SYLLABUS FOR B.E. III & IV SEMESTER

(With effect from 2017 - 18 Academic year)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2017–18)

BACHELOR DEGREE

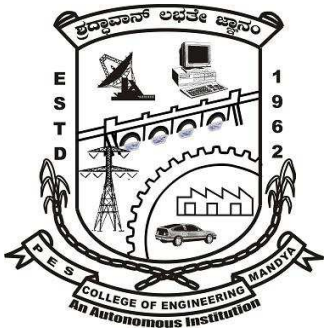
IN

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)

Ph : 08232- 220043, Fax : 08232 – 222075,Web : www.pescemandya.org

PREFACE

PES 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.

Dr. Umesh D.R.
Deputy Dean (Academic)
Associate Professor,
Dept. of Computer Science & Engg.

Dr. P S Puttaswamy
Dean (Academic)
Professor,
Dept. of Electrical & Electronics Engg.

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.

P.E.S. COLLEGE OF ENGINEERING, MANDYA
(An Autonomous Institution)
Scheme of Teaching and Examination

III Semester B.E. (CS & E)

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P17MAT31	Engineering Mathematics-III	Maths	3:2:0:5	4	50	50	100
2.	P17CS32	Digital Logic Design	CS	4:0:0:4	4	50	50	100
3.	P17CS33	Data Structures	CS	4:0:0:4	4	50	50	100
4.	P17CS34	Discrete Mathematical Structures	CS	4:0:0:4	4	50	50	100
5.	P17CS35	Object Oriented Programming with C++	CS	4:0:0:4	4	50	50	100
6.	P17CS36	Computer Organization	CS	4:0:0:4	3	50	50	100
7.	P17CSL37	Data Structures Laboratory	CS	0:0:3:3	1.5	50	50	100
8.	P17CSL38	Digital Logic Design Laboratory	CS	0:0:3:3	1.5	50	50	100
9	P17HU**DIP**39	Comprehensive Communication Development(CCD)	HS&M	2:0:0:2	[2]	[50]	[50]	[100]
10	P17HU39	**Aptitude and Reasoning Development - BEGINNER (ARDB)	HS&M	2:0:0:2	0	(50)	--	--
11	P17HU**DIP**310	* Indian Constitution, Human Rights & Professional Ethics	Human& Science	2:0:0:2	0	--	---	---
12	P17MA**DIP**31	*Additional Maths-I	Maths	4:0:0:4	0	--	---	---
Total					26[28]	400[450]	400[450]	800[900]

*** Additional Mathematics-I & Constitution of India and Professional Ethics : Lateral entry students shall have to pass these mandatory learning courses before completion of VI- Semester**

**** ARDB: All students shall have to pass this mandatory learning courses before completion of VI- Semester**

P.E.S. COLLEGE OF ENGINEERING, MANDYA
(An Autonomous Institution)
Scheme of Teaching and Examination

IV Semester B.E. (CS & E)

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/ Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P17MAAC41^{+}/ P17MAES41^{++}	Engineering Mathematics-IV	Maths	3:2:0:5	4	50	50	100
2.	P17CS42	Graph Theory & Combinatorics	CSE	4:0:0:4	4	50	50	100
3.	P17CS43	Theory of Computation	CSE	4:0:0:4	4	50	50	100
4.	P17CS44	Analysis and Design of Algorithms	CSE	4:0:0:4	4	50	50	100
5.	P17CS45	Data Communications	CSE	4:0:0:4	4	50	50	100
6.	P17CS46	Microprocessor	CSE	4:0:0:4	3	50	50	100
7.	P17CSL47	Analysis and Design of Algorithms Laboratory	CSE	0:0:3:3	1.5	50	50	100
8.	P17CSL48	Object Oriented Programming with C++ Laboratory	CSE	0:0:3:3	1.5	50	50	100
9	P17HU49	Aptitude and Reasoning Development – Intermediate (ARDI)	HS&M	2:0:0:2	1	50	50	100
10	P17EV**DIP**410	*Environmental Studies	ENV	2:0:0:2	0	--	--	--
11	P17MA**DIP**41	*Additional Maths-II	Maths	4:0:0:4	0	--	--	--
Total					27	450	450	900

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

$^{+}$ Common to BE (AU, CV, ME and I&PE)

$^{++}$ Common to BE (CS, EC, E&E and IS&E)

Course Title : Engineering Mathematics-III (Common to All Branches)			
Course Code : P17MAT31	Semester : 3	L :T:P:H : 3:2:0:5	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

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 $(\frac{1}{3})^{rd}$ rule, Simpson's $(\frac{3}{8})^{th}$ rule, Boole's rule and Weddle's rule (All rules without proof)- Illustrative problems.

Self-Study Component: Derive Newton- Cotes quadrature formula. 10 Hours

Unit-3

Fourier series: Periodic functions, Fourier series- Euler's formula, Dirichlet's conditions. Fourier series of discontinuous functions, Fourier series of even and odd functions. Change of interval-Fourier series of functions of arbitrary period. Half–range Fourier series expansions, Fourier series in complex form, 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 Fourier cosine transforms, properties. Inverse infinite Fourier and inverse Fourier sine & cosine transforms – Illustrative examples.

Difference equations and Z-transforms: Definition of Z-transforms- standard Z-transforms, 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's identities related problems. 10 Hours

Unit-5

Partial differential equations (PDE's): Formation of PDE's. Solution of non-homogeneous PDE by 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: Charpit'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.

Reference Books:

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 Ed.
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 ***five*** full questions choosing at least ***one*** question from each unit.

Course Outcomes

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

1. Apply forward, backward difference formulae and central differences formulae in solving interpolation- extrapolation problems in engineering field.
2. Apply Numerical differentiation and integration rules in solving engineering where the handling of numerical methods is inevitable.
3. Recognize the importance of Fourier series & Fourier transforms, difference equations and Z-transforms in the field of signals and systems, communication and network theory signal and image processing, control theory, flow & heat transfer and theory of elasticity.
4. Learn modeling in terms of partial differential equations and also, learn different exact/analytical methods of solving with special emphasis on interpretation of the solution.
5. Interpret the solution of one-dimensional wave, heat and Laplace equations with given initial and boundary conditions in the context of various engineering and technological applications.

CO-PO Mapping

Semester: 3	**Course code : P17MAT31**	**Title : Engineering Mathematics –III**											
CO's		**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		1	**2**	-	-	-	-	-	-	-	-	-	-
CO-2		**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO-3		**3**	**3**	-	-	-	-	-	-	-	-	-	-
CO-4		**2**	**3**	-	-	-	-	-	-	-	-	-	-
CO-5		**2**	**3**	-	-	-	-	-	-	-	-	-	-

Course Title : Digital Logic Design			
Course Code : P17CS32	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 4
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 .

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

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 – Triggerred RS Flip-Flops**,** Edge – Triggerred D Flip-Flops**,** Edge – Triggerred JK Flip-Flops, JK Master-Slave Flip-Flops, Various representation of flipflops, Conversion of flip-flops.

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.

10 Hours

Unit-5

Design of Synchronous and Asynchronous Sequential Circuit : Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, Implementation using Read Only Memory, 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.

11 Hours

Self Study Components:

Unit-1 : Five variable Karnaugh map
Unit-2 : Number system
Unit-3 : Flip-Flop timing, Analysis of sequential circuits
Unit-4 : Universal Shift register, Digital clock
Unit-5 : D/A and A/D conversion

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 McGraw Hill 2009.
2. Fundamentals of Digital Logic with Verilog Design, Stephen Brown, ZVonkoVranesic, TMH, 2006

Course outcomes:

1. **Apply** Boolean laws and Boolean equation minimization techniques to design logic circuits.
2. **Design** the data processing circuits.
3. **Apply** the logic to 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 : P17CS32**					**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 : P17CS33	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Unit-1

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.

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

10 Hours

Unit-2

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

10 Hours

Unit-3

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

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

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

12 Hours

Unit-5

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

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

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.

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.

Self study component

Unit-1 : Structures concepts, Programmes on structures.
Unit-2 : Recursive programmes on Multiplication of natural numbers, GCD of two numbers.
Unit-3 : Conversion from Infix to Prefix expression, Postfix to Prefix expression.
Unit-4 : Different traversal techniques using iterative approach.
Unit-5 : Sorting methods – Quick sort, Merge sort, Searching methods – Binary search, Indexed sequential search.

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 : P17CS33**					**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 : Discrete Mathematical Structures			
Course Code : P17CS34	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Unit-1

Principles of counting: The rules of sum and product, Permutations, Combinations: The Binomial theorem- combinations with repetition.

Set Theory: Sets and subsets, set operations and the Laws of set theory, Counting and Venn Diagrams, A First Word on Probability.

10 Hours

Unit-2

Fundamentals of Logic: Basic Connectives and Truth Tables, Logic Equivalence, the Laws of Logic, Logical Implication - Rules of Inference.

Quantifiers and their uses: Quantifiers, Definitions and the Proofs of Theorems (Direct and indirect methods)

10 Hours

Unit-3

Properties of Integers: Mathematical Induction, The Well Ordering Principle- Mathematical Induction in the Alternative form, Recursive Definitions.

Relations and Functions: Cartesian Products and Relations, Functions .Plain and One-to-One, Onto Functions – Stirling's Numbers of the Second Kind, The Pigeon-hole Principle, Function Composition and Inverse Functions. Special functions-characteristic function, Permutation function, Hashing function.

10 Hours

Unit-4

Relations Revisited: Properties of Relations Computer Recognition : Zero-One Matrices and Directed Graphs, Partial Orders - Hasse Diagrams.

Equivalence Relations and Partitions- Partitions induced by Equivalence relations. Topological sorting algorithm, totally ordered sets. External elements, Lattices.

12 Hours

Unit-5

Groups: Definitions, Elementary Properties, Homomorphism's, Isomorphisms, and Cyclic Groups, Cosets, and Lagrange's Theorem.

Coding Theory: Elements of Coding Theory, The Hamming Metric, The Parity Check, and Generator Matrices. Group Codes: Decoding with Coset Leaders.

10 Hours

Text Books :

1. Discrete and Combinatorial Mathematics, RalphP. Grimaldi &B.V. Ramana, 5th Edition, PHI/Pearson education.
2. "Discrete Mathematical structures", Dr D. S. Chandrashekariah, Prism 2005.

Reference Books:

1. "Discrete Mathematics and its Applications", Kenneth H. Rosen, 6th Edition, McGraw Hill, 2007.
2. "Discrete Mathematical Structures: Theory and Applications ", D.S. Malik and M.K. Sen, Thomson, 2004.
3. "Discrete Mathematical structures", Kolman Busby Ross , 5th edition , PHI.

Self Study component

Unit-1: The Binomial Theorem(combinations)
Unit-2: Basic connectives and Truth tables
Unit-3: The Division Algorithm : Prime numbers
Unit-4: Special Functions
Unit-5: Algebraic Systems, Semigroups and Monoids.

Course Outcomes

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

1. Understand the principles of counting and set theory. –L2
2. Identify the quantifiers and their uses and learn the fundamentals of logic theory.-L3
3. Apply the Mathematical induction principle and pigeonhole principle to solve the real time problems.-L3
4. Solve the problems using the concepts of relations and functions and Identify the different ways of representing relations.-L3
5. Apply the concepts of group theory and coding theory to solve the given problem.-L5

CO-PO Mapping

Semester: 3		**Course code : P17CS34**					**Title : Discrete Mathematical Structure**								
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 304.1	**Apply** the concepts of sets and counting theory	3	3	2	1									2	
CO 304.2	**Apply** the concepts of logic theory quantifiers to check the validity of a given arguments	3	3	3	3									3	
CO 304.3	**Solve** the given open statement using different proof techniques.	2	3	2	1									2	
CO 304.4	**Identity** the concepts of relations and functions for a given data.	2	3	2	1									2	
CO 304.5	**Apply** the concepts of group and coding theory for a given problem.	3	3	1	3									3	
C304		**2.6**	**3**	**2**	**1.8**									**2.4**	

Course Title : Object Oriented Programming with C++			
Course Code : P17CS35	Semester : 3	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Unit 1

Basic Concepts of object oriented programming: Objects, Classes, data abstraction and encapsulation Inheritance, polymorphism, dynamic binding, message passing. Benefits of OOP's and its application. Procedure oriented programming V/S object oriented programming (OOP).

Classes and Objects: Creation, accessing class members, defining member functions, Inline

function, function overloading, default arguments, friend function, static data members and member function, arrays of objects, object as function argument, returning objects from functions, const member function, pointer to object, namespace fundamentals.

11 Hours

Unit 2

Constructor and Destructor : Types of constructors: Parameterized constructor, multiple constructors in a class, and constructors with default arguments, copy constructor, Dynamic constructor. Dynamic initialization of objects, Destructors.

Operator Overloading : Need of operator overloading, overloading unary operators, overloading binary operators, binary operator overloading using friend function, instream/outstream operator overloading.

11 Hours

Unit 3

Inheritance: Introduction, defining a derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, Virtual base classes, Constructors in derived classes, Member classes: Nesting of classes.

10 Hours

Unit 4

Virtual Functions and Polymorphism : Virtual function, Calling a Virtual function through a base class reference, inheriting Virtual attribute and Virtual functions, Pure virtual functions, Early vs. late binding.

C++ I/O Stream Basics : C++ streams, stream classes, Formatted I/O.

10 Hours

Unit 5

Templates: Introduction, function templates, function templates with multiple parameters, class templates, class templates with multiple parameters, overloading of template functions, member function templates.

Exception handling: Introduction, Basics of Exception Handling, Exception handling mechanism, Throwing mechanism, Catching mechanism, Re-throwing an exception, Specifying exceptions.

STL: overview, containers, vectors, lists, maps.

10 Hours

Text Books:

1. Object Oriented Programming with C++, E Balguruswamy, Tata McGraw Hill, 6th edition.
2. Mastering C++, K R Venugopal, RajkumarBuyya, Tata McGraw Hill, 2nd Edition, Tata McGraw Hill, 2013.

Reference Books:

1. The Complete Reference C++, Herbert Scheldt, 4th Edition, Tata McGraw Hill, 2012.
2. C++ Primer, Stanley B.Lippman, JoseeLajoie, 5th Edition, Pearson Education, 2009.

Self study components

Unit-1 : Difference between structure and class, Local classes, Pointers to members.

Unit-2 : Constructing two dimensional arrays, Manipulation of strings using operators, Dynamic memory allocation(new) and deallocation(delete) for single variable and for arrays, Overloading new and delete operator, Array subscriptor - [ ], Pointer to member operator, Assignment operator.

Unit-3 : Exceptions in constructors and destructors, Exception in operator overloading functions, STL components – set, multiset, multimap, stack, queue.
Unit-4 : Abstract classes, this pointer, Pointer to derived classes, Array of pointers to objects.
Unit-5 : Virtual constructors and destructors, Manipulators – setw( ), setprecision( ), setfill ( ), setiosflags( ), resetiosflags( ).

Course Outcomes:

The students should be able to

1. **Apply** the concepts of data abstraction and data encapsulation.
2. **Apply** the concept of redefining the operators for user defined data types.
3. **Develop** the application using templates to reduce the code size.
4. **Identify and apply** the different inheritance in the given problem**.**
5. **Apply** multiple forms and I/O streams.

IO-PO Mapping

Semester : 3	Course code : P17CS35	Title : Object Oriented Programming with C++													
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**
CO1	**Apply** the concepts of data abstraction and data encapsulation	2	2	2		2				2					3
CO2	**Apply** the concept of redefining the operators for user defined data types	2	2	2		2				2					3
CO3	**Develop** the application using templates to reduce the code size.	2	2	2		2				2					3
CO4	**Identify and apply** the different inheritance in the given problem	2	2	2		2				2					3
CO5	**Apply** multiple forms and I/O streams.	2	2	2		2				2					3
CO		**2**	**2**	**2**		**2**				**2**					**3**

Course Title : Computer Organization			
Course Code : P17CS36	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

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

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

10 Hours

Unit 2

Instruction Set Architecture (Cont'd): Addressing Modes, Assembly Language, Basic I/O operations, Stacks and queues, Subroutines, Additional Instructions, example programs.

11 Hours

Unit 3

Basic Processing Unit : Fundamental Concepts, Execution of complete Instruction, multiple bus organisation, Hardware control, microprogramed control.

Input/output organisation : Accessing I/O devices interrupts, direct memory access, busses, Interface circuits, standard I/O interfaces

11 Hours

Unit 4

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

10 Hours

Unit 5

Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Address, Multiplication of positive Numbers, Signed operand multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

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.

Self Study Components

Unit-1 : Instruction Set Architecture
Unit-2: Addressing Modes, Stacks and queue operations
Unit-3: Interrupts, Interface circuits, Microprogramed control
Unit-4: Virtual Memory, Performance considerations
Unit-5: Fast Multiplications, Integer Division, Operations on floating point Numbers

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 : P17CS36						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 : Data Structures Laboratory			
Course Code : P17CSL37	Semester : 3	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: 3 Hr/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 of the list ii) At the rear end of the list 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 : P17CSL38	Semester : 3	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: 3 Hr/Week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

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

2. Code Converters
a) 3 bit Binary to gray code .
b) Write the Verilog /VHDL code for 3 bit binary to gray code

3. Experiment on data processing circuit.
a) Given any 3 and 4 variable logic expression realize using 8:1 multiplexer.
b) Write the Verilog /VHDL code for an 8:1 multiplexer.

4. Comparator circuits
a) 2 bit Magnitude comparator using basic gates.
b) Write the Verilog /VHDL code for 2 bit comparator

5. Arithmetic circuits & Encoder
a) Full adder and Full subtractor using Decoder and Nand gates.
b) Write the Verilog/VHDL code for full subtractor and Full adder.

6.
a) Implement a Octal to binary encoder using basic gates.
b) Write the Verilog/VHDL code for encoder(i) &(ii).

7. Shift Register
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 Verilog/VHDL code for Johnson counter.

8.
a) Implement a ring counter and Johnson counter using 4-bit shift register.
b) Write the Verilog/VHDL code for ring counter.

9. Counters

a) Design a 3 bit Asynchronous counter using J-K flipflop
b) Write the Verilog/VHDL code for mod – 8 up counter.

10.

a) Design and implement 3 bit synchronous up counter using D Flip -Flop ICs.
b) Write the Verilog/VHDL code

11.

c) Design a counter for the given sequence with lock in condition.
a) Write the Verilog/VHDL code for mod – 8 up counter

12.

a) Design a 2 bit down counter using JK- Flip –Flop.
b) Write the Verilog/VHDL code for mod – 8 up counter

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 : P17HU39	Semester : 3	L :T:P:H : 2:0:0:2	Credits: NA
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage :CIE:100% - [P/NP]	

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

Self-study Component- 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.

Self-study Component- 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.

Self-study Component- 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.

Self-study Component-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.

Self-study Component: 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.

Self-study Component-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 Articulation Matrix														
Course Outcomes	Program Outcomes												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
CO1	_	3	1	2	3	_	_	_	_	_	_	_	_	_
CO2	2	1	_	_	_	_	_	_	1	_	_	_	_	_
CO3	_	3	3	_	_	_	_	_	_	_	_	_	_	_
CO4	_	_	_	_	_	_	_	2	_	2	2	_	_	_
CO5	_	3	_	_	_	_	_	_	_	_	1	_	_	_

Course Title : Additional Maths-I			
Course Code : P17MADIP31	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 n^{th} 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 : Engineering Mathematics-IV			
Course Code : P17MAT41	Semester : 4	L:T:P:H : 3:2:0:5	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

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 first degree – Introduction. Taylor's series method. Modified Euler's method, Runge - Kutta method of IV order, Milne's and Adams predictor & corrector methods (All formulae without proof).

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

10 Hours

Unit-2

Linear Algebra-II: Introduction to vector spaces – subspaces, Linear combination of vectors, linearly independent/dependent sets; Bases and dimension. Linear transformation - Rank nullity theorem (Statement only). Change of basis. Matrix of linear transformations. (No proof for theorems/properties) - Illustrative examples from engineering field.

Numerical methods for system of linear equations- Gauss-Jacobi and Gauss- Seidel iterative methods. Relaxation methods**.** Determination of largest eigen value and corresponding eigen vector by power method.

Self-Study Component: Ramanujan's Method to find the smallest root of a polynomial**.**

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 problems on properties of analytic functions (No proof). Construction of analytic function: Milne-Thomson method. Conformal transformation–Definitions. Discussion of transformations : $w=z^2$, $w=e^z$, $w = z + 1/z\ (z \neq 0)$. Bilinear transformations.

Complex integration: complex line integrals. Cauchy theorem, Cauchy integral formula. Taylor's and Laurent's series (Statements only). Singularities, poles and residues. Cauchy residue theorem (statement only). Simple illustrative examples.

Self-Study Component: Derivation of Cauchy- Riemann equation in Cartesian and polar form. Derivation of Cauchy theorem, Cauchy integral formula and Cauchy's residue theorem.

11 Hours

Unit-4

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* $y = ax^2 + bx + c.$

Prof. Karl Pearson's coefficient of correlation and lines of regression.

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.

Self-Study Component: Basic definitions of probability and problems up to Bayes' theorem. To fit curves of the type : $y = ae^{bx}$, Derivation of Mean and SD of Binomial & Poisson distribution**.**

11 Hours

Unit-5

Joint probability distributions and Markov chains:

Series solutions of ODE's and special functions: Power series solution of a second order ODE, Series solution-Frobenius method. Series solution leading to $J_n(x)$- Bessel's function of first kind. Expansions for $J_{1/2}(x) and\ J_{-1/2}(x)$. -simple related examples. Series solutions of Legendre's differential equation leading to $P_n(x)$-Legendre's polynomials. Rodrigues'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

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

Reference Books:

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 Ed. Ltd., 3rd Ed, 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

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

Course Outcomes

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

1. Apply the familiarity of numerical methods for solving algebraic and transcendental equations and demonstrate single-step and multi-step numerical methods for solving ordinary differential equations and interpret the solution in engineering applications.
2. Describe the concept of vector space, subspace, basis, dimension and their practical utility in matrix of linear transformations required in the area of graphics, analysis of

graphs, internet search, machine learning and scientific computing etc. And, understand the procedure of numerically solving large systems of linear algebraic equations and obtaining eigen value and eigen vector corresponding to a large eigen vector, with the aid of standard methods of numerical linear algebra

3. Explain the concept of analyticity and potential fields through complex functional /potential, conformal transformations and interpret the solution in fluid flow and electromagnetic problems and describe the process of complex integration and learn series representation of a function of complex variables, residues and poles.
4. Apply the knowledge of statistics in interpretation the data, fitting of a linear and non-linear curves of best fit for experimental data arising in engineering calculations and analyze the same by expressing in the form of regression lines. And, Illustrate the concept of random variables (discrete/continuous) and related probability distributions and use them in analyzing and solving engineering problems associated with probability model.
5. Define the concept of joint probability of two random variables and apply the knowledge of joint probability distribution in interpreting data through statistical measure. and, analyze the notion of higher transition probabilities, the Markov chain and queuing models arising in engineering problems for feasible random events.
   Obtain series solution of essential ODE's such as Bessel's and Legendre's differential equations and understand their scientific/engineering utility

CO-PO Mapping

Course code : P17MAES41	**Title : Engineering Mathematics –IV**											
CO's	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	**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO-2	**3**	**3**	-	-	-	-	-	-	-	-	-	-
CO-3	**3**	**3**	-	-	-	-	-	-	-	-	-	-
CO-4	**2**	**2**	-	-	-	-	-	-	-	-	-	-
CO-5	**3**	**3**	-	-	-	-	-	-	-	-	-	-

Course Title : Graph Theory & Combinatorics			
Course Code : P17CS42	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course content

Unit-1

Introduction to Graph Theory : Definitions and examples, finite and infinite graphs ,sub graphs, Operations on graphs, complements, and Graph isomorphism, Vertex degree, Euler Trails and circuits ,complements, Hamilton paths and cycles. Application of Graphs-Konigsberg Bridge problem, Travelling salesmen problem, Utility problem, Seating arrangement problem.

10 Hours

Unit-2

Planar graphs, Kuratowski's two graphs, different representations of a planar graphs, Eulers formula, Detection of planarity. Geometric dual ,Geometric dual. Cutsets, some properties of a cut-set Graph colouring, chromatic number, chromatic partitioning and chromatic polynomials.

11 Hours

Unit-3

Trees: Definitions, properties, and examples, rooted trees, trees and sorting, Weighted trees and prefix codes. Optimization: Dijkstra's shortest path algorithm, minimal spanning trees - The algorithms of Kruskal and Prim, Transport networks - Maxflow, Min-cut theorem

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. Generating functions: Introductory examples, Definition and examples– calculational techniques, partitions of integers, The exponential generating function, The summation operator.

10 Hours

Unit-5

Recurrence relations: First order linear recurrence relation, the second order linear homogeneous recurrence relation with constant coefficients,

Third and higher –order Homogeous Recurrence relations, The non homogeneous recurrence relation, The method of generating functions for second order recurrence relations.

10 Hours

Text Books :

1. Discrete and Combinatorial Mathematics, Ralph P.Grimaldi & B.V.Ramana ,5th Edition, PHI/Pearson education. Chapters 8,9,10,11,12.
2. Graph Theory with Applications to Engineering and Computer Science - Narsing Deo. Chapters-1,2,3,4.1,4.2,58.1 to 8.4.

Reference Books :

1. Graph Theory and Combinatorics , Dr. D.S. Chandrasekharaiah, Prism, 2005.
2. Introduction to Graph Theory, Chartrand Zhang, TMH, 2006.

Self learning component

Unit-1: Fleury's Algorithm

Unit-2: Matching theory.

Unit-3: Biconnected Components and Articulation Points

Unit-4: Partitions of Integers
Unit-5: A Special Kind of Nonlinear Recurrence relation

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

1. **Identify** different parameters of graphs and its applications.
2. **Understand** planar graphs and its properties of a given properties to detect planarity of a given graph.
3. **Apply** optimization techniques to construct a minimal spanning tree of a graph, prefix code for a given message.
4. **Apply** and understand the principle of Inclusion and Exclusion, generating functions to solve the given problem.
5. **Solve** simple recurrence relation of second and third order.

CO-PO Mapping

Semester: 4	Course code : P17CS42	Title : Graph theory and Combinatorics													
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 402.1	**Identify** different parameters of graphs and its applications	2	3		1									2	
CO 402.2	**Understand** planar graphs and its properties of a given properties to detect planarity of a given graph	2	3	2	2									2	
CO 402.3	**Apply** optimization techniques to construct a minimal spanning tree of a graph, prefix code for a given message	2	3	3	3									3	
CO 402.4	**Apply** and understand the principle of Inclusion and Exclusion, generating functions to solve the given problem	2	3											2	
CO 402.5	**Solve** simple recurrence relation of second and third order	2	3											3	
C402		**2**	**3**	**2.5**	**2**									**2.4**	

Course Title : Theory of Computation			
Course Code : P17CS43	Semester : 4	L :T:P:H : 4:0:0:4	Credits: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		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.

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;

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.

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.

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;

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. 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 : P17CS43	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 1 1**	**PO 12**	**PS O1**	**PS O2**
CO 403.1	Design finite automata	2	3	3	2	1								3	2
CO 403.2	Apply regular expression for lexical analysis phases	3	3	3	2	1								3	2
CO 403.3	Design grammars for various languages	3	3	3	3	1								3	3
CO 403.4	Design push-down automata from grammars and grammar to pda	3	3	3	2	1								3	3
CO 403.5	Design Turing machines for simple languages and design problem reductions to determine the undecidability of languages	3	3	3	2									3	1
C403		**2.8**	**3**	**3**	**2.2**	**0.8**								**3**	**2.2**

Course Title : Analysis & Design of Algorithms			
Course Code : P17CS44	**Semester : 4**	**L :T:P:H : 4:0:0:4**	**Credits: 4**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

Course Content

Unit-1

Introduction : Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Graphs.
Fundamentals of the analysis of algorithm efficiency : Analysis Framework, Asymptotic notations and basic efficiency classes. Mathematical Analysis of non-Recursive Algorithms and Mathematical Analysis of Recursive Algorithms.

11 Hours

Unit-2

Brute Force: Selection sort, bubble sort, Sequential search, Brute-force string matching
Divide and Conquer : Merge sort, Quick sort, Binary Search,

11 Hours

Unit-3

Decrease and Conquer: Insertion Sort, Depth First Search, Breadth First Search, Topological Sorting, Algorithms for generating objects

10 Hours

Unit-4

Dynamic Programming : Computing a Binomial Coefficient, Warshall's and Floyd's Algorithms, The Knapsack Problem and Memory Functions.

10 Hours

Unit-5

Greedy Technique : Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

10 Hours

Text Book :

1. Introduction to the Design & Analysis of Algorithms**,** Anany Levitin, 3rd Edition, Pearson Education, 2012.

Reference Books:

1. Introduction to Algorithms , Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 2nd Edition, PHI, 2006.
2. Introduction to the Design and Analysis of Algorithms A Strategic Approach, R.C.T. Lee, S.S. Tseng, R.C. Chang & Y.T.Tsai, TMH, 2005.

Course Outcomes:

1. **Determine** time and space complexities of the algorithms using asymptotic notations.
2. **Analyze** the time complexities using divide and conquer approach for various problems**.**
3. **Apply** the decrease and conquer approach to solve various problems.
4. **Apply** the dynamic programming technique to solve various problems.
5. **Apply** the greedy technique to solve various problems.

CO-PO Mapping

Semester: 4	**Course code : P17CS44**					**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**
Determine time and space complexities of the algorithms using asymptotic notations.	2	2		2									2	2
Analyze the time complexities using divide and conquer approach for various problems	2	2		2									2	2
Apply the decrease and conquer approach to solve various problems	2	2		2									2	2
Apply the dynamic programming technique to solve various problems	2	2		2									2	2
Apply the greedy technique to solve various problems	2	2	2	2									2	2

Course Title : Data Communications			
Course Code: P17CS45	Semester : 4	L:T:P: H 4:0:0:4	Credits: 4
Contact Period : Lecture :52 Hr, Exam: 3Hr		Weightage :CIE:50% SEE:50%	

Course content

Unit-1

Introduction: Data Communications, Networks, Network Types.

Network models: Protocol Layering, TCP/IP Protocol Suite, The OSI Model.

Introduction to physical layer: Data And Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data Rate Limits, Performance.

11 Hours

Unit-2

Digital transmission: Digital-To-Digital Conversion, Analog-To-Digital Conversion, Transmission Modes.
Analog transmission: Digital-To-Analog Conversion, Analog-To-Analog Conversion.
Bandwidth utilization: Multiplexing and spread spectrum: Multiplexing, spread spectrum.

11 Hours

Unit-3

Transmission media: Introduction, Guided Media, Unguided Media: Wireless.
Switching: Introduction, Circuit-Switched Networks, Packet Switching, Structure of a Switch.
Introduction to data-link layer: Introduction, Link-Layer Addressing.

10 Hours

Unit-4

Error detection and correction: Introduction, Block Coding, Cyclic Codes, Checksum.
Data link control (DLC):DLC Services, Data-Link Layer Protocols, HDLC, Point-To-Point Protocol (PPP).
Media access control (MAC): Random Access, Controlled Access, Channelization.

10 Hours

Unit-5

Wired LANs: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Gigabit Ethernet.
Other wired networks: Telephone Networks, Cable Networks, Sonet, ATM.
Wireless LANs: Introduction, IEEE 802.11, Bluetooth.

10 Hours

Text Book:

1. Data Communication and Networking, Behrouz A.Forouzan**,** McGraw Hill, 5th Edition, 2013.

Reference Books:

1. Computer Networks, Tanenbaum, 5th Edition, Pearson Education/PHI, 2011.
2. Communication Networks-Fundamental Concepts and key architectures, Alberto Leon-Garcia and Indra Widjaja, Tata Mc-Graw-Hill 2nd Edition, Pearson Education, 2014

Self Study Components

Unit – 1: Types of noises and how noises affect the network, Noise reduction technique in data communication. RFC's related to each protocol.
Unit – 2: Mathematical approach to modulation and sampling.
Unit – 3: Fault coverage of transmission media, switching in digital telephony.
Unit – 4: Data Link Layer design issues, Forward Error Correction.
Unit – 5: Comparative study of Wireless networks.

Course Outcomes

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

1. **CO-1: Describe** different network models and calculate the performance of the Network.

2. **CO-2: Select** encoding scheme, multiplexing methods and suitable media for data transmission.
3. **CO-3: Apply** different error detection and correction methods for digital data.
4. **CO-4: Choose** suitable media access control protocol for data transmission.
5. **CO-5: Explain** the architecture of wired and wireless Local Area Networks (LANs).

CO-PO Mapping

Semester: 4		Course code : P17CS45					Title : Data Communications								
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 503.1	**Describe** different network models and calculate the performance of the Network	2	2	3	3								2	1	
CO 503.2	**Select** encoding scheme, multiplexing methods and suitable media for data transmission	2	2	3	3	1							2	1	
CO 503.3	**Apply** different error detection and correction methods for digital data	2	2	3	2	1							2	2	
CO 503.4	**Choose** suitable media access control protocol for data transmission	3	3	2	2	1							2	2	
CO 503.5	**Explain** the architecture of wired and wireless Local Area Networks (LANs)	2	1	1	1	1							2	1	
C503		**2.2**	**2**	**2.4**	**2.2**	**1**							**2**	**1.4**	

Course Title : Microprocessor			
Course Code : P17CS46	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

8086 Architecture: CPU architecture, Internal Operation, addressing modes instruction format, Machine code for the add Instruction**.** Assembler language programming **:** Assembler instruction format, Data transfer instructions, Logical instructions, Shift and Rotate instructions.

10 Hours

Unit-2

Assembler language programming (contd.,) : Arithmetic instructions, branch **instructions**-conditional branch instruction, unconditional branch instructions, loop instructions, String manipulation instructions-String Instructions, REP prefix, table translation, NOP, HLT

instructions, directives and operators- data definition and storage allocation, structure, records, assigning name of expression, segment definition, program termination, alignment directives, value returning Attribute Operators.

11 Hours

Unit-3

Modular Programming : Linking and Relocation – Segment Combination, Access to External Identifiers, Stacks, Procedures – Calls, Returns and Procedure Definitions, Saving and Restoring Register, Interrupts and Interrupt Routines, MSAM Macros

11 Hours

Unit-4

I/O Programming and Interfaces: I/O programming- Fundamental I/O considerations, Programmed I/O, Interrupt I/O, Block transfers and DMA. I/O interface-Block diagram of 8255A programmable peripheral interface, format of control register, interfacing keyboard and display

10 Hours

Unit-5

System Bus Structure : Basic 8086/8088 configurations – Minimum mode, Maximum mode, System Bus Timing, Memory Interfacing, Interrupt Priority Management – Interrupt System based on Single 8259A.

10 Hours

Text Book:

1. Yu-Cheng Liu, Glenn A.Gibson, - Microcomputer Systems: The 8086 / 8088 Family Architecture, Programming and Design‖, Second Edition, Prentice Hall of India, 2007

Reference Books :

1. **The Intel Microprocessors**, Barry.B.Brey, PHI Publication, 8th edition, 2009.
2. **The Intel Microprocessor Family:** Hardware and Software Principles and Applications, James L. Antonakos, Thomson**,** 2007.
3. **Microprocessors and Interfacing,** Programming and Hardware Doughlas V.Hall, TMH, 2012

Self Study Component

Unit-1 : Instruction execution timing.
Unit-2 : Assembly process.
Unit-3 : Program design.
Unit-4 : A/D and D/A Interface
Unit-5 : Bus standard

Course Outcomes

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

1. **Understand** the architecture of 8086 microprocessor. (Unit-I)
2. **Apply** 8086 instruction set for the given problems (Unit-II)
3. **Develop** different modules & link them. (Unit-III)
4. **Design** solution to interface 8086 to external device (Unit-IV)
5. **Understand** min & max mode of 8086 and design memory interfacing. (Unit-V)

IO-PO Mapping

Semester : 4	Course code : P17CS46					Title : Microprocessor								
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**	**PSO1**	**PSO2**
CO 406.1	**Understand** the architecture of 8086 microprocessor. (Unit-I)	1												2	
CO 406.2	**Apply** 8086 instruction set for the given problems (Unit-II)	2	2	3		1								2	
CO 406.3	**Design** solution to interface 8086 to external device (Unit-IV)	3	2	3		1								2	
CO 406.4	Program and interface external device to 8086 (Unit-IV)	2	2	3		1								2	
CO 406.5	**Understand** min & max mode of 8086 and design memory interfacing. (Unit-V)	2	2	3										2	
C406		2	1.8	2.4		1								2	

Course Title : Analysis & Design of Algorithms Laboratory			
Course Code : P17CSL47	Semester : 4	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: 3 Hr/Week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Divide and conquer

1. Sort a given set of elements using Merge sort method and determine the time required to sort the elements. Repeat the experiment for different values of n.the number of elements in the list to be sorted and plot graph of the time taken versus n. The elements can be read from file are generated using random number generator.
2. Sort a given set of elements using Quick sort method and determine the time required sort the elements.. Repeat the experiment for different values of n. The number of elements in the list to be sorted and plot graph of the time taken versus n. The elements can be read from file are generated using random number generator.
3. Obtain the Topological ordering of vertices in a given digraph.
4. Print all the nodes reachable from a given starting node in a digraph using BFS method.
5. Check whether a given graph is connected or not using DFS method.

Transform and conquer

6. Sort a given set of elements using the Heap sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
7. Implement Horspool String Matching algorithm.

Dynamic programming

8. Compute the transitive closure of a given directed graph using Warshall's algorithm.
9. Implement Floyd's algorithm for the All-Pairs- Shortest-Paths problem.
10. Implement 0/1 Knapsack problem using dynamic programming.
11. Write a program to solve TSP problem using dynamic programming approach

Greedy technique

12. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
13. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
14. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

Back Tracking.

15. Implement N Queen's problem using Back Tracking.
16. Find a subset of a given set S={s1,s2,…sn} of n positive integers whose sum is equal to a given positive integer d. For example ,is S={1,2,5,6,8} and d=9 there are two solutions {1,2,6} and {1,8}.A suitable message is to be displayed if the given problem instance doesn't have a solution.

Course Title : Object Oriented Programming with C++ Laboratory			
Course Code : P17CSL48	Semester : 4	L :T:P:H : 0:0:3:3	Credits: 1.5
Contact Period: 3 Hr/Week, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Exercise Program

a. Define a class **STUDENT** with USN, name, and marks in 3 test of a subject. Declare an array of 10 STUDENT objects. Using appropriate functions, find average of two better marks for all the STUDENTS. Print the USN, name, 3 test marks and the average marks of all the students in tabular format.
b. Given that an **EMPLOYEE** class contains the following members:
   Data member: Eno, Ename, basic, DA, IT, net_sal
   Member function: to read the data, to print data members.
   Write a C++ program to read the data of N employees and compute net_sal of each employee. Also modify the basic salary of any employee based on the Eno. (DA = 51% of basic, Income tax(IT) = 20% of the gross salary and net salary = basic + DA - IT)

1. Develop a simple library management system with class name **LIBRARY** and members as shown below. At the beginning program should accept values for data members for atleast 10 books in the library.

Class name: Library
Struct { **Data member:** Acc No. , Title of book, Author, Status, USN, Name }
Member functions: read info( ) write info( ) search ( ) issue ( ) / return( )

Status → available → 1
not available → 0

After reading the information about books, the program should allow the librarian to issue or receive the books and to display the status of the books

2. Develop a program to generate cinema bill with a class name cinema and data members as date , time, number of adults, number of children and bill amount, theatre name and cinema name. Overload the function by name **C_BILL** to generate the bill for the following categories
   a. Only adult
   b. Only children
   c. Both adult and children

   Call system data and time.
3. Create a two classes **DM** and **DF** which stores the value of distance. DM stores distance in meters and centimeters, DF in feet and inches. Write a program that can read values for class objects and add one objects of DM with another object DF. Display the results as per user choice.
4. Develop a program to monitor the status of a 2 conference hall with respect to its capacity. The maximum seating capacity of each hall in 30. Create a class by name conference_hall with the following data members
   a. Name of the conference hall
   b. Availability of seats

   Update seat availability in each hall as and when the delegates enter and leave the hall. Write the following member functions
   i. enter_hall( ) – overload unary +
   ii. exit_hall( ) - overload unary -
   iii. display1( ) - should display available seats in conference H1-overload <<
   iv. display2( ) - should display available seats in conference H2 - overload <<

   Write a friend function to display the total no. of available seats in H1 and H2 by overloading binary+ operator.
5. Write a program to create a class called MATRIX using a 2-dimensional array of integers. Implement the following by overloading operators = =, *, << and >> .
   a. M3=M1*M2
   b. M4=M2 * c where c is a constant number.

   Dynamically allocate memory for matrix.

6. Write a program to perform search operation on a given list of data (**int or float or char**) . If the given list is sorted perform binary search else perform linear search.
7. Create a linked list of data type (**int or float or char**) & perform following operations.
   a) Insert a node at a given position
   b) Delete the node with given data
   c) Swap the node information of given two nodes.
8. Create a class called **VECTOR** with array of characters as data member.
   Create two vector objects and perform the insertion and deletion operations as follows.
   Insert elements into first vector object until it is full. Once it is full insert the data into second vector object. Delete operation must begin from first vector.
9. Create a class **STRING** and implement the following operations
   a. Concatenate 2 string objects using Copy Constructor.
   b. Count the number of occurrence of a given sub string in a string.
   c. Replace a given character in a string by other character **9 same as old problem**
10. Consider an example of a bookshop which sells books and video tapes. These two classes are inherited from the base class called ***media.*** The media class has data members such as ***title*** **and** ***publication*****.** The ***book*** class has data members for storing a number of pages in a book, and the ***tape*** class has the playing time in a tape. Each class will have member functions such as ***read( )*** and ***show( ).*** In the base class, these members have to be defined as virtual functions. Write a program which models the class hierarchy for the bookshop and processes objects of these classes using pointers to the base class.
11. Write a C++ Program to create class STUDENT ,with data members USN, name and age. Using Inheritance, create classes UGSTUDENT and PGSTUDENT having fields as semester, fees and stipend. Enger the data for atleast 5 students .Find the Semester wise average age for all UG and PG Students separately .

Course Title : Aptitude and Reasoning Development - INTERMEDIATE (ARDI)			
Course Code : P17HU49	Semester : 4	L :T:P:H : 2:0:0:2	Credits: 1
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

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.

Self-study Component- 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 applications.

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.

Self-study Component-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 Articulation Matrix														
Course Outcomes	Program Outcomes												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	01	02
CO1	**3**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO2	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO3	**-**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**1**	**-**	**1**	**-**	-	-
CO4	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	-	-
CO5	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**-**	**2**	**-**	**-**	-	-
CO6	**-**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**	**1**	**-**	-	-

Course Title : Additional Mathematics-II			
Course Code : P17MADIP41	Semester : 4	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

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. Application of Cayley-Hamilton theorem(without proof) to compute the inverse of a matrix-Examples.

10 Hours

Unit-2

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

14 Hours

Unit-3

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. Orthogonal curvilinear coordinates.

10 Hours

Unit-4

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. Application to solutions of Linear differential equations and simultaneous differential equations.

12 Hours

Unit-5

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples. Bayes's theorem-examples.

6 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.

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