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DATAWAREHOUSING AND DATA MINING

Code: 24CS601
Max Marks: 70

UNIT I (11 Hrs)

Introduction to Data Warehousing: Overview, Difference between Database System and Data Warehouse, The Compelling Need for data warehousing, Data warehouse – The building Blocks: Defining Features, data warehouses and data marts, overview of the components, three tier architecture, Metadata in the data warehouse.
ETL tools: - Defining the business requirements: Dimensional analysis, information packages – a new concept, requirements gathering methods, requirements definition: scope and content.

UNIT II (11 Hrs)

Principles of Dimensional Modelling: Objectives, From Requirements to data design, Multi-Dimensional Data Model, Schemas: the STAR schema, the Snowflake schema, fact constellation schema.
OLAP in the Data Warehouse: Demand for Online Analytical Processing, limitations of other analysis methods, OLAP definitions and rules, OLAP characteristics, major features and functions, hyper cubes.
OLAP Operations: Drill-down and roll-up, slice-and-dice, pivot or rotation, OLAP models, overview of variations, the MOLAP model, the ROLAP model, the DOLAP model, ROLAP versus MOLAP, OLAP implementation considerations. Query and Reporting, Executive Information Systems (EIS), Data Warehouse and Business Strategy.

UNIT III (10 Hrs)

Data mining and data pre-processing:
Data mining: Introduction, What kind of data can be mined, What kind of patterns to be mined, Which technologies are used, What kinds of applications are targeted, Major issues in data mining.
Data pre-processing: Overview of Data pre-processing, data cleaning, data integration, data reduction, data transformation and data discretization, exploring data using IRIS datasets. Introduction to apriori algorithm for association mining rule.

UNIT IV (10 Hrs)

Data mining applications, and Data mining Tools:
Applications of data mining: Data mining for retail and telecommunication industries, data mining and recommender systems.
Introduction to data mining tools (open source): Weka, Rapid Miner, IBM Watson for classification and clustering algorithms using IRIS Datasets.

Text Book:

1. Kamber and Han, “Data Mining Concepts and Techniques”, Third edition, Hartcourt India P.Ltd.,2012.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to data mining”, Pearson education, 2006
3. Paul Raj Poonia, “Fundamentals of Data Warehousing”, John Wiley & Sons, 2004

Reference Books:

1. Ashok N. Srivastava, Mehran Sahami, “Text Mining Classification, Clustering, and Applications”, Published by Chapman and Hall/CRC1st Edition, June 23, 2009
2. Ian H., Eibe Frank, Mark A. Hall, Christopher Pal “Data Mining: Practical Machine Learning Tools and Techniques” Published by Morgan Kaufmann; 4th edition, December 1, 2016
3. G. K. Gupta, “Introduction to Data Mining with Case Studies”, PHI, 2006
4. Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & OLAP”, Tata McGraw Hill, 1 July 2017 RB5. Shmueli, “Data Mining for Business Intelligence: Concepts, Techniques and Applications in Microsoft Excel with XL Miner”, Wiley Publications

ARYAVART INTERNATIONAL UNIVERSITY
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INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Code: 24CS412
Max Marks: 70

UNIT I (10 Hrs)

Overview of AI: Introduction to AI, Importance of AI, AI and its related field, AI techniques, Criteria for success. Problems, problem space and search: Defining the problem as a state space search, Production Systems and its characteristics, Issues in the design of the search programs.

Heuristic search techniques: Generate and test, hill climbing, best first search technique, problem reduction, constraint satisfaction.

UNIT II (10 Hrs)

Knowledge Representation: Definition and importance of knowledge, Knowledge representation, various approaches used in knowledge representation, Issues in knowledge representation.

Logical Reasoning: Logical agents, propositional logic, inferences, Syntax and semantics of First Order Logic, Inference in First Order Logic Knowledge Base, forward chaining, backward chaining, unification, resolution, Expert system : Case study of Expert system in PROLOG.

UNIT III

Handling Uncertainty: Non-Monotonic Reasoning, Probabilistic reasoning, Bayes 'Theorem, Certainty factors and Rule-based Systems, Bayesian Networks, Dempster-Shafer Theory, Introduction to Fuzzy logic. Fuzzy set definition & types. Membership functions. Designing a fuzzy set for a given application.

Natural Language Processing: Introduction, Syntactic Processing, Semantic Processing, Pragmatic Processing.

UNIT IV (10 Hrs)

Learning: Introduction to Learning, Rote Learning, learning by taking advice, learning in problem solving, learning from examples: Induction, Explanation-based Learning, Discovery, Analogy, Neural Networks, and Genetic Learning.

Text Book:

1. Rich and Knight, "Artificial Intelligence", Tata McGraw Hill, 1992.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Second Edition (Indian Reprint: Pearson Education)

Reference Books:

1. Ivan brakto, "Prolog Programming for AI", Addison Wesley
2. George F. Luger Artificial Intelligence Pearson Education
3. Ben Coppin Artificial Intelligence Illuminated Jones and Bartlett Publisher

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DISTRIBUTED COMPUTING

Code: 24CS505
Max Marks: 70

UNIT I (08 Hrs)
Evolution of Distributed Computing -Issues in designing a distributed system- Challenges- Minicomputer model – Workstation model - Workstation-Server model– Processor - pool model - Trends in distributed systems

UNIT II (06 Hrs)
System models: Physical models - Architectural models - Fundamental models

UNIT III (08 Hrs)
Inter-process communication: characteristics – group communication - Multicast Communication –Remote Procedure call - Network virtualization. Case study : Skype

UNIT IV (08 Hrs)
Distributed file system: File service architecture - Network file system- Andrew file system- Name Service

UNIT V (08 Hrs)
Transactional concurrency control:- Transactions, Nested transactions-Locks-Optimistic concurrency control

UNIT VI (08 Hrs)
Distributed mutual exclusion – central server algorithm – ring based algorithm- Maekawa's voting algorithm – Election: Ring -based election algorithm – Bully algorithm

Text Book:

1. George Coulouris, Jean Dollimore and Tim Kindberg , Distributed Systems: Concepts and Design, Fifth Edition , Pearson Education, 2011
2. Pradeep K Sinha, Distributed Operating Systems : Concepts and Design, Prentice Hall of India

Reference Books:

1. A S Tanenbaum and M V Steen , Distributed Systems: Principles and paradigms, Pearson Education, 2007
2. M Solomon and J Krammer, Distributed Systems and Computer Networks, PHI

FULL STACK WEB DEVELOPMENT LAB

Code: 24CS593
Max. Marks: 70
(BASED ON 24CS504) Full Stack Web Development:

List of Practical:

1. Develop a Form and validate using Angular JS.
2. Create and implement modules and controllers in Angular JS.
3. Implement Error Handling in Angular JS.
4. Create and implement Custom directives.
5. Create a simple web application using Express, Node JS and Angular JS.
6. Implement CRUD operations on Mongo DB.
7. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
8. Create a service in react that fetches the weather information from openweathermap.org and the display the current and historical weather information using graphical representation using chart.js.
9. Create a TODO application in react with necessary components and deploy it into github.
10. A. Develop an express web application that can interact with REST API to perform CRUD operations on student data. (Use Postman).

B. For the above application create authorized end points using JWT (JSON Web Token).

DATAWAREHOUSING AND MINING LAB

Code: 24CS691
Max. Marks: 70
(BASED ON 24CS601) Data warehousing and Data mining:

List of Practical:

1. Listing applications for mining
2. File format for data mining
3. conversion of various data files
4. Training the given dataset for an application
5. Testing the given dataset for an application
6. Generating accurate models
7. Data pre-processing – data filters
8. Feature selection
9. Web mining
10. Text mining
11. Design of fact & dimension tables
12. Generating graphs for star schema.

Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks
- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY

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Syllabus for B Tech (CSE)

Semester 6

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24CS604	Automata and Compiler Design	3	1	0	4	70	30	0	100
24CS502	Cloud Computing	4	0	0	4	70	30	0	100
24CS614	Mobile Application Development	4	0	0	4	70	30	0	100
Discipline Specific Elective (DSE-4) (Choose any one)									
24CS605	Communication System	4	0	0	4	70	30	0	100
24CS615	Software Project Management	4	0	0	4	70	30	0	100
Generic Elective-2 (Choose any one)									
24EN105	Introduction to Linguistics	4	0	0	4	70	30	0	100
24HR101	Human Resource Management	4	0	0	4	70	30	0	100
Practical									
24CS694	Android Application Development Lab	0	0	2	2	0	30	70	100
24CS692	Cloud Computing Lab	0	0	2	2	0	30	70	100
	Total				**24**	**350**	**210**	**140**	**700**

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Detailed Syllabus

AUTOMATA AND COMPILER DESIGN

Code: 24CS604
Max Marks: 70

Course Objectives: The main objective of this course is to introduce the major concept areas of automata and compiler design and to develop an awareness of the function and complexity of modern compilers. This course is a study of the theory and practice required for the design and implementation of interpreters and compilers for programming languages.

UNIT I
Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Context Free grammars and parsing, derivation, parse trees, Application of Finite Automata.

UNIT II
Introduction To Compiler, Phases of Compilation, ambiguity LL(K) grammars and LL(1) parsing Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars, YACC programming specification. Semantics: Syntax directed translation, S-attributed and L-attributed grammars.

UNIT III
Intermediate code – abstract syntax tree, translation of simple statements and control flow statements. Context Sensitive features – Chomsky hierarchy of languages and recognizers, type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

UNIT IV
Run time storage: Storage organization, storage allocation strategies scope access to nonlocal names, Code optimization: Principal Sources of optimization, optimization of basic blocks, peephole optimization.

UNIT V
Code generation: Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

Text Books:

1. Introduction to Theory of computation. Sipser, 2nd Edition, Thomson.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education.

References:

1. Modern Compiler Construction in C, Andrew W. Appel Cambridge University Press.
2. Compiler Construction, LOUDEN, Thomson.
3. Elements of Compiler Design, A. Meduna, Auerbach Publications, Taylor and Francis Group.
4. Principles of Compiler Design, V. Raghavan, TMH.
5. Engineering a Compiler, K. D. Cooper, L. Torczon, ELSEVIER.

CLOUD COMPUTING

Code: 24CS502
Max Marks: 70

Course Objectives: The primary objectives of cloud computing include increasing efficiency, scalability, and flexibility of IT resources, while reducing costs and complexity. By leveraging cloud services, organizations can access computing resources on-demand, easily scale up or down based on their needs, and benefit from pay-as-you-go pricing models. This enables businesses to focus on their core competencies, innovate more rapidly, and respond quickly to changing market demands without significant upfront investments in hardware and infrastructure.

UNIT I (11 Hrs)
Cloud Computing Overview –Services of Internet, Origins of Cloud computing – Cloud components – Essential characteristics – On-demand self-service, The vision of cloud computing – Characteristics, benefits, and Challenges ahead

UNIT II (11 Hrs)
Cloud Computing Architecture-Introduction – Internet as a Platform, The cloud reference model - Types of clouds - Economics of the cloud, Computing platforms and technologies, Cloud computing economics, Cloud infrastructure - Economics of private clouds - Software productivity in the cloud - Economies of scale: public vs. private clouds.

UNIT III (11 Hrs)
Principles of Parallel and Distributed Computing: Parallel vs. distributed computing - Elements of parallel computing - Hardware architectures for parallel processing, Approaches to parallel programming - Laws of caution.

UNIT IV (11 Hrs)
Virtualization: Introduction - Characteristics of virtualized environments - Taxonomy of virtualization techniques - Virtualization and cloud computing - Pros and cons of virtualization - Technology example: VMware: full virtualization, Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization

Text Book:

1. Rajkumar Buyya, Christian Vecchiola and S. Thamarai Selvi, “Mastering Cloud Computing” - Foundations and Applications Programming, MK publications, 2013.
2. Gautam Shroff, “Enterprise Cloud Computing: Technology, Architecture, Applications” by Cambridge University Press, 2010.

Reference Books:

1. Michael J. Kavis, “Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)”, John Wiley & Sons Inc., Jan 2014.

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MOBILE APPLICATION DEVELOPMENT

Code: 24CS614
Max Marks: 70

Course Objectives: This course is concerned with the development of applications on mobile and wireless computing platforms. Android will be used as a basis for teaching programming techniques and design patterns related to the development of standalone applications and mobile portals to enterprise and commerce systems. Emphasis is placed on the processes, tools and frameworks required to develop applications for current and emerging mobile computing devices. Students will work at all stages of the software development life-cycle from inception through to implementation and testing. In doing so, students will be required to consider the impact of user characteristics, device capabilities, networking infrastructure and deployment environment, in order to develop software capable of meeting the requirements of stakeholders.

UNIT I (14 Hrs)

Introduction: Brief history of mobile applications, Different types of mobile applications, Brief history of Android, Introduction to Android Development Environment, Android Application

Design Essentials: Anatomy of an Android applications, Creating First Android Application, Creating Android project, Project organization, setting up real Android device, setting up Android emulator, developing simple user interface, Running your first application

Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT II (11 Hrs)

User Interface in Android: Adaptive and responsive user interfaces, User Input Controls, Menus, Screen Navigation, Recycler View, Drawable, Themes and Styles, Fragments Fragment Life Cycle, Introduction to Material Design.

Android Application Components: App Widgets, Processes and Threads, User Interface Components, Views and layouts, Input controls, Input Events, Settings, Dialogs, Menus, Notifications, Toasts, Testing the user interface

UNIT III (11 Hrs)

Background tasks: AsyncTask, AsyncTaskLoader, Connecting App to Internet, Broadcast receivers, Services, Notifications, Alarm managers.

Sensor, Location and Maps: Sensor Basic, Motion and Position Sensors, Location services, Google maps API, Google Places API

UNIT IV (12 Hrs)

Working with data in Android: Shared Preferences, App Setting, SQLite primer, Store data using SQLite database, Content Providers, Content Resolver, Loader

Publishing Your App: Preparing for publishing, Signing and preparing the graphics, publishing to the Android Market

Using Common Android APIs: Using Android Data and Storage APIs, managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, using android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

Text Book:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)
2. Wei-Meng Lee," Beginning Android 4 Application Development", Wiley India Pvt. Ltd.
3. J. F. DiMarzio, "Android: A Programmers Guide", McGraw Hill Education (India) Private Limited.

Reference Books:

1. Paul Deitel "Android for Programmers: An App-Driven Approach" 1st Edition, Pearson India.
2. Wei-Meng Lee, "Beginning Android Application Development", Wiley Publishing

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COMMUNICATION SYSTEM

Code: 24CS614
Max Marks: 70

Course Objectives: The aim of this course is to introduce the students to the basic concepts of communication systems. The main objective of this course is to understand and implement the basic analogue and digital communication techniques/ circuits with the help of theoretical and practical problem solving. It is required from the students to understand the basic analogue and digital communication techniques which in turn are used as the building blocks of the larger and more complex communication systems.

UNIT I **(11 Hrs)**

Introduction: Overview of Communication system, Communication channels, Mathematical Models for Communication Channels.

Introduction of random Variables: Definition of random variables, PDF, CDF and its properties, joint PDF, CDF, Marginalized PDF, CDF, WSS wide stationery, strict sense stationery, non-stationery signals, UDF, GDF, RDF, Binomial distribution, White process, Poisson process, Wiener process.

UNIT II **(11 Hrs)**

Amplitude Modulation: Need for modulation, Representation of Band Pass signals and systems: Hilbert Transform, In-phase, Quad-phase representations, Power relation, modulation index, Bandwidth efficiency, AM: modulation and demodulation, DSB-SC: Modulation and demodulation, SSB: modulation and demodulation, VSB: modulation and demodulation.

UNIT III **(11 Hrs)**

Angle Modulation Systems: Frequency Modulation, Types of Frequency Modulation, Generation of NBFM, WBFM, Transmission BW of FM Signal, Phase Modulation, Relationship between PM& FM.

Radio Receivers: Functions & Classification of Radio Receivers, Tuned Radio Frequency (TRF) Receiver, Superheterodyne Receiver, Basic Elements, Receiver Characteristics, Frequency Mixers, AGC Characteristics.

UNIT IV **(11 Hrs)**

Noise Theory: Noise, Types of noise, Addition of Noise due to several sources in series and parallel, Generalized Nyquist Theorem for Thermal Noise, Calculation of Thermal Noise for a Single Noise Source, RC Circuits & Multiple Noise sources. Equivalent Noise Bandwidth, Signal to Noise Ratio, Noise-Figure, Noise Temperature, Calculation of Noise Figure.

Performance of Communication Systems: Receiver Model, Noise in DSB-SC Receivers, Noise in SSB-SC Receivers, Noise in AM receiver (Using Envelope Detection), Noise in FM Receivers, FM Threshold Effect, Threshold Improvement through Pre-Emphasis and De-Emphasis, Noise in PM system – Comparison of Noise performance in PM and FM, Link budget analysis for radio channels.

Text Book:

1. John G. Proakis & Masoud Salehi, ―Communication System Engineering‖, Pearson Education.
2. Haykin, S., ―Communication Systems‖, John Wiley (2009) 4th ed.

Reference Books:

1. Taub, H., “Principles of Communication Systems”, McGraw-Hill (2008) 3rd ed.
2. Kennedy, G., “Electronic Communication Systems”, McGraw-Hill (2008) 4th ed.
3. V. Chandra Sekar “Analog Communication”, Oxford University Press, Incorporated, 2010.
4. John G Proakis, M. Salehi and G. Bauch: “Modern Communication System Using MATLAB” Cengage Learning, 3rd edition, 2013.

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SOFTWARE PROJECT MANAGEMENT

Code: 24CS615
Max. Marks: 70

Course Objectives: The course provides an in depth examination of project management principles and modern software project management practices. The five process groups and nine knowledge areas examined in the context of the systems development lifecycle. Methods for managing and optimizing the software development process are discussed along with techniques for performing each phase of the systems development lifecycle. Portfolio management and the use and application of software project management tools are also discussed.

UNIT I: SYSTEM ANALYSIS & DESIGN

Overview of system analysis & Design: Introduction to different methodologies & structured system analysis – Details of SDLC approach – mini cases – E.R. diagrams – DFD concepts – Data dictionary concepts. Structure charts – modular programming – I/O & file design consideration – Entity Life histories (ELH).

UNIT II: SYSTEM IMPLEMENTATION

System implementation & maintenance: Implementation Strategies – SW / HW selection & procurement – Control & security – issues of designing & implementing on-line systems – data communication requirements – system conservation approaches & selection issues.

UNIT III: PROJECT DEVELOPMENT & DATABASE DESIGN

Introduction to Database technologies & CASE tools with specific packages – overview of relational model – Database creation – SQL command – Normalization – designing forms & reports – using CASE tools for system analysis & design-case studies – Cost / benefit analysis – project & resource planning – design & development testing & documentation.

UNIT IV: SOFTWARE PROJECT MANAGEMENT

Software project management: challenges & opportunities – changing technologies & approaches – choice development of methodologies & technical platforms, project management techniques – monitoring 7 measurement of progress.

UNIT V: SOFTWARE PROJECT MANAGEMENT

Software project management – elements, cost estimation, manpower planning, Software & Product Metrics – Quality assurance & control – standards' & documentation – testing – implementation – training – technology management – quality standards – certificate – handling multiple projects, issues of share development.

Text books:

1. Software Engineering Principles and practice by Waman S. Jawadekar Tata McGraw Hill Co. – Chennai. Email : mark_pani@mcgrawhill.com
2. For Unit I Database Management systems Alexis Leon & Mathews Leon, Vikas Publishing House PVT Ltd.
3. Software Project Management by S.A. Kelkar, PHI learning India PVT Ltd., Email : phi@phindia.com
4. Software project management (2 volumes set) by Prof. SN. Singh and SL. Gupta – Global India publications PVT Ltd., New Delhi. Email : info@globalindiapublications.com

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INTRODUCTION TO LINGUISTICS

Code: 24EN105

Max Marks: 70

Course Objectives: This course provides an introduction to the discipline of Linguistics. Students will learn the basic concepts and methods used by linguists in the scientific study of human language. While many key aspects will be illustrated using evidence derived primarily from English, we will discuss evidence from a variety of languages in order to better demonstrate the richness of linguistic diversity. Students will become familiar with how linguists approach and analyze language in primary fields of linguistic analysis such as morphology (word structure), syntax (phrases and sentences), semantics (meaning), phonetics (types of sound), and phonology (rules of phonetic processes), and language in society, and writing.

UNIT I

Language: Its Origin and Properties; Linguistics: Definition and Scope, Traditional and Modern Linguistics.

UNIT II

Structural Linguists: Ferdinand de Saussure and Leonard Bloomfield; Functional Linguistics: Michael A K Halliday; Mentalistic Approach to Linguistics: Noam Chomsky; Transformational Generative Grammar; Language and Society: Idiolect, Dialect, Sociolect.

UNIT III

Phonetics and Phonology: Speech Mechanism, Production, Classification and Description of English Phonemes; Vowels, Consonants and Diphthongs.

UNIT IV

Supra-segmental Phonology: Syllable, Stress, Intonation; Phonemic/ Phonetic Transcription, Phonemic Transcription of a Dialogue/Passage.

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HUMAN RESOURCE MANAGEMENT

Code: 24HR101
Max Marks: 70

Course Objectives: The primary objectives of Human resource management are to ensure a seamless experience for the staff and other people associated with management and accomplish organizational goals. Objectives of HRM include ensuring the availability of resources, easy access to data, on-time payroll, ensuring compliance, etc. The objectives of human resource management (HRM) are aligned with the entire interest of the organization for enhancing the productivity and profitability of a business. HRM objectives are basically influenced by organizational goals and verticals. The objective of HRM is to ensure a stable work environment with organized data management and efficient operations.

UNIT I
Meaning, Scope and Significance of Human Resource Management, Evolution of HRM, Function of HRM. Challenges before HRM in Present changing Environment.

UNIT II
HR Planning. Job Analysis, Recruitment, Methods and Techniques of Selection' Induction internal Mobility and Separation of Employees Transfer, Promotion, Demotion and Separation of Employees.

UNIT III
Industrial Relations, trade Unions Dispute and their Resolution, Collective Bargaining, Employee Welfare a Brief Introduction, Workers' Participation in Management.

UNIT IV
Wages and Salary Administration, Economic Objectives of Wages Policy, Social Objectives, Principles of wage and Salary Administration. Essentials of a Wage and Salary Structure. Factors Affecting wages, Methods of wage Payment. Wage Policy In India. Pay Commission. Wage Boards, Adjudication, Pay Revision in Public Sector-issue and Considerations.

UNIT V
Other Contemporary Issues in HRM- Employee Compensation- Concept, Factors Affecting Employee Compensation Components, of Employee Pay, HR Audit Human Resource Information System. Performance & Skill Based Pay Systems, Voluntary Retirement Scheme (VRS).

Reference Books:

1. Rao T. V. and Abraham E., "HRD Practices in Indian Industries – A trend Report".
2. Santhanam M., "Development of Human Resources."
3. Sharma A. K., "Some Issue ln Management Development."
4. Rudrabasavraj M. N., "Executive Development In The Public Sector."
5. B. D. Singh, "Compensation and Reward and management."

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ANDROID APPLICATION DEVELOPMENT LAB

Code: 24CS694
Max Marks: 70

(BASED ON 24CS614) Mobile Application Development:
List of Practical:

1. Set up ANDROID STUDIO using ECLIPSE IDE.
2. Build and Run first ANDROID program in Emulator.
3. Create an APP for currency converter.
4. Create an APP to registration form.
5. Create a calculator using ANDROID APP.
6. Create an APP to insert data from registration form into database.
7. Create an APP to conduct online quiz.
8. Create Slide show of multiple images using ANDROID APP.
9. Develop an APP which plays video files.
10. Create an App to identify the current location using GOOGLE MAP API.

CLOUD COMPUTING LAB

Code: 24CS692
Max Marks: 70

(BASED ON 24CS502) Cloud Computing:
List of Practicals

1. Install Virtualbox/VMware Workstation with different flavours of Linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
6. Find a procedure to transfer the files from one virtual machine to another virtual machine.
7. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).
8. Install Hadoop single node cluster and run simple applications like wordcount.

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Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks
- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

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Syllabus for B Tech (CSE)

Semester 7

Theory									
Course Code	**Topic**	**L**	**T**	**P**	**Credit**	**Theory Marks**	**Internal Marks**	**Practical Marks**	**Total Marks**
24CS701	Big Data Analytics	4	0	0	4	70	30	0	100
24CS603	Internet of Things	4	0	0	4	70	30	0	100
24PR401	Minor Project	0	0	4	4	0	100	0	100
Discipline Specific Elective (DSE-5) (Choose any one)									
24CS711	Digital Signal Processing	3	1	0	4	70	30	0	100
24CS513	Web Development with Java & JSP	3	1	0	4	70	30	0	100
Skill Enhancement Courses (SEC-1) (Choose any one)									
24CS702	Blockchain Technology	2	0	0	2	70	30	0	100
24CS703	Mobile Computing	2	0	0	2	70	30	0	100
Practical									
24CS791	Big Data Analytics Lab	0	0	2	2	0	30	70	100
24CS693	IOT Lab	0	0	2	2	0	30	70	100
	Total				**22**	**280**	**280**	**140**	**700**

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Detailed Syllabus

BIG DATA ANALYTICS

Code: 24CS701
Max Marks: 70

Course Objectives: This course gives an overview of Big Data, i.e. storage, retrieval and processing of big data. In addition, it also focuses on the "technologies", i.e., the tools/algorithms that are available for storage, processing of Big Data. It also helps a student to perform a variety of "analytics" on different data sets and to arrive at positive conclusions.

UNIT I **(08 Hrs)**
Introduction to Big Data: Big Data and its Importance – Four V's of Big Data – Drivers for Big Data – Introduction to Big Data Analytics – Big Data Analytics applications.

UNIT II **(08 Hrs)**
Big Data Technologies: Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data –Predictive Analytics – Mobile Business Intelligence and Big Data

UNIT III **(08 Hrs)**
Introduction Hadoop: Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization.

UNIT IV **(10 Hrs)**
Hadoop Architecture: Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node, HDFS Architecture, Hadoop Configuration, Map Reduce Framework, Role of HBase in Big Data processing, HIVE, PIG.

UNIT V **(08 Hrs)**
Data Analytics with R Machine Learning: Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering, Social Media Analytics, Mobile Analytics, Big Data Analytics with BigR.

Text Book:

1. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
2. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business, Michael Minelli, Michehe Chambers, 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.
4. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

Reference Books:

1. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013).
2. Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop, Tom Plunkett, Mark Hornick, McGraw-Hill/Osborne Media (2013), Oracle press.
3. Professional Hadoop Solutions, Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Wiley, ISBN: 9788126551071, 2015.
4. Understanding Big data, Chris Eaton, Dirk deroos et al. McGraw Hill, 2012.
5. Intelligent Data Analysis, Michael Berthold, David J. Hand, Springer, 2007.
6. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Bill Franks, 1st Edition, Wiley and SAS Business Series, 2012.

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INTERNET OF THINGS

Code: 24CS603
Max Marks: 70

Course Objectives: This course focuses on the latest microcontrollers with application development, product design and prototyping. The Internet of Things (IOT) is the next wave, world is going to witness. Internet of Things is a term given to the attempt of connecting objects to the internet and also to each other - allowing people and objects themselves to analyze data from various sources in real-time and take necessary actions in an intelligent fashion.

UNIT I **(10 Hrs)**

Introduction: Definition, Functional requirements, Characteristics, Foundations, architectures, challenges and issues, Physical design of IoT, Logical design of IoT, Web 3.0 of IoT, IoT World Forum (IoTWF) and Alternative IoT models, IoT Communication Models, IoT in Global Context, Real world scenarios, Different Areas, Examples Trends in the Adaption of the IoT (Cloud Computing, Big Data Analytics, Concepts of Web of Things, Concept of Cloud of Things with emphasis on Mobile Cloud Computing, Smart Objects).

UNIT II **(10 Hrs)**

Components in IoT: Control Units, Sensors, Communication modules, Power Sources, Communication Technologies, RFID, Bluetooth, Zigbee, Wi-fi, RF links, Mobile Internet, Wired Communication;
IoT Protocol and Technology: RFID, NFC, Wireless Networks, WSN, RTLS , GPS, Agents , Multi – Agent Systems, IoT Protocols: M2M, BacNet, ModBus, Bluetooth, WiFi, ZigBee;
Web of Things (WoT): WoT vs. IoT, Architecture;
Cloud of Things (CoT): Grid/SOA and Cloud Computing, Standards, Cloud Providers and Systems, Architecture.

UNIT III **(10 Hrs)**

Data Analytics for IoT: Introduction, Machine Learning, Big Data Analytics Tools and Technology, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Apache Kafka, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Using Apache Storm for Real-time Data Analysis, Structural Health Monitoring Case Study.
Tools for IoT: Chef, Chef Case Studies, Puppet, Puppet Case Study – Multi-tier Deployment, NETCONF-YANG Case Studies, IoT Code Generator.

UNIT IV **(10 Hrs)**

Domain specific applications of IoT: Home automation, Industry applications, Surveillance applications, Smart Homes, Ambient Assisted Living, Intelligent Transport, Other IoT application: Use-Case Examples.
Developing IoT solutions: Introduction to Python, Introduction to different IoT tools, Introduction to Arduino and Raspberry Pi Implementation of IoT with Arduino and Raspberry, Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT.

Text Book:

1. A. Bahga, V. Madisetti, “Internet of Things: A Hands-on Approach”, 1st Edition, Universities Press, 2015/ Latest Edition.
2. R. Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education private limited, 2017/ Latest Edition.

Reference Books:

1. D. Uckelmann, M. Harrison, “Architecting the Internet of Things”, 1st Ed., Springer, 2011/ Latest Edition.
2. O. Hersent, D. Boswarthick, O. Elloumi, “The Internet of Things – Key applications and Protocols”, 2nd Edition, Wiley, 2012/ Latest Edition

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MINOR PROJECT

Code: 24PR401
Max Marks: 100

PROJECT REPORT
All the students are required to submit a report based on the project work done by them during the sixth semester.

SYNOPSIS (SUMMARY/ABSTRACT):
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following:

- Name / Title of the Project
- Statement about the Problem
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT
This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

OBJECTIVE AND SCOPE:
This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRIPTION:
The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS:
The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION:
The write-up must end with the concluding remarks- briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest. Bachelor of Computer Applications programme offered by USICT at affiliated institutions.

The following suggested guidelines must be followed in preparing the Minor Project Report:
Good quality white A4 size paper should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

- Page Specification: (Written paper and source code)
- Left margin - 3.0cms
- Right margin- 2.0cms
- Top margin 2.54cms
- Bottom margin 2.54cms
- Page numbers - All text pages as well as Program source code listing should be numbered at the bottom centre of the pages.

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Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing
Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.
Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing. Coding Font size: 10, Courier New, Normal
Submission of Project Report to the University:
The student will submit his/her project report in the prescribed format. The Project Report should include:

1. One copy of the summary/abstract.
2. One hard Copy of the Project Report.
3. The Project Report may be about 75 pages (excluding coding).

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION OF THE PROJECT

I. Cover Page as per format
II. Acknowledgement
III. Certificate of the project guide
IV. Synopsis of the Project
V. Main Report
   a. Objective & Scope of the Project
   b. Theoretical Background Definition of Problem
   c. System Analysis & Design vis-a-vis User Requirements
   d. System Planning (PERT Chart)
   e. Methodology adopted; System Implementation & Details of Hardware & Software used System Maintenance &Evaluation
   f. Detailed Life Cycle of the Project
      i. ERD, DFD
      ii. Input and Output Screen Design
      iii. Process involved
      iv. Methodology used testing
      v. Test Report, Printout of the Report & Code Sheet
VI. Coding and Screenshots of the project
VII. Conclusion and Future Scope
VIII. References

Formats of various certificates and formatting styles are as:

1. **Certificate from the Guide**

CERTIFICATE

This is to certify that this project entitled " xxxxxx xxxxx xxxxx xxxx xxxx xxx" submitted in partial fulfilment of the degree of Bachelor of Technology (CSE) to the "xxxxxxxxxxxxxxxxxxxxxxxxxx" through xxxxxx xxxxx done by Mr./Ms. _____, Roll No. _____is an authentic work carried out by him/her at _____ under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree to the best of my knowledge and belief.

Signature of the student Signature of the Guide

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2. Project Report Cover Page Format:

Title of the Project/report
(Times New Roman, Italic, Font size = 24)

Submitted in partial fulfilment of the requirements for the award of the Degree of
Bachelor of Technology (CSE)
(Bookman Old Style, 16 point, centre)

Submitted to:
(Guide Name)

Submitted by:
(Student's name)
Roll No
College Name

3. Self-Certificate by the students

SELF CERTIFICATE

This is to certify that the dissertation/project report entitled "……" is done by me is an authentic work carried out for the partial fulfilment of the requirements for the award of the degree of Bachelor of Technology (CSE) under the guidance of _____. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student
Name of the Student
Roll No.

4. ACKNOWLEDGEMENTS

In the "Acknowledgements" page, the writer recognizes his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognize specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

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DIGITAL SIGNAL PROCESSING

Code: 24CS711
Max Marks: 70

Course Objectives: The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems.

UNIT I **(08 Hrs)**

Discrete Time System: Basic Discrete Time Signals and their classifications, Discrete times systems and their classifications, Stability of discrete time system, Analysis and response (convolution sum) of discrete - time linear LTI system, Recursive and Non-recursive discrete time system, impulse response of LTI system, Correlation of discrete time Signal.

UNIT II **(08 Hrs)**

Z-Transform and Its Application to the Analysis of LTI Systems: Z-Transform, Direct Z-Transform, Properties of the Z- Transform, Inverse Z-Transform, Inversion Z-Transform by Power Series Expansion, Inversion of the Z-Transform by Partial-Fraction Expansion, Analysis of Linear Time Invariant Systems in the z-Domain.

UNIT III **(12 Hrs)**

Discrete Fourier Transform: Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals, Discrete Fourier Transform, DFT as a Linear Transformation, Relationship of DFT to other Transforms, Properties of DFT: Periodicity, Linearity, and Symmetry Properties, Multiplication of Two DFTs and Circular Convolution, Use of DFT in Linear Filtering, Filtering of Long Data Sequences.
Efficient Computation of DFT: FFT Algorithms, Direct Computation of the DFT, Radix-2 FFT Algorithms, Decimation-In-Time (DIT), Decimation-In-Time (DIF).

UNIT IV **(10 Hrs)**

Structure and Implementation of FIR and IIR Filter: Structure for the Realization of Discrete-Time Systems, Structure of FIR Systems: Direct- Form Structure, Cascade-Form Structure, Frequency Sampling Structure, Design of FIR Filters: Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters by using Windows, Design of Linear-Phase FIR Filters by Frequency Sampling Method. Structure for IIR Systems: Direct-Form Structure, Signal Flow Graphs and Transposed Structure, Cascade-Form Structure, Parallel-Form Structure. Design of IIR Filters.

UNIT V **(07 Hrs)**

Analog Filters: IIR Filter Design by Impulse Invariance, IIR Filter Design by the Bilinear Transformation.
Basic adaptive filter: Structure of Adaptive FIR filter, System Modelling and Inverse Modelling, MATLAB realization of DFT, FFT, Z-transform, IIR, FIR and adaptive filter.

Text Book:

1. "Digital Signal Processing – Principles, Algorithms and Applications" by J. G. Proakis and D. G. Manolakis, Pearson.
2. "Digital Signal Processing": Tarun Kumar Rawat, Oxford University Press.

Reference Books:

1. "Digital Signal Processing" – S. Salivahan, A. Vallavraj and C. Gnanapriya, Tata McGraw Hill.
2. "Digital Signal Processing" – Manson H. Hayes (Schaum's Outlines) Adapted by Subrata Bhattacharya, Tata McGraw Hill.

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WEB DEVELOPMENT WITH JAVA & JSP

Code: 24CS513
Max Marks: 70

Course Objectives: The objective of this course is to familiarize students with client server architecture and enable them to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers.

UNIT I **(11 Hrs)**

Introduction to HTML, CSS and Java Script: Content, layout, and styling of web page.
J2EE and Web Development: Java Platform, J2EE Architecture Types, Types of Servers in J2EE Application, HTTP Protocols and API, Web Application Structure, Web Containers and Web Architecture Models.
Swings: Introduction and comparison with AWT controls.

UNIT II **(11 Hrs)**

Introduction to Java EE Web Component: Overview of Servlet, Servlet Life Cycle, Types of Servlets, HTTP Methods Structure and Deployment descriptor Servlet Context and Servlet Config interface, State Management: client and server side,
JDBC Programming: JDBC Architecture, Types of JDBC Drivers, Introduction to major JDBC Classes and Interface, creating simple JDBC Application, Database operations using JDBC, Types of Statement (Statement Interface, Prepared Statement, Callable Statement), Exploring Result Set Operations.

UNIT III **(11 Hrs)**

Java Server Pages: Introduction to JSP, Comparison with Servlet, JSP Architecture, JSP Life Cycle, JSP Directives, JSP Action, JSP Standard Tag Libraries, JSP Session Management.
Develop Web Applications with JSF: Java Server Faces (JSF) framework, architecture of JSF web applications, and development view of a JSF application.

UNIT IV **(11 Hrs)**

Java Beans, Java Web Frameworks: Spring MVC: Java Beans, Spring Introduction, Spring Architecture, Spring MVC Module, Bean life cycle, Spring API.
Hibernate and Struts: Java Beans, Introduction to Hibernate, Hibernate Architecture, Hibernate Mapping Types, Introduction to Struts, core components, architecture, Interceptors, validation.
Advance Networking: Networking Basics, Introduction of Socket, Types of Sockets, Socket API, TCP/IP client sockets, URL, TCP/IP server sockets, Datagrams, java.net package Socket, Server Socket, Inet Address, URL, URL Connection.

Text Book:

1. Herbert Schildt, "Java - The Complete Reference", Oracle Press, 9th Edition, 2014.
2. Y. Daniel Liang, "Introduction to Java Programming", Comprehensive Version, Pearson.
3. "Sams Teach Yourself HTML, CSS & JavaScript Web Publishing in One Hour a Day" by Laura Lemay, Rafe Colburn, Jennifer Kyrnin, 2015.

Reference Books:

1. E. Balaguruswamy, "Programming with Java", Tata McGraw Hill,4th Edition,2009.
2. Cay Horstmann, "Computing Concepts with Java2 Essentials", John Wiley & Sons, 2nd Edition, 1999.
3. Jeffrey C. Jackson, "Web Technologies: A Computer Science Perspective", Pearson.
4. "Jakarta Struts Cookbook", by Bill Siggelkow, O'Reilly Media, Inc. 2005.

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BLOCKCHAIN TECHNOLOGY

Code: 24CS702
Max Marks: 70

Course Objectives: The objective of this course is to develop familiarity with theoretical concepts, underlying technology, tools, implementation strategies and current practices. The course will offer strong technical understanding of Blockchain technologies, develop familiarity of current technologies, tools, and implementation strategies and introduce application areas, current practices, and research activity.

UNIT I
Introduction to Blockchain Technology – Distributed systems – The history of blockchain – Introduction to blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain – Decentralization using blockchain - Methods of decentralization – Routes to decentralization.

UNIT II
Cryptography in Blockchain: Introduction – cryptographic primitives – Asymmetric cryptography – public and private keys -line interface – Bitcoin improvement proposals (BIPs) – Consensus Algorithms.

UNIT III
BitCoin Introduction – Transactions – Structure - Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin payments– Bitcoin investment and buying and selling bitcoins – Bitcoin installation – Bitcoin programming and the command-line interface – Bitcoin improvement proposals (BIPs).

UNIT IV
Ethereum - Ethereum block chain- Elements of the Ethereum block chain– Precompiled contracts – Accounts and its types – Block header- Ether – Messages – Mining - Clients and wallets – Trading and investment – The yellow paper - The Ethereum network - Applications developed on Ethereum - Scalability and security issues.

UNIT V
Smart Contract and Hyper ledger – History of Smart Contract – Ricardian contracts - The DAO. Hyper ledger projects – Hyperledger as a protocol – Fabric - Hyperledger Fabric - Sawtoothlake – Corda Architecture.

Text Book:

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd revised edition. Birmingham: Packt Publishing, 2018.

Reference Books:

1. A. M. Antonopoulos, Mastering bitcoin, First edition. Sebastopol CA: O'Reilly, 2015.
2. Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, ― "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends", in 2017 IEEE International Congress on Big Data (BigData Congress), 2017, pp.557–564.

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MOBILE COMPUTING

Code: 24CS703
Max Marks: 70

Course Objectives: The objective of this course is to develop an understanding of the ways that mobile technologies can be used for teaching and learning and also consider the impact of mobile computing on the field of education.

UNIT I **(10 Hrs)**

Introduction to Mobile Computing: History, Types, Benefits, Application, Evolution, Characteristics of Mobile computing, Security Concern regarding Mobile Computing, Different Propagation Modes, Wireless Architecture and its types. First-Generation Analogue, Second Generation TDMA, Second-Generation CDMA, Third-Generation Systems.
Cellular Concept: Cellular Systems and Principals of Cellular Networks, Hexagonal geometry cell and concept of frequency reuse, Channel Assignment Strategies, Distance to frequency reuse ratio; Electromagnetic Spectrum.
Antennas and Propagation: Antennas, Propagation Modes, Line of Sight Transmission, Fading in the Mobile Environment, Signal Characteristics; Channel Capacity, Multiplexing, Spread Spectrum: DSSS & FHSS, CDMA.

UNIT II **(12 Hrs)**

Telecommunication Systems: GSM: Architecture, Channel allocation ,call routing, PLMN interface, GSM addresses and identifiers, network aspects, frequency allocation, authentication and security, Handoffs Technique.
GPRS: network architecture, network operation, data services, Applications, Billing and charging.
UTRAN, UMTS; Mobile Networking: Medium Access Protocol, Internet Protocol and Transport layer, Medium Access Control: Motivation for specialized MAC, Introduction to multiple Access techniques (MACA).

UNIT III **(12 Hrs)**

Mobile IP: Features of Mobile IP and its need, IP packet delivery, Key Mechanism in Mobile IP, Agent Discovery, Registration, Tunnelling and encapsulation, Reverse Tunnelling, Routing (DSDV,DSR), Route optimization, IP Handoff.
Mobile TCP: Traditional TCP, Classical TCP Improvements like Indirect TCP, Snooping TCP & Mobile TCP, Fast Retransmit/ Fast Recovery, Transmission/Timeout Freezing, Selective Retransmission.
Wireless Application Protocol: Introduction, Application, Architecture, Protocol Stack and Challenges.

UNIT IV **(10 Hrs)**

Bluetooth: Introduction, User Scenario, Architecture, protocol stack; IP Mobility, Macro Mobility and Micro Mobility, Introduction to 4G and 5G; LTE, HIPERLAN, Mobile Device Operating Systems, Special Constrains & Requirements, Commercial Mobile Operating Systems, Software Development Kit: iOS, Android, BlackBerry, Windows Phone, M-Commerce, Structure, Mobile Payment System.

Text Book:

1. John H. Schiller, “Mobile Communications”, Pearson Education, 2nd Edition, 2003.
2. Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, “Mobile Computing: Technology, Applications and Service Creation”, 2nd Edition, Tata McGraw Hill, 2010.

Reference Books:

1. Andreas F. Molisch, “Wireless Communications”, 2nd Edition, Wiley –India, 2006.
2. Raj Kamal, “Mobile Computing”, 3rd Edition, Oxford University Press, 2018.
3. Frank Adelstein, S.K.S. Gupta, Golden G. Richard III and Loren Schwiebert, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional.

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BIG DATA ANALYTICS LAB

Code: 24CS791
Max Marks: 70

(BASED ON 24CS701) Big Data Analytics:
List of Practical:

1. Install Apache Hadoop.
2. Develop a MapReduce program to calculate the frequency of a given word in a given file.
3. Develop a MapReduce program to find the maximum temperature in each year.
4. Develop a MapReduce program to find the grades of student's.
5. Develop a MapReduce program to implement Matrix Multiplication.
6. Develop a MapReduce to find the maximum electrical consumption in each year given electrical consumption for each month in each year.
7. Develop a MapReduce to analyze weather data set and print whether the day is shinny or cool day.
8. Develop a MapReduce program to find the number of products sold in each country by considering sales data containing fields like-
   Transaction_date
   Product
   Price
   Payment_Type
   Name
   City
   State
   Country
   Account_Created
   Last_Login
   Latitude
   Longitude
9. Develop a MapReduce program to find the tags associated with each movie by analyzing movie lens data.
10. XYZ.com is an online music website where users listen to various tracks, the data gets collected which is given below. The data is coming in log files and looks like as shown below.

User Id	Track Id	Shared	Radio	Skip
111115	222	0	1	0
111113	225	1	0	0
111117	223	0	1	1
111115	225	1	0	0

11. Write a MapReduce program to get the following:
    - Number of unique listeners.
    - Number of times the track was shared with others.
    - Number of times the track was listened to on the radio.
    - Number of times the track was listened to in total.
    - Number of times the track was skipped on the radio.
12. Develop a MapReduce program to find the frequency of books published each year and find in which year maximum number of books were published using the following data:
    Title
    Author
    Published year
    Author country
    Language
    No. of pages
13. Write queries to sort and aggregate the data in a table using HiveQL.
14. Develop a Java application to find the maximum temperature using Spark.

15. Develop a program to calculate the maximum recorded temperature by year wise for the weather dataset in Pig Latin.

IOT LAB

Code: 24CS693
Max Marks: 70

(BASED ON 24CS603) Internet of Things:
List of Practical:

1. Select any one development board (E.g., Arduino or Raspberry Pi) and control LED using the board.
2. Using the same board as in (1), read data from a sensor. Experiment with both analogue and digital sensors.
3. Control any two actuators connected to the development board using Bluetooth.
4. Read data from sensor and send it to a requesting client. (using socket communication) Note: The client and server should be connected to same local area network.
5. Create any cloud platform account, explore IoT services and register a thing on the platform.
6. Push sensor data to cloud.
7. Control an actuator through cloud.
8. Accesses the data pushed from sensor to cloud and apply any data analytics or visualization services.
9. Create a mobile app to control an actuator.
10. Design an IoT based air pollution control system which monitors the air pollution by measuring carbon monoxide, ammonia, etc and gives alarm or sends message when the pollution level is more than permitted range.
11. Design an IoT based system which measures the physical and chemical properties of the water and displays the measured values.
12. Identify a problem in your local area or college which can be solved by integrating the things you learned and create a prototype to solve it (Mini Project).
13. Design a business model canvas for a digital display.

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Theory Paper

Total: 100 Marks
External: 70 Marks
Internal: 30 Marks

External: 70 Marks
10 Question (MCQ): 1 marks each (1x10 = 10)
Answer any 6 out of 8 (Very Short 20-30 Words): 2 marks each (2x6 = 12)
Answer any 6 out of 8 (Short 50-70 Words): 3 marks each (3x6 = 18)
Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

Internal: 30 Marks
Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

Lab

Practical: 100 Marks
External: 70 Marks
Internal: 30 Marks

External (Two programs): 70 Marks
- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart**: 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks

ARYAVART INTERNATIONAL UNIVERSITY

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Syllabus for B Tech (CSE)

Semester 8

Theory									
Course Code	Topic	L	T	P	Credit	Theory Marks	Internal Marks	Practical Marks	Total Marks
24CS801	Wireless Communication	3	1	0	4	70	30	0	100
24CS802	Embedded System Design	4	0	0	4	70	30	0	100
24MG113	Project Management	4	0	0	4	70	30	0	100
24PR501	Major Project	0	0	6	6	0	100	0	100
24PR502	Seminar/Conference Presentation	0	0	2	2	70	30	0	100
Discipline Specific Elective (DSE-6) (Choose any one)									
24CS811	Natural Language Processing	3	1	0	4	70	30	0	100
24CS812	Quantum Computing	3	1	0	4	70	30	0	100
24CS813	Neural Networks & Deep Learning	3	1	0	4	70	30	0	100
	Total				**22**	**350**	**250**	**0**	**600**

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Detailed Syllabus

WIRELESS COMMUNICATION

Code: 24CS801
Max Marks: 70

Course Objectives: This course provides a comprehensive overview and advanced knowledge of modern mobile and wireless communication systems. Building on the prior knowledge on digital communications, students develop further understanding on the challenges and opportunities brought by the wireless medium in designing current and future wireless communication systems and networks.

UNIT I **(5 hours)**
History of wireless communication: Concept of mobile and personal communication, wireless cellular platform, the design fundamentals of cellular networks, frequency reuse, spectrum capacity enhancement techniques, co-channel and adjacent channel interference, location management, handoff management; Concept of mobile IP for mobility management issues.

UNIT II **(10 hours)**
Propagation Models for Wireless Networks: Two-ray ground reflection model, a micro-cell propagation model, a macro-cell propagation model, shadowing model, large scale path loss and shadowing, multi path effects in mobile communication, linear time variant channel model; Concept of coherent bandwidth, Coherent time, Doppler Shift - Effect of velocity of the mobile, models for multi path reception, mobile communication antennas.

UNIT III **(7 hours)**
Multiple access techniques in wireless communications: frequency division multiple access technology (FDMA), time division multiple access (TDMA), space division multiple access (SDMA), code division multiple access (CDMA); spectral efficiency of different wireless access technologies, spectral efficiency in FDMA system, spectral efficiency in TDMA system, spectral efficiency for DS-CDMA system.

UNIT IV **(10 hours)**
Second Generation Mobile Networks-GSM: Architecture and protocols, access technology, call set up procedure, 2.5 G networks; evolution to GPRS, concept of data communication on GPRS, session management and PDP Context, data transfer through GPRS network and routing, concept of LTE, WiMax, 4G and 5G

UNIT V **(8 hours)**
Applications of different RF bands: ranges • Brief about various applications of RF technology like WiFi, Bluetooth, Air traffic control, GPS navigation system, satellite systems, mobile networks, radio astronomy and remote sensing, 5G technology. • LTE-WiFi Radio Level Aggregation (LWA).

Text Book:

1. Wireless Communications- Principles and Practice, T S Rappaport, Pearson Education India, Second Edition.

Reference Books:

1. Wireless Communication and Networks, Upen Dalal, Oxford university Press, First Edition, 2015.
2. Wireless Communication and Networks 3G and Beyond, Iti Saha Misra, Tata McGraw Hill Education Pvt. Ltd, Second Edition, 2009.
3. Mobile Communication Engineering – Theory and Applications W C Y Lee, TMH Publication, Second Edition, 2008.
4. Wireless Communication, Andrea Goldsmith, Cambridge University Press, 2005.
5. Fundamentals of Wireless Communication, David Tse and Pramod Viswanath, Cambridge University Press, 2005.

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EMBEDDED SYSTEM DESIGN

Code: 24CS802
Max Marks: 70

Course Objectives: This course emphasizes on comprehensive treatment of embedded hardware and real time operating systems along with case studies, in tune with the requirements of Industry. The objective of this course is to enable the students to understand embedded-system programming and apply that knowledge to design and develop embedded solutions.

UNIT I **(10 Hrs)**

Introduction to Embedded systems: Embedded system overview and applications, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture, instruction set, instruction formats, and various addressing modes of 32-bit. Fixed point and Floating point arithmetic operations. Introduction ARM architecture and Cortex – M series, Introduction to the Tiva family viz. TM4C123x(Cortex M4F) and its targeted applications, block diagram, address space, on-chip peripherals (Analog and Digital) Register sets, Addressing modes and instruction set basics.

UNIT II **(08 Hrs)**

Microcontroller Fundamentals for Basic Programming: I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Introduction to Interrupts, Interrupt vector table, interrupt programming.

UNIT III **(08 Hrs)**

Timers, PWM and Mixed Signals Processing: Timer, Basic Timer, Real Time Clock (RTC), Timing generation and measurements, Analog interfacing and data acquisition: ADC, Analog Comparators, DMA, Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

UNIT IV **(10 Hrs)**

Communication protocols and Interfacing with external devices: Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, I2C protocol, SPI protocol & UART protocol. Implementing and programming I2C, SPI & UART interface and CAN & USB interfaces on TM4C123x .

UNIT V **(15 Hrs)**

Embedded networking: Embedded Networking fundamentals, Ethernet, TCP/IP introduction, Overview of wireless sensor networks and design examples. Various wireless protocols and its applications: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi.

Text Book:

1. J.W. Valvano, "Embedded Microcomputer System: Real Time Interfacing", Brooks/Cole, 2000.

Reference Books:

2. Jack Ganssle, "The Art of Designing Embedded Systems", Newness, 1999.
3. V.K. Madisetti, "VLSI Digital Signal Processing", IEEE Press (NY, USA), 1995.
4. David Simon, "An Embedded Software Primer", Addison Wesley, 2000.
5. K.J. Ayala, "The 8051 Microcontroller: Architecture, Programming, and Applications", Penram Intl, 1996.

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PROJECT MANAGEMENT

Code: 24MG113
Max Marks: 70

Course Objectives: The "Project Management" course equips students with essential skills to plan, execute, monitor, and close projects effectively. It covers key areas such as project planning, risk management, budgeting, stakeholder engagement, and the use of modern project management tools. Students will also develop leadership and teamwork abilities for successful project delivery.

UNIT I

Overview of Project Management: Verities of project, Project Features, Project Life Cycle – S-Curve, J-C.

Project Selection: Project Identification and Screening– New ideas, Vision, Long-term objectives, SWOT Analysis (Strength, Weakness, Opportunities, and Threats).

Project Appraisal– Market Appraisal, Technical Appraisal, Economic Appraisal, Ecological Appraisal and Financial Appraisal– Payback, Net Present Value (NPV), Internal Rate of Returns (IRR).

Project Selection– Decision Matrix, Technique for Order Preference using Similarity to Ideal Solution (TOPSIS), Simple Additive Weighting (SAW).

UNIT II

Project Presentation: WBS, Project Network – Activity on Arrow (A-O-A), Activity on Node (A-O-N).

Project Scheduling: Gant Chart, Critical Path Method (CPM), Project Evaluation & Review Technique (PERT). Linear time cost trade-offs in project – Direct cost, indirect cost, Project crashing Resource Consideration – Profiling, Allocation, Levelling.

Introduction to project management software: Primavera/ Microsoft project

UNIT III

Project Execution: Monitoring control cycle, Earned Value Analysis (EVA), Project Control– Physical control, Human control, financial control.

Organizational and Behavioural Issues: Organizational Structure, Selection-Project Manager, Leadership Motivation, Communication, Risk Management.

Project Termination: Extinction, Addition, Integration, Starvation.

Textbooks:

1. Jack R. Meredith and Samuel J. Mantel, Jr. – 'Project Management- A Managerial Approach' Eighth Edition – John Wiley & Sons Inc – 2012.
2. Arun Kanda – 'Project Management-A Life Cycle Approach' PHI Learning Private Limited – 2011.

Reference Books:

1. 'A Guide to Project Management Body of Knowledge' PMBOK GUIDE, Sixth edition, Project management Institute – 2017.
2. Ted Klastrorin – 'Project Management, Tools, and Trade-Offs' – John Wiley – 2011.

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MAJOR PROJECT

Code: 24PR501
Max Marks: 70

PROJECT REPORT
All the students are required to submit a report based on the project work done by them during the sixth semester.

SYNOPSIS (SUMMARY/ABSTRACT):
All students must submit a summary/abstract separately with the project report. Summary, preferably, should be of about 3-4 pages. The content should be as brief as is sufficient enough to explain the objective and implementation of the project that the candidate is going to take up. The write up must adhere to the guidelines and should include the following:

- Name / Title of the Project
- Statement about the Problem
- Why is the particular topic chosen?
- Objective and scope of the Project
- Methodology (including a summary of the project)
- Hardware & Software to be used
- Testing Technologies used
- What contribution would the project make?

TOPIC OF THE PROJECT-
This should be explicitly mentioned at the beginning of the Synopsis. Since the topic itself gives a peep into the project to be taken up, candidate is advised to be prudent on naming the project. This being the overall impression on the future work, the topic should corroborate the work.

OBJECTIVE AND SCOPE:
This should give a clear picture of the project. Objective should be clearly specified. What the project ends up to and in what way this is going to help the end user has to be mentioned.

PROCESS DISCRIPTION:
The process of the whole software system proposed, to be developed, should be mentioned in brief. This may be supported by DFDs / Flowcharts to explain the flow of the information.

RESOURCES AND LIMITATIONS:
The requirement of the resources for designing and developing the proposed system must be given. The resources might be in form of the hardware/software or the data from the industry. The limitation of the proposed system in respect of a larger and comprehensive system must be given.

CONCLUSION:
The write-up must end with the concluding remarks- briefly describing innovation in the approach for implementing the Project, main achievements and also any other important feature that makes the system stand out from the rest.

The following suggested guidelines must be followed in preparing the Final Project Report:
Good quality white A4 size paper should be used for typing and duplication. Care should be taken to avoid smudging while duplicating the copies.

- Page Specification: (Written paper and source code)
- Left margin - 3.0cms
- Right margin- 2.0cms
- Top margin 2.54cms
- Bottom margin 2.54cms
- Page numbers - All text pages as well as Program source code listing should be numbered at the bottom centre of the pages.

Normal Body Text: Font Size: 12, Times New Roman, Double Spacing, Justified. 6 point above and below para spacing

Paragraph Heading Font Size: 14, Times New Roman, Underlined, Left Aligned. 12 point above & below spacing.
Chapter Heading Font Size: 20, Times New Roman, Centre Aligned, 30 point above and below spacing.
Coding Font size: 10, Courier New, Normal
Submission of Project Report to the University: The student will submit his/her project report in the prescribed format. The Project Report should include:

1. One copy of the summary/abstract.
2. One hard Copy of the Project Report.
3. The Project Report may be about 75 pages (excluding coding).

FORMAT OF THE STUDENT PROJECT REPORT ON COMPLETION OF THE PROJECT

I. Cover Page as per format
II. Acknowledgement
III. Certificate of the project guide
IV. Synopsis of the Project
V. Main Report
   i. Objective & Scope of the Project
   ii. Theoretical Background Definition of Problem
   iii. System Analysis & Design vis-a-vis User Requirements
   iv. System Planning (PERT Chart)
   v. Methodology adopted; System Implementation & Details of Hardware & Software used System Maintenance &Evaluation
   vi. Detailed Life Cycle of the Project
      a. ERD, DFD
      b. Input and Output Screen Design
      c. Process involved
      d. Methodology used testing
      e. Test Report, Printout of the Report & Code Sheet
VI. Coding and Screenshots of the project
VII. Conclusion and Future Scope
VIII. References

Formats of various certificates and formatting styles are as:

1. Certificate from the Guide

CERTIFICATE

This is to certify that this project entitled " xxxxxx xxxxx xxxxx xxxx xxxx xxx" submitted in partial fulfilment of the degree of Bachelor of Technology (Computer Science Engineering) to the "xxxxxxxxxxxxxxxxxxxxxxxxxxx" through xxxxxx xxxxx done by Mr./Ms. _____, Roll No. _____ is an is an authentic work carried out by him/her at _____ under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree to the best of my knowledge and belief.

Signature of the student Signature of the Guide

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2. Project Report Cover Page Format:

Title of the Project/report
(Times New Roman, Italic, Font size = 24)

Submitted in partial fulfilment of the requirements for the award of the Degree of
Bachelor of Technology (CSE)
(Bookman Old Style, 16 point, centre)

Submitted to:
(Guide Name)

Submitted by:
(Student's name)
Roll No:
College Name:

3. Self-Certificate by the students

SELF CERTIFICATE

This is to certify that the dissertation/project report entitled "……" is done by me is an authentic work carried out for the partial fulfilment of the requirements for the award of the degree of Bachelor of Technology (CSE) under the guidance of _____. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

Signature of the student
Name of the Student
Roll No.

4. ACKNOWLEDGEMENTS

In the "Acknowledgements" page, the writer recognizes his indebtedness for guidance and assistance of the thesis adviser and other members of the faculty. Courtesy demands that he also recognize specific contributions by other persons or institutions such as libraries and research foundations. Acknowledgements should be expressed simply, tastefully, and tactfully.

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SEMINAR/CONFERENCE PRESENTATION

Code: 24PR502
Max Marks: 70

OBJECTIVE:
Seminars/Conferences and Presentations provide a platform to the students, where they can learn from what others are doing, learn about new things, ideas and important tips related to new technologies. To foster the Innovations happening in upcoming technologies and harnessing the entrepreneurial opportunities, Institutes must provide ample opportunities to the students to learn and yield the advantages of new advancements in the field of technology. It is expected from a student to learn latest in the industry and write an article related to it and present their findings in front of a panel.

The following points need to considered while planning and evaluating the presentation

- The seminars must be conducted after every 15 days/ or a month. A minimum of 3-4 seminar sessions can be organized during the semester.
- A minimum of 7-8 slides must be there which would include the title slide. The first slide should be the Introduction slide and the last one reference slide wherein all the links/books references/paper reference to paper must be quoted. The rest of the slides should focus on the technology, application areas etc.
- The title of the seminar must be related to the field of Information technology and must talk about the latest innovation/technology like IOT, Machine learning, Deep learning, AI Cloud computing, Mobility, Hand held devices, Social Computing, NOSQL Database, CRM, Social CRM, Open Source Application Development Frameworks, Zero Trust Security Framework/ Architecture, Big Data/ Data Lake, Emerging and Innovative Technologies, Conversational AI, Sentiments Analysis, DevOps, Real time Analytics, Fraud Detection. Proper approval must be taken before starting the work.
- Student's feedback must be taken after taking the seminar as to what learning they have gathered after studying the topics. For this, a feedback form may be designed using Google form utility.

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NATURAL LANGUAGE PROCESSING

Code: 24CS811
Max Marks: 70

Course Objectives: This course aims at teaching the basics about processing of Natural Languages. Natural language processing is the feature of 5th Generation Computer and is part of Artificial intelligence. It teaches about the different phases of natural language processing, methodologies, algorithms, data structures used for Natural Language Processing.

UNIT I **(10 Hrs)**

Introduction: Basic concepts of Natural language Processing, evolution of NLP, issues and challenges in NLP, basic concepts of phases of natural language processing morphological analysis, syntactic analysis, semantic analysis, pragmatic analysis, tools and techniques used for performing these analysis, ambiguities, Types of ambiguities.

UNIT II **(11 Hrs)**

Syntactic analysis: Concept of Grammars, Chomsky hierarchy of grammars, concept of parsing, top down parsing, bottom up parsing, bidirectional parsing, generating parse tree, data structures and algorithms used for parsing, tokenizer, Case study of parsers of NLP systems like ELIZA, LUNAR.

UNIT III **(11 Hrs)**

Semantic Analysis: understanding meaning, CASE grammars, transformational grammars used for performing semantic analysis. Resolving ambiguities to generate correct meaning, Word Sense Disambiguation Case study of Toolkit of word sense disambiguation used in WORDNET.

UNIT IV **(10 Hrs)**

Software tools for Performing NLP: English WORDNET, components of WorldNet understanding NLTK tool for using wordnet, HINDI wordnet, Indian Govt initiative for language analysis and machine translation.

Text Book:

1. Allen, James, "Natural Language Understanding", Second Edition, Benjamin/ Cumming, 1995.
2. Jurafsky, Danand Martin, James," Speech and Language Processing", Second Edition, Prentice Hall, 2008.

Reference Books:

1. Bharati Akshar, Chaitanya Vineet, Sangal, Rajeev, "Natural Language Processing: A Paninian Perspective", Prentice Hall India Learning Private Limited; EASTERN ECONOMY ed. edition, 1995.
2. Philipp Koehn, Statistical Machine Translation, Cambridge University Press; 1st edition, 2009.
3. U.S. Tiwari and Tanveer Siddiqui, Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

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QUANTUM COMPUTING

Code: 24CS812
Max Marks: 70

Course Objectives: The course aims to serve as an introduction to the quantum computational model with the goal of understanding basic quantum algorithms and analyzing them. The course also addresses limitations of quantum algorithms and introduces the necessary tools and techniques to prove the same.

UNIT I **(10 Hrs)**

Introduction to Quantum Computation: Classical deterministic systems, classical probabilistic systems, quantum systems, basic quantum theory. Quantum bits, Bloch sphere representation of a qubit, multiple qubits.
Background Mathematics and Physics: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis

UNIT II **(11 Hrs)**

Quantum Circuits: single qubit gates, multiple qubit gates, design of quantum circuits, classical gates, quantum gates.
Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states. Quantum teleportation. Quantum Cryptography, no cloning theorem. Asymmetric and symmetric encryption, quantum key distribution

UNIT III **(11 Hrs)**

Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Quantum circuits, reversibility of quantum circuits, power of quantum algorithms, Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor factorization, Grover search, applications of quantum algorithms.

UNIT IV **(10 Hrs)**

Noise and error correction: Graph states and codes, Quantum error correction, fault tolerant computation, Single-Qubit Errors, Quantum Operations and Krauss Operators, The Depolarization Channel, The Bit Flip and Phase Flip Channels, Amplitude Damping, Phase Damping

Text Book:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press, 2002.
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific, 2004.

Reference Books:

1. Quantum Computation and Quantum Information. Michael A. Nielsen, Isaac L. Chuang. Cambridge University Press, Dec 9, 2010 - Science.
2. An Introduction to Quantum Computing. Phillip Kaye, Raymond Laflamme, Michele Mosca. Oxford University Press Inc., New York, 2007.
3. Quantum Computing: An Applied Approach. Jack D. Hidary. Springer; 1st ed. 2019 edition (20 September 2019).

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NEURAL NETWORK AND DEEP LEARNING

Code: 24CS813
Max Marks: 70

Course Objectives: Deep learning has resurged with the availability of massive datasets and affordable computing, enabling new applications in computer vision and natural language processing. This course introduces convolution, recurrent, and other neural network architectures for deep learning. Students design, implement, and train these models to solve real-world problems. The objective of this course is to introduce students to deep learning algorithms and their applications in order to solve real problems.

UNIT I **(07 Hrs)**

Review of Linear Regression and Logistic Regression, Neural Networks, Feedforward & Backpropagation algorithm. Gradient Descent (GD), Batch GD, Stochastic GD, AdaGrad, RMSProp, Regularization, Learning Curves, Bias vs Variance, Early Stopping.

UNIT II **(08 Hrs)**

Image Classification, Convolutional Neural Networks (CNN), Operations - Convolution, Pooling, Stride, Padding, FC layer. Well known CNN architectures - AlexNet, VGG16, ResNet, InceptionNet. Object Recognition, One Shot Learning, Siamese Network, Face Recognition. Image data augmentation techniques.

UNIT III **(07 Hrs)**

Sequence Models. Recurrent Neural Networks, Back propagation over time. LSTM, GRU. Language Models. Word Embeddings - Word2Vec, GloVe. Encoder Decoder Models, Attention Mechanism, Transformer, BERT. NLP data augmentation techniques.

UNIT IV **(08 Hrs)**

Auto-encoders, Restricted Boltzmann Machines, Motivation for Sampling, Markov Chains, Training RBMs - Gibbs Sampling, Contrastive Divergence. Generative Adversarial Networks - GANs and applications. Explainability techniques.

Text Book:

1. Deep Learning, An MIT Press book, Ian Goodfellow and Yoshua Bengio and Aaron Courville http://www.deeplearningbook.org, 2016.
2. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “Introduction to data mining”, Pearson education, 2006.
3. Ravindran, K. M. Ragsdell , and G. V. Reklaitis , ENGINEERING OPTIMIZATION: Methods and Applications , John Wiley & Sons, Inc. , 2016

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Theory Paper

Total: 100 Marks
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Answer any 6 out of 8 (Long 100-120 Words): 5 marks each (5x6 = 30)

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Two Internal Assessment Examinations will be conducted, each carrying 50 marks. The higher of the two scores will be considered for the final assessment.

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Practical: 100 Marks
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Internal: 30 Marks

External (Two programs): 70 Marks
- **Program Writing**: 10 + 10 Marks
- **Algorithm& Flowchart** : 5 + 5 Marks
- **Program Execution**: 15 + 15 Marks
- **Viva**: 10 Marks

Internal Assessment (30 Marks)
Internal Assessment Examinations will be conducted, carrying 50 marks
- **Record**: 5 Marks
- **Attendance**: 5 Marks
- **Program Writing**: 15 Marks
- **Program Execution**: 15 Marks
- **Viva**: 10 Marks