SYLLABUS

(With effect from 2018-19)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2018–19)

III & IV Semester

BACHELOR DEGREE

IN

COMPUTER SCIENCE & ENGINEERING

OUT COME BASED EDUCATION

WITH

CHOICE BASED CREDIT SYSTEM

P.E.S. COLLEGE OF ENGINEERING,

MANDYA - 571 401, KARNATAKA

(An Autonomous Institution Affiliated to VTU, Belagavi)

Grant -in- Aid Institution (Government of Karnataka)

Accredited by NBA, New Delhi & Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ

(ವಿ.ಟಿ.ಯು, ಬೆಳಗಾವಿ ಅಡಿಯಲ್ಲಿನ ಸ್ವಾಯತ್ತ ಸಂಸ್ಥೆ)

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PREFACE

P.E.S. College of Engineering, Mandya, started in the year 1962, has become autonomous institute in the academic year 2008-09. Since, then it has been doing the academics and assessment activities successfully. The college is running eight undergraduate and eight Postgraduate programs including MBA and MCA which are affiliated to VTU, Belagavi.

India has recently become a Permanent Member of the Washington Accord. The accord was signed by the National Board of Accreditation (NBA) on behalf of India on 13th June 2014. It enables not only the mobility of our degree globally but also establishes equivalence to our degrees with that of the member nations. The implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the various countries.

Our Higher Educational Institution has adopted the Choice Based Credit System (CBCS) based semester structure with OBE scheme and grading system. Which provides the flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. There lies a shift in thinking, teaching and learning process moving towards Students Centric from Teachers Centric education which enhances the knowledge, skills & moral values of each student.

Choice Based Credit System (CBCS) provides the options for the students to select from the number of prescribed courses. The CBCS provides a ‘cafeteria’ type approach in which the students can Choose electives from a wide range of courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, adopt an interdisciplinary approach for learning which enables integration of concepts, theories, techniques. These are greatly enhances the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills, self-learning components and Personality Development modules have been added to the existing curriculum. In order to enhance creativity and innovation Mini Project and Industrial visit & Interaction are made mandatory for all undergraduate programs.

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P.E.S. College of Engineering, Mandya

VISION

"PESCE shall be a leading institution imparting quality Engineering and Management education developing creative and socially responsible professionals

MISSION

- Provide state of the art infrastructure, motivate the faculty to be proficient in their field of specialization and adopt best teaching-learning practices.
- Impart engineering and managerial skills through competent and committed faculty using outcome based educational curriculum.
- Inculcate professional ethics, leadership qualities and entrepreneurial skills to meet the societal needs.
- Promote research, product development and industry-institution interaction.

Department of Computer Science and Engineering

The Vision of the department is:
"The Department of Computer Science and Engineering shall create professionally competent and socially responsible engineers capable of working in global environment.*"*

The mission of the department is:

DM1: Enforce best practices in teaching-learning, with dedicated faculty and supportive infrastructure to impart the knowledge in emerging technologies.
{Required to create professionally competent engineers}

DM2: Improve Industry-Institute relationship for mutual benefit.
{Required to create professionally competent engineers}

DM3: Inculcate ethical values, communication and entrepreneurial skills.
{Required to create professionally competent and socially responsible engineers}

DM4: Sensitize social, legal, environmental and cultural diversity issues through professional training and balanced curriculum.
{Required to create engineers capable of working in global environment}

Program Educational Objectives (PEOs)

Graduates of the program shall

1. Have Successful computer professional career in IT industry and related areas.
2. Pursue higher education in engineering or management with the focus on intensive research and developmental activities.
3. Develop computing systems in a responsible, professional and ethical manner to serve the society**.**

The National Board of Accreditation (NBA) has defined twelve Program Outcomes for Under Graduate (UG) engineering programs as listed below.

Program Outcomes (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problem.
2. **Problem analysis**: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

The Under Graduate (UG) of B.E Computer Science & Engineering Program has defined **Program Specific Outcomes (PSO**) which are listed below.

The students shall have the

1. Ability to design and develop network based systems in emerging technology environments like Cloud Computing, Security, Internet of Things and embedded systems.
2. Ability to develop knowledge based data management system in the areas like data analytics, data mining, business intelligence, pattern recognition and knowledge discovery in solving engineering problems.

(An Autonomous Institution, Under VTU)

Scheme of Teaching and Examination for B.E. (3rd /4th) Computer Science & Engineering

III Semester

Sl. No	Course code	Course Title	Teaching Dept.	Hrs/Week	Total Credit	Examination Marks		
				L :T: P:H		CIE	SEE	Total
1	P18MA31	Transform calculus, fouries and numerical techniques	Maths	4:0:0: 4	4	50	50	100
2	P18CS32	Digital Logic Design	CS	4:0:0: 4	3	50	50	100
3	P18CS33	Data Structures	CS	4:0:0:4	3	50	50	100
4	P18CS34	Computer Organization	CS	4:0:0:4	3	50	50	100
5	P18CS35	Discrete Mathematical Structures	CS	4:0:0:4	3	50	50	100
6	P18CS36	Object Oriented Programming with Java (FC-I)	CS	2:2:0:4	3	50	50	100
7	P18CSL37	Data Structures Lab	CS	0:0:3:3	1.5	50	50	100
8	P18CSL38	Digital Logic Design Lab	CS	0:0:3:3	1.5	50	50	100
9	P18HU39	# Aptitude and Reasoning Development – Basics(ARDB)	HM	2:0:0:2	--	50	--	--
10	P18HUDIP310	*Comprehensive Communication Development (CCD)	HM	2:0:0:2	[2]	[50]	[50]	[100]
11	P18HUMDIP311	* Indian Institution, Human Rights & professional Ethics (ICHRPF)	HM	2:0:0:2	0	(50)	--	--
12	P18MADIP31	*Additional Maths-I	MA	4:0:0:4	0	(50)	--	--
				Total	**24 [24]**	**400 [400]**	**400 [400]**	**800 [800]**

*CCD/ ICHRPF/ Additional Maths-I: Lateral entry (i.e Diploma) students shall have to pass these mandatory learning courses before completion of VI semester. CIE only for 50 marks

# ARDB : All students shall have to pass this mandatory learning courses before completion of VI semester

+ Common to B.E. (AU,CV, ME and I&PE)

++ Common to B.E. (CS, EC, E&E and IS&E)

IV Semester

Sl. No	Course code	Course Title	Teaching Dept.	Hrs/Week	Total Credit	Examination Marks		
				L :T: P:H		CIE	SEE	Total
1	P18MA41	Complex analysis, statistics, probability and numerical techniques	Maths	4:0:0:4	4	50	50	100
2	P18CS42	Theory of Computation	CS	4:0:0:4	3			
3	P18CS43	Analysis and Design of Algorithms	CS	4:0:0:4	3	50	50	100
4	P18CS44	Data Communication	CS	4:0:0:4	3	50	50	100
5	P18CS45	AVR Microcontroller	CS	4:0:0:4	3	50	50	100
6	P18CS46	Database Management Systems (FC-II)	CS	2:2:0:4	3	50	50	100
7	P18CSL47	Analysis and Design of Algorithms Lab	CS	0:0:3:3	1.5	50	50	100
8	P18CSL48	Object oriented programming with Java Lab	CS	0:0:3:3	1.5	50	50	100
9	P18HU49	** Aptitude and Reasoning Development – INTERMEDIATE (ARDI)	HM	2:0:0:2	1	50	50	100
10	P18EVDIP50	*Environmental Studies	HM	2:0:0:2	--	(50)	--	--
11	P18MADIP41	*Additional Maths-II	MA	4:0:0:4	--	(50)	--	--
				Total	**23**	**400**	**400**	**800**

* Additional Mathematics-II & Environmental Studies : Lateral entry students shall have to pass these mandatory learning courses before completion of VI semester

+Common to B.E. (AU,CV, ME and I&PE)

++ Common to B.E. (CS, EC, E&E and IS&E)

Course Title: TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES			
Course Code: P18MA31	Semester: III	L:T:P:H: 4:0:0:4	Credits: 4-0-0
Contact Period-Lecturer: 52Hrs. Exam: 3Hrs		Weightage:CIE:50%; SEE:50%	

(Common to All Branches)

Course Content

Unit-1

Numerical Methods-I: Finite differences**:** Forward and Backward differences,Gregory-Newton forward and backward interpolation formulae, Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula. (All formulae without proof) – Problems only

Central differences: Gauss Forward and Backward difference formulae, Sterling's, and Bessel's formulae (All formulae without proof) – problems.

Self-Study Component: Problems using Everett's formula in Central differences

10 Hours

Unit-2

Numerical differentiation using Newton's forward and backward interpolation formulae, Newton's divided difference formula and Sterling's formula (All formulae without proof)-problems only and Applications to Maxima and Minima of a tabulated function.

Numerical integration: Newton- Cotes quadrature formula, Trapezoidal rule, Simpson's (⅓) rd. rule, Simpson's (⅜)th rule, Boole's rule and Weddle's rule (All rules without proof)-Illustrative problems.

Self-Study Component: DeriveNewton- Cotes quadrature formula.

10 Hours

Unit-3

Fourier series: Periodic functions, Euler's formula, Dirichlet's conditions. Discontinuous functions, even and odd functions, functions of arbitrary intervals. Half–range Fourier series expansions, complex form of Fourier series, Practical harmonic analysis- Illustrative examples from engineering field.

Self-Study Component: Derivations of Euler's formulae

11 Hours

Unit-4

Fourier Transforms: Infinite Fourier transforms-properties. Fourier sine and cosine transforms, properties. Inverse infinite Fourier and inverse Fourier sine & cosine transforms – Illustrative examples.

Difference equations and Z-transforms: Definition, Z-transform of standard functions, linearity property, damping rule, shifting rules, initial value theorem and final value theorem (All rules and theorems without proof). Inverse Z – transforms. Difference equations- basic definitions. Application of Z-transforms to solve difference equations.

Self-Study Component: Convolution theorem, Parseval'sidentities related problems.

10 Hours

Unit-5

Partial differential equations (PDE's):

Formation of PDE by eliminating orbitrary constants and functions. Solution of non-homogeneous PDE by the method of direct integration. Solutions of homogeneous PDE involving derivative with respect to one independent variable only (both types with given set of conditions). Method of separation of variables (first and second order equations). Solution of the Lagrange's linear PDE's of the type: Pp + Qq = R.

Applications of PDE's:
One- dimensional wave and heat equations (No derivation), and various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two dimensional
Laplace's equation (No derivation)–various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems). Illustrative examples from engineering field.
Self-Study Component: Finding the solution of non-linear equations of first order: Char pit's Method -simple problem.

11 Hours

Text Books:

1. Higher Engineering Mathematics: B.S. Grewal, Khanna Publishers, New Delhi, 42nd Ed. 2012.
2. Advanced Engineering Mathematics: - E. Kreyszig, John Wiley & Sons, 6th Ed.2007.

References:

1. Advanced Modern Engineering Mathematics: - Glyn James, Pearson Education Ltd., 3rd Ed., 2007.
2. Advanced Engineering Mathematics: Peter V O' Neil Thomson, Brooks/Cole, 5th edition, 2007.
3. Higher Engineering Mathematics: - B.V. RAMANA, McGraw Hill Education, 2007

Note: - Each unit contains **two** full questions of **20 marks** each. Students are required to Answer any fivefull questions choosing at least **one** full question from each unit.

Course Articulation Matrix

Mapping of Course Outcomes (CO) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

Sem: 3	**Course code : P18MAT31**	**Title : Engineering Mathematics –III**											
CO's	Statement	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO-1	Apply forward, backward difference formulae and central differences formulae in solving interpolation- extrapolation problems in engineering field.	1	**2**	-	-	-	-	-	-	-	-	-	-
CO-2	Numerical differentiation and integration rules in solving engineering where the handling of numerical methods are inevitable	**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO-3	Apply the knowledge of periodic function, Fourier series, complex Fourier series, Fourier sine/cosine series of a function valid in different periods. Analyze engineering problems arising in control theory/fluid flow phenomena using harmonic analysis.	**3**	**3**	-	-	-	-	-	-	-	-	-	-
CO-4	Understand complex/infinite Fourier transforms, Fourier sine and Fourier cosine transforms with related properties Analyze the engineering problems arising in signals and systems, digital signal processing using Fourier transform techniques. Define Z-transforms& find Z-transforms of standard functions to solve the specific problems by using properties of Z-transforms. Identify and solve difference equations arising in engineering applications using inverse Z–transforms techniques.	**2**	**3**	-	-	-	-	-	-	-	-	-	-
CO-5	Define Partial Differential Equations (PDE's),order, degree and formation of PDE's and, to solve PDE's by various methods of solution Explain one - dimensional wave and heat equation and Laplace's equation and physical significance of their solutions to the problems selected from engineering field.	**2**	**3**	-	-	-	-	-	-	-	-	-	-

Course Title : Digital Logic Design			
Course Code : P18CS32	**Semester : 3**	**L :T:P:H : 4:0:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

Course Content

Unit-1

Digital Logic and Combinational Logic Circuits: Overview of Basic Gates and Universal Logic Gates, AND-OR –Invert Gates, Positive and Negative Logic,Boolean Laws and Theorems, Sum-of-products Method, Truth table to Karnaugh Map, Pairs, Quads, and Octets, Karnaugh Simplification, Don't Care Conditions, Product-of-Sum Method, Product-of-sum Simplification, Simplification by Quine-McClusky Method, Simplification by VEM Technique.

Self Study Component : Five variable Karnaugh map

11 Hours

Unit-2

Data Processing Circuits and Arithmetic Circuits: Multiplexers, Demultiplexers, Decoders, BCD-to-Decimal Decoders, Seven-segment Decoders, Encoders, Ex-OR gates, Parity Generators and Checkers, Magnitude Comparators, Design of code converters, Half Adder, Full Adder, Half Subtractor, Full Subtractor, Fast Adder, Adder- Subtractor , Arithmetic Logic Unit.

Self Study Component : Number system

10 Hours

Unit-3

Memory Devices: Read-only memory (ROM), PROM, EPROM, EEPROM, Programmable Array Logic (PAL), Programmable Logic Array (PLA).

Flip-Flops and Simple Flip-Flop Applications: RS Flip-Flops, Gated Flip-Flops, Edge – Triggered RS Flip-Flops**,** Edge – Triggered D Flip-Flops**,** Edge – Triggered JK Flip-Flops,JK Master-Slave Flip-Flops, Various representation of flip-flops, Conversion of flip-flops.

Self Study Component : Flip-Flop timing, Analysis of sequential circuits

10 Hours

Unit-4

Registers: Types of registers, Serial in Serial out, Serial in Parallel out, Parallel in Serial out, parallel in parallel out, Application of shift registers: Ring counter, Johnson counter, sequence detector and sequence generator.

Asynchronous and synchronous counter: Asynchronous counters, Decoding gates, synchronous counters, changing the counter modulus, decade counter, counter design as a synthesis problem.

Self Study Component : Universal Shift register, Digital clock

10 Hours

Unit-5

Design of Synchronous and Asynchronous Sequential Circuit : Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, Algorithmic State Machine, State Reduction Technique, Analysis of Asynchronous Sequential Circuit, Problems with Asynchronous Sequential Circuits, Design of Asynchronous Sequential Circuit

VHDL Programming: Introduction to VHDL, Describing data flow, Behavioral, Structural and Mixed design style, Simulation for Arithmetic, Combinational circuits and sequential circuits.
Self Study Component : Frequency Counter

11 Hours

Text Books:

1. Digital Principles and Applications: Donald P Leach, Albert Paul Malvino &Goutham Saha, TMH, 8th Edition, 2014.
2. A Verilog HDL Primer, 2nd Edition, J . Bhaskar, BS Publications

Reference Books:

1. Digital Principles & Design by Donald D Givone, 4th Reprint, Tata McGrawHill2009.
2. Fundamentals of Digital Logic with Verilog Design, Stephen Brown, ZVonkoVranesic, TMH, 2006

Course outcomes:

1. **Design** simplified logic circuits using Boolean equation minimization techniques.
2. **Design** the data processing circuits.
3. **Design** memory circuits.
4. **Design** shift registers and counters using flip-flops.
5. **Derive** state machine models for sequential circuits and write VHDL code for all logic circuits.

CO-PO Mapping

Semester: 3	**Course code : P18CS32**						**Title : Digital Logic Design**								
CO	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO 302.1	**Apply** Boolean laws and Boolean equation minimization techniques to design logic circuits..	3	1	1										1	
CO 302.2	**Design** the data processing circuits.	3	3	2										1	
CO 302.3	**Apply** the logic to design memory circuits	3	2	3										1	
CO 302.4	**Design** shift registers and counters using flip-flops.	2	2	3										1	
CO 302.5	**Derive** state machine models for sequential circuits and write VHDL code for all logic circuits.	2	2	3		3								1	
C302		**2.6**	**2**	**2.4**		**3**								**1**	

Course Title : Data Structures			
Course Code : P18CS33	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

Course Content

Unit-1

Pointers: Pointers and character strings, array of pointers, pointers as function arguments, functions returning arguments, pointers to functions, pointers and structures.

Introduction to data structures-Definition, Classification of Data Structures.

Stacks: Representing stack in C- Implementation of Push, Pop and display operations using arrays and pointers. Applications of Stacks: Infix, Postfix, Prefix, Infix to postfix, prefix to postfix, evaluation of postfix.

Self Study Component : Structures concepts, Programmes on structures

10 Hours

Unit-2

Recursion: Definition,Writing Recursive programs-Factorial Numbers, Fibonacci Numbers and Tower of Hanoi Problem

Queues: Definition, Representation, operations, implementation using arrays and linked lists. Different types of queues, Basic operations on - Linear queue, Circular queue, Priority Queue and Double ended Queue (Using SLL), Applications of Queues

Self Study Component : Recursive programmes on Multiplication of natural numbers, GCD of two numbers.

10 Hours

Unit-3

Linked Lists: Static Memory Allocation and Dynamic Memory Allocation, Basic operations on SLL, DLL, Circular SLL and Circular DLL: insertion, deletion and display. Implementation of SLL with Header nodes

Applications of Linked Lists: Merging, Reversing, Searching, Addition of two polynomials using SLL.

Self Study Component : Conversion from Infix to Prefix expression, Postfix to Prefix expression.

10 Hours

Unit-4

Trees: Introduction-Definition, Tree Representation, Properties of Trees, Operations on Binary tree, Binary Search Tree [BST] - Definition, searching BST, Insertion to BST, Deletion from BST, Display BST. Tree and their Applications- Tree Traversal, General Expression as a tree, Evaluating an Expression Tree; Threaded Binary Trees-Threads, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree

Self Study Component : Different traversal techniques using iterative approach

12 Hours

Unit-5

Sorting Techniques: Address calculation sort, Binary tree sort, Radix sort.

Searching Techniques: Sentinel search, probability search, ordered list search (Text Book-2)

Self Study Component : Sorting methods – Quick sort, Merge sort, Searching methods – Binary search, Indexed sequential search

10 Hours

Text Books:

1. Data Structures using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum, PHI, 2nd Edition.
2. Data Structures – A pseudo code Approach with C – Richard F Gilberg and Behrouz A forouzan, 2nd Edition.
3. Programming in ANSI C, C.Balaguruswamy, 6th edition 2013.

Reference Book:

1. Fundamentals of Data Structures in C -Horowitz, Sahani, Anderson-Freed, 2nd Edition, University Press. 2nd Ed. Understand primitive and derived data structure.

Course Outcomes

After learning all the units of the course, the student is able to:

1. **Design** and Implement standard data structures like stack using recursion
2. **Design** and implement operations on linked list.
3. **Develop** programs to implement different queues.
4. **Design and** implement diffèrent tree traversal techniques using iteraton and recursion.
5. **Implement** sorting and searching techniques

CO-PO Mapping

Semester: 3		**Course code : P18CS33**					**Title : Data Structures**								
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO 303.1	**Solve** the given problems using the concepts of stacks	2	2	2		2				2					3
CO 303.2	**Apply** the concepts of linked list	2	2	2		2				2					3
CO 303.3	**Apply** the concepts of queues	2	2	2		2				2					3
CO 303.4	**Design** different types of trees for a given problem.	2	2	2		2				2					3
CO 303.5	**Apply** sorting and searching techniques	2	2	2		2				2					3
C303		**2**	**2**	**2**		**2**				**2**					**3**

Course Title : Computer Organization			
Course Code : P18CS34	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

Course Content

Unit 1

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus structures, Software, Performance, Multi processors and Multi computers, Historical perspective.

Self Study Component : Numbers, arithmetic operations and characters.

10 Hours

Unit 2

Instruction Set Architecture: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes

Self Study Component : Stacks and Queues.

10 Hours

Unit 3

Assembly Language, Basic I/O operations, Subroutines, Additional Instructions, example programs.

Self Study Component : Additional instructions.

11 Hours

Unit 4

Basic Processing Unit: Fundamental Concepts, Execution of complete Instruction, Hardware control, and micro programed control.

Input/output organisation: Accessing I/O devices interrupts, direct memory access.

Self Study Component : Multiple bus organisations.

11 Hours

Unit 5

The Memory System: Some Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, size and cost, Cache memories.

Arithmetic: Multiplication of positive Numbers, Signed operand multiplication, Fast Multiplication, Floating-Point Numbers and Operations.

Self Study Component : Performance considerations.

10 Hours

Text Book:

1. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5th Edition, TMH

Reference Books:

1. Computer Organization & Architecture, William Stallings, 9th Edition, PHI, 2013.
2. Computer Systems Design and Architecture, Vincent P. Heuring & Harry F. Jordan, 2nd Ed. Pearson Education, 2004.

Course Outcomes :

1. Understand and analyze the machine instructions and program execution.
2. Understand and explain the I/O organisation
3. Understand and explain the memory system.
4. Apply the algorithms used for performing various arithmetic operations.
5. Understand and Explain the Concept of Basic Input/output

CO-PO Mapping

Semester: 3	**Course code : P18CS34**					**Title : Computer Organization**									
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PO S1**	**PO S2**
CO 306.1	**Analyze** the machine instructions and program execution	3	2	2	1									3	3
CO 306.2	Understand and explain the I/O organisation	2	3	2	1									2	2
CO 306.3	Understand and explain the memory system	3	3	2	1									3	2
CO 306.4	Apply the algorithms used for performing various arithmetic operations	2	2	3	3	1								1	3
CO 306.5	Understand and Explain the Concept of Basic Input/output	3	3	3	3									2	2
C306		**2.6**	**2.6**	**2.4**	**1.8**	**1**								**2.2**	**2.4**

Course Title : Discrete Mathematical Structures			
Course Code : P18CS35	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		Weightage : CIE:50%, SEE:50%	

Course Content

Unit-1

Fundamentals of Logic: Truth Tables, Logic Equivalence – The Laws of Logic, Logical Implication – Rules of Inference. The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

Self Study Component : Basic Connectives, proofs of theorems

10 Hours

Unit-2

Properties of the Integers: Mathematical Induction, The Well Ordering Principle – Mathematical Induction, Recursive Definitions. The Division Algorithm:Prime numbers. Fundamental Permutations, Combinations – The Binomial Theorem, Combinations with Repetition.

Self Study Component : Principles of Counting: The Rules of Sum and Product

10 Hours

Unit-3

Relations and Functions: Relations, Functions – Plain and One-to-One, Onto Functions. The Pigeon-hole Principle, Function Composition and Inverse Functions. Properties of Relations.

Computer Recognition – Zero-One Matrices and Directed Graphs, Partial Orders – Hasse Diagrams, Equivalence Relations and Partitions.

Self Study Component : Cartesian Product and Relations

11 Hours

Unit-4

The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials. Arrangement with forbidden position.

Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients.

Self Study Component : Addition Principle

10 Hours

Unit-5

Introduction to Graph Theory: Definitions and Examples, Sub graphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits, Planar graphs. Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes

Self Study Component : Graph colouring and chromatic polynomials

11 Hours

Text Book:

1. Ralph P. Grimaldi: Discrete and Combinatorial Mathematics, 5th Ed, Pearson Ed. 2004

Reference Books:

1. Basavaraj S Anami and Venakanna S Madalli: Discrete Mathematics – A Concept based approach, Universities Press, 2016 2.
2. Kenneth H. Rosen: Discrete Mathematics and its Applications, 6th Edition, McGraw Hill, 2007.
3. Jayant Ganguly: A Treatise on Discrete Mathematical Structures, Sanguine-Pearson, 2010.
4. D.S. Malik and M.K. Sen: Discrete Mathematical Structures: Theory and Applications, Thomson, 2004. 5. Thomas Koshy: Discrete Mathematics with Applications, Elsevier, 2005, Reprint 2008.

Course outcomes:

After studying this course, students will be able to:

1. **Verify** the correctness of an argument using propositional and predicate logic
2. **Demonstrate** the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.
3. **Solve** problems involving recurrence relations.
4. **Construct** proofs using direct proof, proof by contraposition, proof by contradiction, and proof by cases, and mathematical induction.
5. **Ability** to Explain and distinguish graphs and their properties.

CO-PO Mapping

Semester: 3	**Course code : P18CS35**						**Title : Discrete Mathematical Structures**								
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PO S1**	**PO S2**
CO 305.1	**Verify** the correctness of an argument using propositional and predicate logic.	3	3	1							3				2
CO 305.2	**Demonstrate** the ability to solve problems using counting techniques and combinatorics in the context of discrete probability.	3	2	2							2			2	2
CO 305.3	**Solve** problems involving recurrence relations	3	2	2							2				2
CO 305.4	**Construct** proofs using direct proof, proof by contraposition, proof by contradiction, proof by cases, and mathematical induction	3	2	2							2				2
CO 305.5	**Ability** to Explain and distinguish graphs and their properties.	3	2	2							2			2	2

Course Title : Object Oriented Programming with Java (FC-I)			
Course Code : P18CS36	**Semester : 3**	**L:T:P:H : 4:0:0:4**	**Credits: 3**
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs	**Weightage: CIE:50; SEE:50**		

Course Content

Unit-1

Object Oriented Concepts : Fundamentals of Object Oriented programming - Object oriented paradigm, basics concepts of object oriented programming, benefits of object oriented programming, applications of object oriented programming.

Program Structure in Java: Brief introduction to data types, scope of variable identifier, literal constants, symbolic constants, user input to programs, formatted output, operators and control statements in java, Writing simple Java programs.

Self Study Component : Type casting in Java

10 Hours

Unit-2

Classes and Objects- Introduction, Class Declaration and Modifiers, Class Modifiers, Declaration of Class Objects, Assigning One Object to Another ,Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Nested Classes, Final Class and Methods , Passing Arguments by Value and by Reference, Keyword this.

Methods- Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Nesting of Methods, Overriding Methods, Attributes Final and Static.

Self Study Component : Overloaded Constructor Methods

11 Hours

Unit-3

Inheritance Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class, Inhibiting inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Abstract Classes, Interfaces and Inheritance.

Interfaces- Introduction- Similarities between Interface and Class, Declaration of Interface, Implementation of interface, Multiple Interfaces.

Self Study Component : Dynamic Method Dispatch

10 Hours

Unit-4

Packages Introduction, Defining, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes,class object, Enumeration, class math, wrapper classes, autoboxing and autounboxing.

Exception Handling- Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions, try with resources, catching subclass exceptions, custom exceptions, nested try and catch blocks, throws clause.

Self Study Component : Rethrowing exceptions

11 Hours

Unit-5

Generics : Introduction, Generics and Primitive Types, Declaration of Generic Class and Constructor,Use of Object Class verses Generic Class, Generic Class with Multiple Type Parameters, Generic Method, Generic Interface, Overridding Methods in Generics Class,Upper Bound on Types, Multiple Bounds on Types, Wildcard, Bounded Wildcard, Generic Constructor in Non-generic Class, Generic Super Class and Generic Subclass, Non-generic Super Class with Generic Subclass, Generic Type Parameters and Inheritance, Generics and Reflection, Restrictions in Java Generics.

Input out streams and File operations: Introduction, Class File, FileInputStream ByteArrayInputStream, OutputStream and its Subclasses FileOutputStream, DataInputStream and DataOutput Stream, Class Writer.

Self Study Component : Generic Method Overloading

10 Hours

Text Books:

1. E Balagurusamy, Programming With Java : A Primer 5th Edition Tata McGraw Hill.
2. Java: One Step Ahead by Anita Seth , B.L. Juneja ,OXFORD University press - First Edition 2017.

Reference Book:

1. Herbert Schildt, Java The Complete Reference, 9th Edition, Tata McGraw Hill.

Course outcomes:

CO1: Understand object-oriented concepts and Java features.

CO2: Apply Java features to develop programs.

CO3: Demonstrate the usage of Inheritance and Interfaces.

CO4: Develop programs using Packages Exception Handling

CO5: Develop programs using generic concepts and files in java

CO-PO Mapping

Semester: 3	**Course code : P18CS36**	**Title : Object Oriented Programming with Java (FC-I)**													
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO-1	Explain the object-oriented concepts and apply Java features to develop simple Java programs.	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO-2	Understand the concepts of classes and objects.	2	2	3	-	-	-	-	-	-	-	-	-	3	
CO-3	Demonstrate the usage of Inheritance and Interfaces	2	2	2		2	2	2						3	
CO-4	Develop programs using Packages, Exception Handling	2	2	2		2	2	2						2	
CO-5	Understand and develop programs using generic concepts and files in java	2	2	2		2	2	2						2	
		2	**2.2**	**2.25**		**2**	**2**	**2**						**2.6**	

Course Title : Data Structures Laboratory			
Course Code : P18CSL37	Semester : 3	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: Laboratory : 3 Hrs/week Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Programs on Stacks

1. Write a C program to construct a stack and to perform the following operations.
   i) Push ii) Pop iii) Display
   The program should print appropriate message for stack overflow, stack underflow & stack empty.
2. Write a C program to convert and print a given valid parenthesized infix arithmetic expression to prefix expression. The expression consists of single character operands and binary operators + (Plus), - (Minus), * (Multiply), / (Divide).
3. Write a C program to evaluate a valid prefix expression using stack. Assume that the prefix expression is read as single line consisting of non negative single digit operands and binary arithmetic operations.
4. Write a C program to check whether a given string is palindrome or not using stack.

Programs on Recursion

5. Write a recursive C programs for
   i) To find larger of 'n' elements in an array
   ii) To multiply two natural numbers
   iii) Solving the Towers of Hanoi Problem

Programs on Queus

6. Write a C program to simulate the working of a queues using an array provide the following operation
   i) Insert ii) Delete iii) Display
7. Write a C program to simulate the working of a circular queues with items as strings. Provide the following operations
   i) Insert ii) Delete iii) Display
8. Write a C program to simulate the working of Double Ended Queue of integers using Structures. Provide the following operations
   i) Insert from front/rear end ii) Delete from front/rear end iii) Display
9. Write a C program to implement priority queues using structures (Assume a maximum of 3 queues).

Programs on Linked List

10. Write a C program using dynamic variables and pointers, to construct a Singly Linked List consisting of the following information in each node: Employee id (integer), Employee name (character string) and Department (character string). The operation to be supported are :
    a) The insertion operation
       (i) At the front end (ii) At the rear end (iii) At any portion in the list
    b) Deleting a node based on employee id. If the specified node is not present in the list an error message should be displayed. Both the options should be demonstrated.

c) Searching a node based on employee id and updates the information content. If the specified node is not present in the list an error message should be displayed. Both situations should be displayed.
d) Displaying all the nodes in the list

11. Write a C program to construct a **Ordered Singly Linked List** and to perform the following operations
    i) Reverse a list ii) Concatenation of two lists

12. Write a C program to support the following operations on a Doubly Linked List where each node consists of integers
    i) Create a Doubly Linked List by adding each node at the front
    ii) Insert a new node to the right of the node whose key value is read as an input
    iii) To delete all nodes whose info is same as key item.
    iv) Display the contents of the list

Programs on Trees

13. Write a C program
    i) To create a tree ii) To search for an item
    iii) To get the exact copy of a tree iv) To display the elements
14. Write a C program
    i) To construct a binary search tree of integers
    ii) To traverse the tree using In-Order, Pre-Order and Post-Order traversal method
    iii) To display the elements
15. Write a C program
    i) To construct a ordered BST of items
    ii) To insert an item into an ordered BST (No duplicates are allowed)
    iii) To search an item in BST
    iv) To display the elements
16. Write a C program to sort the given list of ‘n’ numbers using
    i) Merge Sort ii) Quick Sort

Course Title : Digital Logic Design Laboratory			
Course Code : P18CSL38	Semester : 3	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: Laboratory : 3 Hrs/week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

1. a) Show that NAND & NOR are universal gates
   b) Write the VHDL code for Basic gates realization using NAND gates.

Experiment on Code Converters:

2. a) Design BCD to Excess -3 using basic gates.
   b) Write the VHDL code for BCD to Excess -3 code conversion

Experiment on data processing circuit.

3. a) Implement the following using 8:1 multiplexer
   i) Full adder
   ii) Given 4 variable expression
   b) Write the VHDL code for an 8:1 multiplexer.

Comparator circuits

4. a) 2 bit Magnitude comparator using suitable Decoder
   b) Write the VHDL code for 2 bit comparator

Arithmetic circuits & Encoder

5. a) Implement Full Subtractor using suitable Decoder and NAND gates.
   b) Write the VHDL code for Full subtractor.
6. a) Implement a Octal to binary encoder using basic gates.

   b) Write the VHDL code for Octal to binary encoder

Shift Register

7. a) Design a 3-bit serial-in –serial out and a serial-in –parallel out shift register using J-K flip flop
   b) Write the VHDL code for Johnson counter.
8. a) Implement a ring counter and Johnson counter using 4-bit shift register.
   b) Write the VHDL code for Ring counter.

Counters

1. a) Design a **Mod n** (n ≤ 8) Asynchronous counter using J-K flipflop
   b) Write the VHDL code for T Flip Flop
10. a) Design and implement 3 bit synchronous up counter using J-K Flip -Flop ICs.
   b) Write the VHDL code for 3 bit up counter
11. a) Design a counter for the given sequence with lock in condition using D Flip Flop
   b) Write the VHDL code for D Flip Flop
12. a) Design a 2 bit down counter using JK- Flip –Flop.
   b) Write the VHDL code for 3 bit Down Counter

Course Outcomes

1. **Design and Conduct experiments** to realize various combinational and sequential circuits using IC.
2. **Simulate** using Xilinx to synthesize their designs and perform timing analysis.

CO-PO mapping

Semester: 3	**Course code : P18CSL38**					**Title : Digital Logic Design Laboratory**									
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO308.1	**Design and Conduct experiments** to realize various combinational and sequential circuits using IC	3	3	3						2				2	
CO308.2	**Simulate** using Xilinx to synthesize their designs and perform timing analysis.	2	2	3		3				2				1	
CO308.3		**2.5**	**2.5**	**3**		**3**				**2**				**1.5**	

Note: Students should design and conduct any one experiment and simulate the experiment given in the same section.(for both CIE and SEE)

Course Title: Aptitude and Reasoning Development - BEGINNER. (ARDB)			
Course Code : P18HU39	**Semester : III**	**L-T-P-H : 2-0-0-2**	**Credits: NA**
Contact Period: Lecture: 32 Hr. Exam: 3 Hr		**Weightage :CIE:100% - [P/NP]**	

Prerequisites: Basics of mathematics.

Course Learning Objectives (CLOs)

This course aims to

1. Solve the mathematical calculations easily and quickly using the methods of vedic mathematics.
2. Illustrate different examples to learn about percentages effectively.
3. Compare the different types of series.
4. Explain the logic behind solving problems under series such as A.P.,G.P.,H.P.
5. Explain divisibility rules, properties of different types of numbers.
6. Explain methods to find the number of factors and sum of factors.
7. Analyze the concept of power cycle, and find last digit and last two digits.
8. Solve problems involving simple equations and inequalities.
9. Explain Componendo, Dividendo, Invertendo, Alternendo and other terms related to ratio and proportion.
10. Explain the concepts behind the logical reasoning modules such as arrangement, blood relations and directions

Relevance of the course:

3rd Semester is considered as the right time to build a base to a student’s analytical and logical ability. This course connects the basics of maths learnt in school into the present problem solving techniques. It creates an awareness towards the importance and significance of an individual’s logical abilities.

Course Content

Unit-1

Sharpen your axe!!

Vedic mathematics:

Viniculum and de- viniculum, subtractions using viniculum .Nikhilum multiplication: For numbers close to base values, multiplication of any two digit numbers or three digits number using criss cross method. Finding the square, square root, cubes , cube root of two digit and three digit numbers quickly. Approximation in multiplication and division. Checking the answer using digital sum method

SSC- Get hands on multiplication tables, increasing the speed in basic arithmetic operations. Classification of numbers.

Percentage calculations and ratio comparison:

Percentage calculations: Percentage rule for calculating, percentage values through additions, percentage– fraction table, approximation in calculating percentages. Application based problems

Ratio comparison: calculations method for ratio compressions: 1. the cross multiplication method, 2. percentage value compression method 3. Numerator and denominator percentage change method. Method for calculating the value of percentage change in the ratio. Application based problems.

SSC- Thorough with fractions and decimal values. Applications of tabulated fractions. Product of means and extremes.

8 Hours

Unit-2

Analytical Reasoning 1: series

Number series: Standard patterns of number series, pure series: perfect square, square cube, prime, combination of this series. Difference series, ratio series, mixed series, geometric series, two-tier arithmetic series, three-tier arithmetic series, change in the order for difference series, change in the order for ratio series, sample company questions.

Letter series: Alphabet and Alphanumeric series, finding the missing term based on logic learnt in number series module, continuous pattern series, correspondence series. sample company questions.

Picture series : image analysis, addition deletion rotation or modification of lines or shapes. Understanding the symmetry of the image. Mirror image analysis. sample company questions.

SSC- Basic knowledge of letter positions, Different number series for example – even, odd, prime, composite etc.

6 Hours

Unit-3

Number system:

Introduction, **Integers:** Remainder zero concept, Odd and Even Integers, Negative and positive integers, power number a^x, properties of a perfect square number. **Prime number:** General method to identify the prime number, properties of prime numbers. Euler's number. **Factorial number:** Wilson's theorem, important results on factorial. **Divisor:** number of divisors, sum of divisors, number expressed as the product of two factors.

Divisibility rules: divisibility of a whole number by a whole number, divisibility of an expression by an expression. **Modulus concept:** divisibility rules in modulus, rules of operations in modulus. **Finding one remainder:** One divisor, remainder of ($a^n – b^n$), remainder for more than one divisor.

UNIT digit: Concept of power cycle, finding last two digits**.** Number of trailing zeroes.

SSC-Basic arithmetic operations, knowledge about quotient and remainders, multiples and factors.

6 Hours

Unit-4

Simple equations, Ratio Proportions and Variations:

Simple equations: Linear equations-Linear equations in one variable, linear equation in two variables, Different methods of solving linear equations in two variables– Method of elimination, Method of substitution, Method of cross multiplication. Format of equations that can be converted to linear equations, Linear equations of three variables, Inequalities and its properties. Advanced problems on Simple equations. Age problems.

Ratio Proportions and Variations: Understanding the meaning and difference between ratio, proportion and variation. Properties of ratio, Comparison of more than two quantities, Proportion, Properties of proportion - Componendo, Dividendo, Invertendo, Alternendo. Continued proportion, Mean proportion. Variation - Direct variation, Indirect variation, Joint variation, Short cut methods to solve problems on variation.

SSC-Knowledge about factors, types of factors. Splitting the middle term rule, formula rule.

6 Hours

Unit-5

Building the fundamentals of logical reasoning:

Arrangement:

Approach to tackle questions, Different types of arrangement– Linear arrangement, Circular arrangement. Selection, Double line map. Possible ways of arrangement– Words or numbers, left side only, right side only, left right alternate, increasing or decreasing order, interchange vs push, Strategy for solutions– some tips for quick answers, general strategy.

Directions:

Basics. Pythagorean theorem, Pythagorean triplets, Solving problems for practice.

Blood relations:

Some typical relations that we come across, family tree, Structuring the given problem step by step. Suggested methods– Backtracking, drawing family tree. Problems on blood relations and professions.

SSC-Basic knowledge of directions, Pythagoras theorem. Logical reasoning skills, Relations, Family tree.

6 Hours

Reference Books:

1. The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by AbhijithGuha. Published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course Outcomes

After learning all the UNITs of the course, the student is able to:

1. Solve mathematical calculations in less duration compared to the conventional method. L2
2. Give examples for AP, GP and HP and differentiate between them. L1
3. Apply divisibility rules, power cycle method and evaluate the significance of the number system module. L2
4. Point out the errors in the problems concerning inequalities and solve simple equations and problems based on ratio, proportion and variation. L5
5. Solve the problems based on blood relations, directions and arrangement. L4

Course Title : Additional Maths-I			
Course Code : P18MADIP31	Semester : 3	L:T:P:H : 4:0:0:4	Credits: 0
Contact Period: Lecture: 52 Hr, Exam: 3 Hr	Weightage: CIE:50%, SEE:50%		

Course Content

Unit -1

Complex Trigonometry: Complex Numbers: Definitions & properties. Modulus and amplitude of a complex number, Argand's diagram, De-Moivre's theorem (without proof). Roots of complex number - Simple problems.

Vector Algebra: Scalar and vectors. Vectors addition and subtraction. Multiplication of vectors (Dot and Cross products). Scalar and vector triple products-simple problems.

12 Hours

Unit -2

Differential Calculus: Review of successive differentiation. Formulae for nth derivatives of standard functions- Liebnitz's theorem(without proof). Polar curves –angle between the radius vector and the tangent pedal equation- Problems. Maclaurin's series expansions- Illustrative examples. Partial Differentiation: Euler's theorem for homogeneous functions of two variables. Total derivatives-differentiation of composite and implicit function. Application to Jacobians, errors & approximations.

10 Hours

Unit –3

Integral Calculus: Statement of reduction formulae for $sin^n x$, $cos^n x$, *and* $sin^m x cos^m x$ and evaluation of these with standard limits-Examples. Differentiation under integral sign(Integrals with constants limits)-Simple problems.Applications of integration to area, length of a given curve, volume and surface area of solids of revolution.

10 Hours

Unit-4

Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl and Laplacian (Definitions only).Solenoidal and irrotational vector fields-Problems.

10 Hours

Unit-5

Ordinary differential equations (ODE's): Introduction-solutions of first order and first degree differential equations: homogeneous, exact, linear differential equations of order one and equations reducible to above types. Applications of first order and first degree ODE's - Orthogonal trajectories of cartesian and polar curves. Newton's law of cooling, R-L circuits- Simple illustrative examples from engineering field.

10 Hours

Text Book:

1. B.S.Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi, 42nd Ed. 2012.

Reference Books :

1. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 6th Ed., 2007.
2. N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers, 7th Ed., 2007.

Course Title: COMPLEX ANALYSIS, STATISTICS, PROBABILITY AND NUMERICAL TECHNIQUES			
Course Code: P18MA41	Semester: IV	L:T:P:H: 4:0:0:4	Credits: 4-0-0
Contact Period-Lecturer: 52Hrs. Exam: 3Hrs		Weightage:CIE:50%; SEE:50%	

(Common to all Branches)

Unit-1

Numerical Methods-II: Solution of algebraic and transcendental equations: Bisection method, Regula-Falsi & Newton-Raphson method. Fixed point iteration method: Aitken's Δ^2 - process - Illustrative examples only. Numerical solution of ordinary differential equations (ODE's): Numerical solutions of ODE's of first order and first degree – Introduction. Taylor's series method. Modified Euler's method, Runge - Kutta method of fourth order, Milne's and Adams-Bashforth predictor & corrector methods (All formulae without proof). Illustrative examples only.

Self-Study Component: Solution of second order ordinary differential equations using Runge-Kutta methods. Solution of first order simultaneous differential equations.

10 Hours

Unit-2

Numerical methods for system of linear equations- Gauss-Jacobi and Gauss- Seidel iterative methods. Relaxation method**.** Determination of largest Eigen value and corresponding Eigen vector by power method.Series solutions of ODE's and special functions:Power series solution of a second order ODE, Series solution-Frobenius method. Series solution of Bessel's differential equation leading to $J_n(x)$. Expansions for $J_{1/2}(x) and\ J_{-1/2}(x)$.. Series solutions of Legendre's differential equation leading to $P_n(x)$-Legendre's polynomials. Rodrigue's formula (No Proof) - simple illustrative examples.

Self-Study Component: Basics of Series solutions of ODE's; analytic, singular point and basic recurrence relations.

10 Hours.

Unit-3

Complex Analysis: Introduction to functions of complex variables. Definitions- limit, continuity and differentiability. Analytic functions. Cauchy - Riemann equations in Cartesian and polar forms (no proof). Construction of analytic function using Milne-Thomson method. Harmonic functions –Problems. Applications of analytic function to flow problems. Conformal transformation – Definitions and Discussion of Transformations: w=z^2, w =e^z and w= $z + 1/z\ (z \neq 0)$ and related problems. Bilinear transformation.

Self-Study Component: Derivation of Cauchy- Riemann equation in Cartesian and polar form.

11 Hours

Unit-4

Complex integration: complex line integrals. Cauchy theorem, Cauchy integral formula. Taylor's and Laurent's series (Statements only) and illustrative examples. Singularities, poles and residues. Cauchy residue theorem (statement only). Illustrative examples.Statistics: Brief review of measures of central tendency and dispersion. Moments, skewness and kurtosis. Curve fitting – least square method $: y = a + bx; y = ax^b, y = ab^x\ and\ y = ax^2 + bx + c.$ Correlation and **regression**.

Self-Study Component: Derivation of Cauchy theorem, Cauchy integral formula and Cauchy's residue theorem.Fit an equation of the **curves** of the type : $y = ae^{bx}$,

11 Hours

Unit-5

Probability Theory: Brief review of elementary probability theory. Random variables (discrete and continuous)-Introduction to probability distributions- probability mass/density functions and cumulative probability density functions – Illustrative examples. Discrete probability distributions- Binomial and Poisson's distributions; Continuous probability distributions - exponential and normal distributions. (No derivation of mean and variance). Illustrative examples from engineering and industrial fields.

Joint probability distributions and Markov chains: Concept of joint probability. Joint probability Distributions of discrete random variables. Expectation, Covariance, correlation coefficient – illustrativeExamples. Continuous joint probability distributions. Probability vectors, stochastic matrices. Fixed pointand regular stochastic matrices.

Self-Study Component : Basic definitions of probability and problems up to Bayes' theorem. Derivation of Mean and SD of Binomial &Poisson distribution.

10 Hours

Text Books:

1. **Higher Engineering Mathematics:** B.S. Grewal, Khanna Publishers, New Delhi, 42nd Ed. 2012.
2. **Advanced Engineering Mathematics: -** E. Kreyszig, John Wiley & Sons, 10th Ed., 2011

References:

1. **T. Veerarajan:** Engineering Mathematics, Tata McGraw-Hill Pub., 2003.
2. **Introductory Methods of Numerical Analysis: -** S.S.Sastry, PHI, 3rd Ed.2000.
3. **Linear Algebra and its applications: -** David C.Lay, Pearson Education Ltd., 3rd Edition, 2003.
4. **Seymour Lipschutz:Probability:-,** Schaum's outline series, McGraw-Hill Pub., 2nd Ed, 2002.
5. **Higher Engineering Mathematics: -** B.V. RAMANA, McGraw Hill Education, 2007

Course Articulation Matrix

Mapping of Course Outcomes (CO) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

Sem: 4		**Course code : P18MAES41**	**Title : Engineering Mathematics –IV**										
CO's	**Statement**		**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
CO-1	Solve algebraic, transcendental and ordinary differential equations arising in various engineering flow and design data problems, using numerical techniques along with physical interpretation of the solutions associated with initial/boundary conditions (UNIT-I)		**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO-2	Learn logical thinking and analytical /geometrical skills in linear algebra through vector spaces, basis, dimension and linear transformations along with construction a matrix of linear transformations with respect change of Bases of same or different dimensions. Understand iterative methods in linear algebra such as Gauss-Jacobi, Gauss -Seidel, Relaxation and Power method and their practical utility in engineering fields(UNIT-II)		**3**	**3**	-	-	-	-	-	-	-	-	-	-
CO-3	Understand the basics of functions of complex variables, analytic functions, conformal and bilinear transformations, complex integration, line / surface / volume integrals and residue theorems with their scientific / engineering importance (UNIT-III)		**3**	**3**	-	-	-	-	-	-	-	-	-	-
CO-4	Apply the basic tools of statistics to understand curve fitting, moments, skewness, kurtosis, correlation and regression, for frequency distributions; explore the idea of probability, probability distributions, required in the analysis of engineering experiments (UNIT-IV)		**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO-5	Apply the basic concepts of probability distributions to understand concept of joint probability and to find expectation covariance, correlation coefficient etc. and to understand probability vector, stochastic matrix etc. Obtain series solution of essential ODE's such as Bessel's and Legendre's differential equations and understand their scientific/engineering utility (UNIT-V)		**3**	**3**	-	-	-	-	-	-	-	-	-	-

Note: - Each unit contains two full questions of 20 marks each. Students are required to Answer any **five**full questions choosing at least **one** full question from each unit.

Course Title : Theory of Computation			
Course Code : P18CS42	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

Course Content

Unit-1

Introduction to Finite Automata: Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. Application of finite automata; Finite automata with Epsilon transitions; Equivalence and minimization of automata.

Self Study Components: Extended transitions and languages for E-NFA

10 Hours

Unit-2

Regular Expression, Regular Languages, Properties of Regular Languages: Regular expressions; Finite Automata and Regular Expressions; Applications of Regular Expressions. Regular languages; Proving languages not to be regular languages; Closure properties of regular languages; Decision properties of regular languages.

Self Study Components: Applications of Regular expressions

10 Hours

Unit-3

Context-Free Grammars And properties of Context-Free Languages : Context –free grammars; Parse trees; Applications; Ambiguity in grammars and Language**s,** Definitions of Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs.

Self Study Components: Removing ambiguity in grammars, normal forms for CFG

10 Hours

Unit-4

Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.

Self Study Components: CFG to PDA, PDA to CFG

12 Hours

Unit-5

Introduction to Turing Machine, Undecidability: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers. Undecidable problem that is RE; Post's Correspondence problem.

Self Study Components: Tuning machine and computers

10 Hours

Text Book :

1. John E.. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson education, 2014.

Reference Books:

1. Raymond Greenlaw, H.James Hoover: Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann, 1998.
2. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw Hill, 2007.
3. Daniel I.A. Cohen: Introduction to Computer Theory, 2nd Edition, John Wiley & Sons, 2004.

4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition, Pearson Education, 2006

Course Outcomes:

After learning all the units of the course, the student is able to

1. Design finite automata
2. Apply regular expression for lexical analysis phases
3. Design grammars for various languages
4. Design push-down automata from grammars and grammar to pda
5. Design Turing machines for simple languages and design problem reductions to determine the undecidability of languages

CO-PO Mapping

Semester: 4	**Course code : P18CS42**		**Title : Theory of Computation**												
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO-1	Design finite automata	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO-2	Apply regular expression for lexical analysis phases	2	2	3	-	-	-	-	-	-	-	-	-	3	
CO-3	Design grammars for various languages	2	2	2		2	2	2						3	
CO-4	Design push-down automata from grammars and grammar to PDA	2	2	2		2	2	2						2	
CO-5	Design Turing machines for simple languages and design problem reductions to determine the undecidability of languages	2	2	2		2	2	2						2	
		2	**2.2**	**2.25**		**2**	**2**	**2**						**2.6**	

Course Title : Analysis & Design of Algorithms			
Course Code : P18CS43	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

Course Content

Unit 1

Introduction: Notion of Algorithm, Fundamentals of algorithmic problem solving, Analysis Framework, Asymptotic Notations, Mathematical analysis of Non-Recursive algorithms, Mathematical analysis of recursive algorithms, and recursive Algorithms with Examples. Graph: Definition, Graph Representation, **Brute Force:** Selection sort, Bubble sort, Depth First Search and Breadth First Search

Self-Study Component: Important problem types,Fundamental Data structures.

11 Hours

Unit 2

Decrease and Conquer: Insertion Sort, Topological Sorting, Binary Search, Computing a median and Selection Problem.

Divide and Conquer: Merge sort, Quick sort, Strassen's matrix multiplication, Advantages and Disadvantages of divide and conquer.

Self-Study Component: Finding max, min element using divide and conquer method

10 Hours

Unit 3

Transform and Conquer Approach: Presorting, AVL Trees, Heap Sort

Space and Time Trade-Offs: Sorting by Counting**,** Input Enhancement in String Matching, Hashing

Dynamic Programming: Knapsack problem and Memory Functions.

Self-Study Component: Balanced search trees

10 Hours

Unit 4

Dynamic Programming: Warshall's Algorithm, Floyd's Algorithm

Greedy Method: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes.

Limitations of Algorithm Power: Lower –Bound Arguments, Decision Trees

Self-Study Component: Optimal Binary search trees, Knapsack problem and memory functions

11 Hours

Unit 5

Limitations of Algorithm Power: P, NP, NP-Complete Problems

Backtracking: N-Queens problem, Sum of subsets problem, Hamiltonian circuit problem.

Branch and Bound: Assignment Problem, Knapsack Problem, Travelling Sales Person problem, Knapsack problem

Self-Study Component: Approximation algorithms for TSP problem.

10 hours

Text Book:

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 3rd Edition, 2017.
   Pearson.

Reference Books:

1. Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014,Universities Press
2. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI
3. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

Course Outcomes:

After studying this course, students will be able to

1. Analyse the computational complexity of different algorithms.
2. Develop the solution for given problems using divide and conquer and decrease and conquer methods.
3. Develop an algorithm using Greedy method and transform and conquer methods.
4. Develop the solution for given problems using Dynamic programming approach.
5. Develop the solution for given problems using Backtracking and Branch-and-Bound technique.

CO-PO Mapping

Semester : 4th		**Course code: P18CS43**					**Title : Analysis and design of algorithms**								
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
1	Analyse the computational complexity of different algorithms.	2	2	3	2									2	2
2	Develop the solution for given problems using divide and conquer and decrease and conquer methods.	2	2	3	2									2	2
3	Devise an algorithm using Greedy method and transform and conquer methods.	2	2	3	2									2	2
4	Develop the solution for given problems using Dynamic programming approach.	2	2	3	2									2	2
5	Develop the solution for given problems using Backtracking and Branch-and-Bound technique.	2	2	3	2									2	2
		2	2	3	2									2	2

Course Title : Data Communication			
Course Code : P18CS44	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		Weightage: CIE:50%, SEE:50%	

Course Content

Unit 1

Data Communications, Networks, The Internet, Protocols and standards, Network Models Reference models OSI, TCP/IP Model, Addressing, Data & Signal-Analog and Digital, Periodic Analog Signals, Digital Signals, Transmission impairment, Data Rate Limits.

Self Learning Component: Performance.

9 Hours

Unit 2

Digital Transmissions: Digital to Digital Conversions, Analog to Digital Conversions, Transmission Modes, Analog Transmission-Digital to Analog conversion, Analog to Analog conversion, Multiplexing- FDM, WDM, STDM, Statistical TDM, Spread Spectrum, Unguided media-Wireless Radio waves, Microwaves, Infrared.

Self Learning Component: Guided Media-Twisted pair cable, Co-axial cable, Fiber optic cable

12 Hours

Unit 3

Circuit switched networks, Datagram networks, Virtual circuit networks, Structure of a Switch-Structure of Circuit Switches & Packet Switches, Data Link Layer-Detection and Correction-Introduction, Block Coding-Error Detection and Correction, Linear Block Codes, Cyclic Codes- CRC, Polynomials, Checksum.

Self-Learning Component : Hamming Distance, Minimum Hamming Distance

10Hours

Unit 4

Data Link Layer– Data Link Control- Framing, Flow and error control, Protocols, Noiseless Channels, Noisy Channels, HDLC, Point-to-Point Protocol- Framing, Transition phases, Multiple Access- Random access-Aloha, CSMA, CSMA/CD, CSMA/CA, Controlled access reservation, polling, token passing,

Self Learning Component: Channelization - FDMA, TDMA, CDMA.

12 Hours

Unit 5

Wired LANs: Ethernet – Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LANsIEEE 802.11, Bluetooth - Architecture, Bluetooth layers, Radio layer, Baseband layer, L2CAP

Self Learning Component: Connecting Devices–Hub, Repeater, Bridges, Transparent Bridges, Switches, Router, and Gateway.

9 Hours

Text Books:

1. Data Communication and Networking, Behrouz A.Forouzan, McGrawHill, 5th Edition, 2018.
2. Data and Computer Communication, William Stallings, 10th Edition, Pearson Education, 2018.

Reference Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education, 2009.(Latest Edition)
2. Communication Networks-Fundamental Concepts and key Architectures, Alberto Leon-Garcia and Indra Widjaja, Tata Mc-Graw-Hill, 2nd Ed., Pearson Education, 2007

Course outcomes:

1. CO1 : Analyze OSI and TCP network models and the layers associated functionalities
2. CO2 Analyze and apply different types of signal conversion techniques in physical layer
3. CO3 Analyze and apply different types of error detection and correction mechanisms
4. CO4 Analyze flow control and Error control mechanism using standard data link layer protocols and Compare different categories of Medium Access protocols
5. CO5 Analyze different protocols used for Ethernet and various connecting devices used in networks.

CO-PO mapping

Semester : 4			**Course Code : P18CS44**						**Data Communication**					
	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO1		3	3									2	3	
CO2			3	2								2	2	
CO3		3	3									2	3	
CO4			3									2	2	
CO5		3	2									2	2	
AVG		**3**	**2.8**	**2**								**2**	**2.4**	

Course Title : AVR Microcontroller			
Course Code : P18CS45	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 3
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Unit 1

Microcontrollers and embedded processors: microcontroller versus microprocessors, criteria for choosing microcontroller. Overview of the AVR family, general purpose registers in AVR, the AVR data memory, instructions with data memory, AVR status register, AVR data format and directive, AVR assembly instruction format, the program counter and program ROM space in AVR.

Self-study components: Introduction to computing- numbering and coding system.

11 Hours

Unit 2

Branch instruction and looping in AVR: looping in AVR, other conditional jumps, unconditional branch instruction. Call instructions and Stack: CALL, RCALL, and ICALL. I/O port programming in AVR, I/O Bit-manipulation programming.

Self-study components: AVR time delay: time delay calculation for AVR.

10 Hours

Unit 3

Arithmetic instructions: Addition, subtraction, multiplication and division of unsigned numbers, signed number concepts and arithmetic operations. Logical and compare instructions. Rotate and Shift instructions.

Self-study components: Data serialization.

11 Hours

Unit 4

BCD and ASCII conversion, introducing to some more assembler directives, Register and Direct addressing mode, register and indirect addressing mode. Macros, Timer 0 programming

Self-study components: look-up table and table processing.

10 Hours

Unit 5

AVR programming in C: Data types and time delays in C, I/O programming in C, Logic operations in C, Data conversion programs in C,Memory allocations in C. Keypad interfacing: Interfacing the keypad to AVR.

Self-study components: Data serialization in C.

10 Hours

Text book:

1. The AVR microcontroller and embedded system using assembly and C by Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi.

Reference book:

1. Programming and interfacing ATMEL’s AVRs by Thomas grace.

Course outcomes:

1. Compare and contrast Microprocessor and Microcontroller
2. Code simple AVR assembly language instructions.
3. Code assembly language to use the ports for input or output
4. Code c program for time delay, logical and arithmetic operations and fro data serialization.
5. Interfacing the keypad to the AVR using assembly and C

CO-PO Mapping

Course code : P18CS45			Title : AVR Microcontroller												
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO 1	**Compare and contrast** Microprocessor and Microcontroller	3	3	3	1					2		2	2		3
CO 2	**Code** simple AVR assembly language instructions.	3	2	3	1					2		2	2		3
CO 3	**Code** assembly language to use the ports for input or output	3	3	3		2				2		2			3
CO 4	**Code** c program for time delay, logical and arithmetic operations and fro data serialization.	2	2	2						2		2			2
CO 5	**Interfacing** the keypad to the AVR using assembly and C	2	1	1											2
		2.6	**2.2**	**2.4**	**1**	**2**				**2**			**2**	**2**	**2.6**

Course Title : Database Management System(FC-II)			
Course Code: P18CS46	**Semester : 4**	**L:T:P: H - 2 : 2 : 0 : 4**	**Credits: 3**
Contact Period : Lecture :52 Hrs, Exam: 3Hrs		**Weightage :CIE:50% SEE:50%**	

Course Content

Unit-1

Introduction : An example: Characteristics of Database approach; Advantages of using DBMS approach; A brief history of database applications; Data models, schemas and instances; Three-schema architecture and data independence

Entity-relationship model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams,

Self study component : Naming Conventions and Design Issues; Relationship types of degree higher than two.

10 Hours

Unit-2

Relational model and relational algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory;

Self study component : Binary Relational Operations : JOIN and DIVISION.

10 Hours

Unit-3

Additional Relational Operations; Examples of Queries in Relational Algebra; Relational Database Design Using ER- to-Relational Mapping

Structured query language :. SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval Queries in SQL, INSERT,

Self study component : DELETE, and UPDATE Statements in SQL.

12 Hours

Unit-4

More complex SQL Retrieval Queries, Specifying constraints as Assertion and Actions as Trigger; Views (Virtual Tables) in SQL;

Database design: Informal Design Guidelines for Relation Schemas; Functional Dependencies.

Self study component : Additional features of SQL; Schema Change Statements in SQL.

10 Hours

Unit – 5

Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form; Multi valued Dependencies and Fourth Normal Form; Join Dependencies and Fifth Normal Form. Transaction processing concepts**:** Introduction to Transaction processing; Transactions and System concepts; Desirable properties of transactions

Self study component: Concurrency control: Two-phase locking techniques for concurrency control.

10 Hours

Text Books:

1. FundamentalsofDatabaseSystems–ElmasriandNavathe,6th Edition,Addison-Wesley, 2011

Reference Books:

1. **DataBase System Concepts**–Silberschatz,KorthandSudharshan, 5th Edition, Mc-GrawHill, 2006.
2. **An Introduction to Database Systems**–C.J.Date,A.Kannan, S.Swamynatham, 8th Ed., Pearson Education,2006.
3. **Database Management Systems** – Raghu Ramakrishnan and JohannesGehrke – 3rd Edition, McGraw-Hill,2003.

Course outcomes

At the end of the course the student should be able to

1. **Design** an ER model for a given example from real world description.
2. **Design** relational models for a given application using schema definition and constraints.
3. **Develop** complex queries using SQL to retrieve the required information from database.
4. **Apply** suitable normal forms to normalize the given database
5. **Determine** the roles of concurrency control in database design.

CO-PO Mapping

Course code : P18CS46			**Title : Database Management System (FC-II)**												
CO	**Statement**	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PS O1**	**PS O2**
CO 502.1	**Design** an ER model for a given example from real world description	3	3	3	1					2		2	2		3
CO 502.2	**Design** relational models for a given application using schema definition and constraints.	3	2	3	1					2		2	2		3
CO 502.3	**Develop** complex queries using SQL to retrieve the required information from database	3	3	3		2				2		2			3
CO 502.4	**Apply** suitable normal forms to normalize the given database	2	2	2						2		2			2
CO 502.5	**Determine** the roles of concurrency control in database design.	2	1	1											2
C502, C302		**2.6**	**2.2**	**2.4**	**1**	**2**				**2**			**2**	**2**	**2.6**

Course Title : ANALYSIS AND DESIGN OF ALGORITHMS LAB			
Course Code : P18CSL47	Semester : 4	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: Laboratory : 3 Hrs/week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Divide and Conquer

1.Sort a given set of n integer elements using **Quick Sort** method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. The elements can be read from a file or can be generated using the random number generator.

2.Sort a given set of n integer elements using **Merge Sort** method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. The elements can be read from a file or can be generated using the random number generator.

Greedy Method

3. Implement the **0/1 Knapsack problem using**Greedy method

4.From a given vertex in a weighted connected graph, find shortest paths to other vertices using **Dijkstra's algorithm.**

5.Find Minimum Cost Spanning Tree of a given connected undirected graph using **Kruskal'salgorithm**. Use Union-Find algorithms in the program.

6. Find Minimum Cost Spanning Tree of a given connected undirected graph using**Prim's algorithm.**

7. Sort a given set of n integer elements using **Heap Sort** method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. The elements can be read from a file or can be generated using the random number generator.

Dynamic Programming

8. Write program to Implement All-Pairs Shortest Paths problem using **Floyd's algorithm.**

9. Write program to implement **Warshalls algorithm.**

10. Implement the **0/1 Knapsack problem** using Dynamic Programming method.

11. Implement **Travelling Sales Person** problem using Dynamic programming.

Backtracking

12Design and implement a C program to **find a subset** of a given set S = {Sl, S2,.....,Sn} of n positive integers whose SUM is equal to a given positive integer d. For example, if S ={1, 2, 5, 6, 8}and d= 9, there are two solutions {1,2,6}and {1,8}. Display a suitable message, if the given problem instance doesn't have a solution.

13 Design and implement a C program to find all **Hamiltonian Cycles** in a connected undirected Graph G of n vertices using backtracking principle.

14. Design and implement **’n’ Queens Problem** using Backtracking method.

Course Title : Object Oriented Programming with Java Laboratory			
Course Code : P18CSL48	Semester : 4	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: Laboratory : 3 Hrs/week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

1. a) Write a Java program to illustrate the concept of class with Parameterized Constructor and default constructors.
   b) Write a Java program to illustrate the concept of class with Method overloading and Method overriding
2. Write a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods.
3. Write a Java program to implement multiple inheritance by using Interface.
4. Write a JAVA program which has
   i. A Interface class for Stack Operations
   ii. A Class that implements the Stack Interface and creates a fixed length Stack.
   iii. A Class that implements the Stack Interface and creates a Dynamic length Stack.
   iv. A Class that uses both the above Stacks through Interface reference and does the Stack operations that demonstrates the runtime binding.
5. a) Write a Java program to implement the concept of exception handling (multiple try and catch blocks).
   b) Write a program to implement the concept of Exception Handling by creating user defined exceptions (one exception).
6. Write a Java program to implement queues using generic methods.
7. Write a Java Program that reads on file name from the user, displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes, and displays the file on the screen, with a line number before each line.
8. Write a Java Program that reads the elements from a file, sort the elements and to the sorted elements into another file.
9. Write a java program that loads data from a text file. The data (two fields) is organized as one line per record and each field in a record are separated by tab (\t). Program must accept the first or second data as input and should print the corresponding other value from the hash table (hint : use hash tables)(collection frame work)
10. Write a Java program to illustrate the concept of generics wildcard arguments
11. Write a program to get the input from the user and store it into file. Using Reader and Writer file.
12. . Write a JAVA Program which writes a object to a file (use transient variable also)
13. Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file.

Course Title : Aptitude and Reasoning Development - Intermediate (ARDI)			
Course Code : P18HU49	Semester : IV	L - T - P : 2-0 - 0 - 2	Credits: 01
Contact Period: Lecture: 32 Hr. Exam: 3 Hr	Weightage: CIE:50%;SEE:50%		

Prerequisites: ARDB

Course Learning Objectives (CLOs)

This course aims to

1. Explain proportionality rule, average speed, relative speed and concepts in circular track.
2. Explain the application of time, speed distance in solving problems related to races, trains, boats and streams, and clocks.
3. Explain different methods to calculate number of smaller cubes, the date and the day of any year and the concepts of clocks.
4. Explain the methodology of strengthening or weakening the given statement.
5. Explain application of Venn diagrams in solving set theory problems.
6. Explains the concept of syllogism and provides the methodology to tackle the problems.
7. Describes all the important properties of triangle, polygons, circle and other geometrical figures and solve application based questions.
8. Describe the properties of cone, cylinder, sphere, cube and cuboid and solve the application based questions.
9. Differentiates between individual work and group work.
10. Integrates the concept of individual work in solving problems related to pipes and cisterns

Relevance of the course: 4th semester deals with more of quantitative aptitude. It is the intermediate level of aptitude which involves modules like Time speed distance. Time and work, set theory. This course also touches upon logical abilities through modules like cubes and Calendars.

Course Content

Unit-1

Time, Speed and Distance: Concept of motion and mathematical representation of motion, The rule of proportionality, Conversion between kmph to m/s, Concept of average speed and its application in different scenarios, Relative speed– Importance, application and observation in day to day life, same direction and opposite direction, An application of allegation in Time speed and distance, Trains– Different scenarios. Boats and streams– resultant speed, upstream and downstream concept. Circular motion– Two or three bodies meeting at the starting point or anywhere in the track. Races– Concept of head start, solving problems under different constraints. Application of solving problems under Clocks.

SSC: Basic relation between the 3 different quantities. Conversions between different UNITs of measurement. Speed and velocity.

6 Hours

Unit-2

Cubes, Clocks & Calendars: Cubes: Number of faces, vertices and edges. Colored cubes. Number of colored faces and the formulae to find-out the same. Problems on cubes.

Clocks & Calendars: Minute spaces. Hour hand and minute hand. Angle between the hands. Relative speed. Faulty clocks. Time gained or lost by the clock. Odd days. Leap year. Ordinary year. Counting of odd days. Problems on clocks and calendars.

Self-study Component- Knowledge about shapes and dimensions, Area and volume. Leap year, number of days. Important dates.

8 Hours

Unit-3

Set theory and Venn diagram: Set builder form, Tabular form, Venn diagram, Types of sets, Operation of sets using venn diagram, Important properties, Algebraic laws of sets, Maxima and minima in set operation, Venn diagram for four sets.

Syllogism: Meaning of syllogisms, Format of problems and standard qualifiers, Concept of distribution, Standard question pattern, Application of venn diagram to solve problems. **Logical Venn diagrams:** Analysis of the given problem and solve it.

Self-study Component- Basics about sets, operations using venn diagram. Basic pplications.

6 Hours

Unit-4

Geometry and Mensuration: Theory, straight lines, triangles– theorems, area, lines inside triangle and geometric centre, Special property of an equilateral triangle, Application of Pythagoras theorem, Congruency and similarity of triangles, Basic proportionality theorem, Polygons, Quadrilaterals, Trapezium, Parallelogram, Rectangle, Rhombus, Square, Division of polygons, Circumscribed and Inscribed polygons, Concyclic points concept, Cyclic quadrilateral, Circle– Radius, Area and perimeter, Arc, Chord, Sector, Segment, Tangent, Secant, Area of common region Solid figures– Introduction, Classification of a solid, Net of a solid, Cuboid, Cube, Right cylinder, Pyramid– right pyramid, triangular pyramid, Cone– frustum of a cone, Sphere, Combination of solid.

Co-ordinate geometry: Cartesian coordinate geometry– rectangular coordinate axis, distance formula, Section formula, Area of a triangle, Centre of gravity or Centroid of a triangle, In-centre of a triangle, Circumcentre of a triangle, Orthocentre of a triangle, Collinearity of three points, Slope of a line, Different forms of equations of a straight line, Perpendicularity and parallelism, Length of perpendicular.

Self-study Component-Basics of geometry, formula, dimensions, shapes. Different types of lines. Example – parallel, intersecting etc.. **8 Hours**

Unit-5

Time and Work: Relationship between time and work. Importance of efficiency, Conventional method of solving problems, L.C.M method, Negative work, The specific case of building a wall, Group work, Constant product rule, When work is not constant, Pipes and cistern– Similarity of logic.

SSC: LCM methods, basic arithmetic. Fractions and efficiency. **4 Hours**

Reference Books:

1. The Trachtenberg speed system of basic mathematics, published by Rupa publications.
2. CAT Mathematics by AbhijithGuha. published by PHI learning private limited.
3. Quantitative aptitude by Dr. R. S Agarwal, published by S.Chand private limited.
4. Verbal reasoning by Dr. R. S Agarwal , published by S. Chand private limited.
5. Quantitative aptitude for CAT by Arun Sharma, published by McGraw Hill publication.
6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course Outcomes (CO)

After learning all the UNITs of the course, the student is able to:

1. Solve problems of higher difficulty level with ease in the following topics– Time, speed and distance and Geometry. L5
2. Analyze the number of colored faces in a cube when it is cut into different number of pieces and solve the problems under clocks and calendars. L5
3. Apply the concept of L.C.M in the module time and work to solve the problems with comprehension. L2
4. Analyze the concepts in Co-ordinate geometry by spatial visualization. L4
5. Interpret the logic in the statements of syllogism by critical thinking and apply venn diagram for the effectives ways of deriving at the conclusion. L4
6. Determine the solutions for complicated problems of set theory using the concept of venn diagram. L4

Course Title : ADDITIONAL MATHEMATICS-II			
Course Code : P18MADIP41	Semester: IV	L - T – P : H : 0-0–3: 3	Credits :0
Contact Period: Lecture: 52 Hrs	Exam Hours :04 Hrs	Weight age: CIE:50; SEE:50	
Prerequisites :NIL			

(Mandatory Learning Course: **Common to All Branches)**

(A Bridge course for Diploma qualified students of IV Sem. B. E.)

UNIT –Is

Linear Algebra: Introduction - Rank of matrix by elementary row operations - Echelon form of a matrix. Consistency of system of linear equations - Gauss elimination method. Gauss-Jordan and LU decomposition methods. Eigen values and eigen vectors of a square matrix..

Self-study Components: Application of Cayley-Hamilton theorem (without proof) to compute the inverse of a matrix-Examples

10 Hours

UNIT –II

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. and variation of parameters. Solution of Cauchy's homogeneous linear equation and Legendre's linear differential equation.

Self-study Components: Method of undetermined coefficients

14 Hours

UNIT –III

Multiple Integrals: Double and triple integrals-region of integration. Evaluation of double integrals by change of order of integration.

Vector Integration: Vector Integration: Integration of vector functions. Concept of a line integrals, surface and volume integrals. Green's, Stokes's and Gauss theorems (without proof) problems.

Self-study Components: Orthogonal curvilinear coordinates.

10 Hours

UNIT –IV

Laplace transforms: Laplace transforms of elementary functions. Transforms of derivatives and integrals**,** transforms of periodic function and unit step function-Problems only. Inverse Laplace transforms: Definition of inverse Laplace transforms. Evaluation of Inverse transforms by standard methods.

Self-study Components: Application to solutions of linear differential equations and simultaneous differential equations.

12 Hours

UNIT –V

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples.

Self-study Components: State and prove Bayes's theorem.

06 Hours

Text Book:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, New Delhi,42nd Ed. 2012.

References:

1.E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 6th Ed., 2007
2.N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers,7th Ed., 2007.