SYLLABUS

(With effect from 2015-2016 Academic year**)**

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2015–16)

III and IV Semester

Bachelor Degree

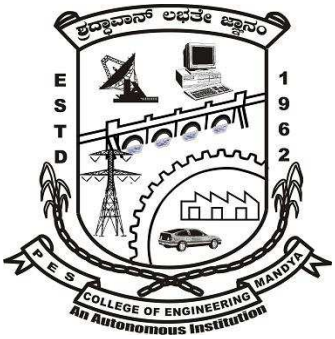
in

Information Science and 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 in the academic year 2008-09. Since, then it has been doing the academic and examination activities successfully. The college is running Eight undergraduate and Eight Postgraduate programs. It consists of Six M.Tech programs, which are affiliated to VTU. Other postgraduate programs are MBA and MCA.

India has recently become a Permanent Member by signing 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 such as Taiwan, Hong Kong, Ireland, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Turkey, Australia, Canada and Japan. Among other signatories to the international agreement are the US and the UK. Implementation of Outcome Based Education (OBE) has been the core issue for enabling the equivalence and of Indian degrees and their mobility across the countries.

Our Higher Educational Institution has adopted the CBCS based semester structure with OBE scheme and grading system.

The credit based OBE semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching.

The OBE, emphasize setting clear standards for observable, measurable outcomes of programs in stages. There lies a shift in thinking, teaching and learning processes moving towards Students Centric from Teacher Centric education. OBE standards focus on mathematics, language, science, attitudes, social skills & moral values.

The key features which may be used to judge, if a system has implemented an outcome based education system is mainly Standard based assessments that determines whether students have achieved the stated standard. Assessments may take any form, so long as the process actually measure whether the student knows the required information or can perform the required task. Outcome based education is a commitment that all students of all groups will ultimately reach the same minimum standards. Outcome Based Education is a method or means which begins with the end in mind and constantly emphasizes continuous improvement.

Choice Based Credit System (CBCS) provides choice for students to select from the prescribed courses (core, Foundation, Foundation Elective, elective, open elective and minor or soft skill 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 to learning which enables integration of concepts, theories, techniques, and, perspectives from two or more disciplines to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline. These greatly enhance the skill/employability of students.

In order to increase the Industry/Corporate readiness, many Soft Skills and Personality Development modules have been added to the existing curriculum of the academic year 2015-16. Industry Interactions have been made compulsory to enhance the field experience. In order to enhance creativity and innovation Mini Project and Industrial visit & Interaction are included in all undergraduate programs.

Sri.B.Dinesh Prabhu
Deputy Dean (Academic)
Associate Professor,
Dept. of Automobile Engg

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

PES College of Engineering Mandya

Vision

"An institution of high repute, imparting quality education to develop innovative and Humane engineers"

Mission

"Committed to develop students potential through high quality teaching- learning processes and state of the art infrastructure"

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

About the Department

The Department of Information science and Engineering takes pride in producing quality engineers over the past 14 years. The credit for all the flowery results goes to the highly motivating staff, from whom all students draw inspiration. The Department was started in the year 2000. The present intake of the undergraduate program is 30. The department has well equipped classrooms, computer laboratories with high-end systems, department library and good collection of software's. Also a research centre is a major credential to our department. We are proud to produce the first PhD student in our college. Faculty members of the department are involved in research activities in different fields such as Medical Image Processing, Pattern Recognition, and Data Mining etc. The department is using Outcome-based education (OBE), which is a recurring education reform model, and it is affiliated to Visvesvaraya Technological University (VTU). The department has achieved good Placement, conducted International /national Conferences and other sponsored short-term courses, workshops, National seminars and symposia. The laboratory facilities and the Internet access are available round the clock to the staff and students of the Information Science and Engineering.

- **VISION :**

"The department strives to equip our graduates with knowledge and expertise to contribute significantly to the Information Science technology industry".

- **MISSION:**

- To provide state-of-art facilities and to produce socially sensitive citizens.
- To prepare students for careers in industry and to peruse higher education.
- To promote leadership qualities among students.
- To encourage the faculty to pursue academic excellence through high quality research and publication.

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

(A) Programme Educational Objectives (PEOs)

The Bachelor of Engineering Programme in Information Science and Engineering [B.E. (IS&E)] during four years term aims to

a) Establish a productive Information Science and Engineering career in industry, government or academia.
b) Engage in professional practice of information, computer and software systems engineering.
c) Promote the development of innovative systems and solutions using hardware and software integration.
d) Be successful in pursuing higher studies in engineering or management.
e) Pursue career paths in teaching or research.
f) Interact with their peers in other disciplines in industry and society and contribute to the economic growth of the country.

(B) Programme Outcomes (POs):

The BACHELOR OF ENGINEERING Programme in Information Science and Engineering [B.E. (IS&E)] must demonstrate that its graduates have

a) An ability to apply the knowledge of mathematics, science and computing appropriate to the Information Science and Engineering.
b) An ability to design and conduct experiments, as well as to analyze and interpret data.
c) An ability to design, implement and evaluate a computer-based system, component or program to meet desired needs.
d) An ability to function effectively on teams to accomplish a common goal.
e) An ability to identify, formulate and solve information and computer science engineering problems and define the computing requirements appropriate to their solutions.
f) An understanding of professional, ethical, legal, security and social issues and responsibilities.
g) An ability to communicate effectively with a range of audiences.
h) An ability to understand the impact of engineering solutions in a global, economic, environmental, and societal context; and to analyze the impact of computing on individuals, organizations, and society.
i) A recognition of the need for, and an ability to engage in life-long learning and continuing professional development.
j) Knowledge of contemporary Information Science and Engineering issues.
k) An ability to use current techniques, skills, and tools necessary for computing and engineering practice.
l) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of information and computer based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
m) An ability to apply design and development principles in the construction of software systems of varying complexity.

These programme outcomes (POs) are achieved through an array of courses. To ensure the achievement of POs, the course learning outcomes (CLOs) are so formulated that they address the POs.

P.E.S.COLLEGE OF ENGINEERING, MANDYA-571401
(An Autonomous Institution Under VTU, Belagavi)
Department of Information Science & Engineering

III Semester B.E. **Scheme of Teaching and Examination 2015- 16**

Sl. No.	Course Code	Course Title	Teaching Dept.	Hours/ Week L:T:P:H	Credits	Examination Marks			Exam Duration in hours
						CIE	SEE	Total Marks	
1.	P15MAT31	Mathematics-III	Maths	3:2:0:5	4	50	50	100	03
2.	P15IS32	Digital Design	IS&E	4:0:0:4	3	50	50	100	03
3.	P15IS33	Data Structures	IS&E	4:0:0:4	4	50	50	100	03
4.	P15IS34	Discrete Mathematical Structures	IS&E	4:0:0:4	4	50	50	100	03
5.	P15IS35	Computer Organization	IS&E	4:0:0:4	4	50	50	100	03
6.	P15IS36	Object Oriented Programming with Java	IS&E	3:0:2:5	4	50	50	100	03
7.	P15ISL37	Data Structures Lab	IS&E	0:1:2:3	1.5	50	50	100	03
8.	P15ISL38	Digital Design Lab	IS&E	0:1:2:3	1.5	50	50	100	03
9	P15HUDIP39	Comprehensive Communication Development (CCD)	HS&M	2:0:0:2	[2]	[50]	[50]	[100]	
10	P15HU39	** Aptitude and Reasoning Development – BEGINNER (ARDB)	HS&M	2:0:0:2	0	(50)	--	--	
11.	P15MADIP31	* Additional Maths-I	Maths	4:0:0:4	0	(50)	---	---	
12.	P15HM3110	* Constitution of India & Professional Ethics	Human& Science	2:0:0:0	0	(50)	---	---	
Total					26[28]	400 [450]	400 [450]	800 [900]	

L**:** Lecture, T: Tutorial, P: Practical, H: CIE: Continuous Internal Evaluation, SEE: Semester End Examination,
* 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 course before completion of VI Semester.

IV Semester B.E. **SCHEME OF TEACHING AND EXAMINATION 2015-16**

Sl.No	Course Code	Course Title	Teaching Dept.	Hours/ Week L:T:P:H	Credits	Examination Marks			Exam Duration in hours
						CIE	SEE	Total Marks	
1.	P15IS41	Mathematics-IV	Maths	3:2:0:5	4	50	50	100	03
2.	P15IS42	Operating System	IS&E	3:0:2:5	4	50	50	100	03
3.	P15IS43	Finite Automata and Formal Language	IS&E	4:0:0:4	4	50	50	100	03
4.	P15IS44	Analysis and Design of Algorithms	IS&E	4:0:0:4	3	50	50	100	03
5.	P15IS45	Graph Theory and Combinatorics	IS&E	4:0:0:4	4	50	50	100	03
6.	P15IS46	Microprocessor	IS&E	4:0:0:4	4	50	50	100	03
7.	P15ISL47	Analysis and Design of Algorithm Lab	IS&E	0:1:2:3	1.5	50	50	100	03
8.	P15ISL48	Microprocessor Lab	IS&E	0:1:2:3	1.5	50	50	100	03
9.	P15HU49	Aptitude and Reasoning Development – INTERMEDIATE (ARDI)	HS&M	2:0:0:2	1	50	50	100	
10.	P15MADIP41	* Additional Maths-II	Maths	4:0:0:4	0	--	--	--	
11.	P15EVDIP49	*Environmental Studies	ENV	2:0:0:2	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.**

Course Title: Engineering Mathematics-III			
Course Code: P15MA31	**Semester:** III	**L – T – P – H :** 3– 2 – 0 – 5	**Credits:** 04
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.		**Weightage:** CIE: 50 %;	SEE: 50%

Prerequisites: The student should have acquired the knowledge of Engineering Mathematics-I & II of I and II semester B.E.

Course Learning Objectives (CLOs):

The course P15MA31 aims to:

1. Describe the concepts of elementary numerical analysis such as forward/backward finite differences, central differences, interpolation and extrapolation formulae, techniques of numerical differentiation and integration.
2. Explain the nature of periodic functions Fourier series of general as well as even /odd functions valid in full range/half-range periods along with applications through practical harmonic analysis.
3. 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 of one-dimensional wave, heat and Laplace equations with given initial and boundary conditions in the context of various engineering and technological applications.

Relevance of the course:

Engineering Mathematics-III deals with the Numerical methods to solve interpolation and extrapolation problems in engineering field.

In Fourier series analyze engineering problems arising in control theory and fluid flow phenomena using harmonic analysis

Analyze the engineering problems arising in signals and systems, digital signal processing using Fourier transform techniques.

Z-transforms & Z-transforms of standard functions to solve the specific problems by using properties of Z-transforms.

Identify and solve difference equations arising in engineering applications using inverse Z–transforms techniques

Partial Differential Equations (PDE's), order, degree and formation of PDE's and, to solve PDE's by various methods of solution.

One – dimensional wave and heat equation and Laplace's equation and physical significance of their solutions to the problems selected from engineering field

B. Course Content

UNIT-I

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.

Central differences: Gauss Forward and Backward difference formulae, Stirling's, and Bessel's formulae (All formulae without proof) – Illustrative problems. **10 Hrs**

UNIT-II

Numerical differentiation using Newton's forward and backward interpolation formulae, Newton's divided difference formula and Stirling'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 $(1/3)^{rd}$ rule, Simpson's $(3/8)^{th}$ rule, Boole's rule and Weddle's rule (All rules without proof)-Illustrative problems. **10 Hrs**

UNIT-III

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. **11 Hrs**

UNIT-IV

Fourier Transforms: Infinite Fourier transforms-properties. Fourier sine and Fourier cosine transforms, properties. Inverse infinite Fourier and inverse Fourier sine & cosine transforms – problems. Convolution theorem, Parseval's identities for Fourier transforms (statements only).

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

10 Hrs

UNIT-V

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. **11 Hrs**

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

References:
1. Advanced Modern Engineering Mathematics:- Glyn James, Pearson Education Ltd., 3rd Ed., 2007.

2. Peter V O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole ,5th edition, 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 modelling 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.

Engineering Mathematics-III(P15MA31)

Time - 3Hrs Max. Marks- 100

Note: Answer any FIVE full questions choosing at least one full question from each unit

Model Question Paper	Marks	CO's	Levels
UNIT- I			
1. a) Find the missing values in the following data:	6	1	L1
b) The table gives the distances in nautical miles of the visible horizon for the given heights (in feet) above the earth's surface:	7	1	L2
Find the values of y when $x = 410\ ft$.			
c) Given $u_{20} = 24.37, u_{22} = 49.28, u_{29} = 162.86$ and $u_{32} = 240.5$, find u_{28} by Newton`s divided difference formula.	7	1	L2
2. a) Use Lagrange interpolation to fit a polynomial to the following data. Hence find f (1.5) and f(5).	6	1	L2
b) Using Gauss backward difference formula, find y(8) from the following table:	7	1	L2
c) Using sterlings formula find y_{35} given $y_{20} = 512,\ y_{30} = 439,\ y_{40} = 346,\ y_{50} = 243$	7	1	L3

x	0	1	2	3	4	5	6
y	5	11	22	4	__	140	__

x = height	100	150	200	250	300	350	400
y = distance	10.63	13.03	15.04	16.81	18.42	19.9	21.27

x	0	1	3	4
y	-12	0	6	12

X:	0	5	10	15	20	25
Y:	7	11	14	18	24	32

UNIT- II

3 a).Given the data					
3 a) Given the data	6	2	L3		

x	-2	-1	0	1	2	3
y	0	0	6	24	60	120

Compute $y''(2)$ and $y''(4)$

b) Find the $f''(6)$ from the following data — 7 | 2 | L3

X: 0	2	3	4	7	8
Y: 4	26	58	112	466	922

using Newton's divided difference formula

c) The table below reveals the velocity v of a body during the specific time t , Find the acceleration at t=1.1 — 7 | 2 | L3

t: 1.0	1.1	1.2	1.3	1.4
v:43.1	47.7	52.1	56.4	60.8

4 a) Find the approximate value of $\int_0^{\pi/2} \sqrt{\cos\theta}\, d\theta$ by Simpson's $1/3^{rd}$ rule by dividing $[0,\ \pi/2]$ into 6 equal parts. — 6 | 2 | L2

b) Use Boole's formula to compute $\int_0^{\pi/2} e^{\sin x}\, dx$ — 7 | 2 | L2

c) Evaluate $\int_0^1 \frac{x\,dx}{1+x^2}$ by Weddle's rule taking seven ordinates and hence find $\log_e 2$. — 7 | 2 | L2

UNIT- III

5. (a) If f(x)= x(2π – x) in 0≤ x ≤ 2π, obtain the Fourier series of f(x)	6	3	L2
(b) Find a Fourier series in $[-\pi,\pi]$ to represent $f(x) = x - x^2$.	7	3	L2

Hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\cdots=\frac{\pi^2}{12}$.			
(c) Draw the graph of the function $f(x)=\begin{cases}\pi x, & 0\le x\le 1\\ \pi(2-x), & 1\le x\le 2\end{cases}$ and Express f(x) as a Fourier series	7	3	L3
6 (a) Obtain the complex Fourier series of $f(x)=\begin{cases}0, & 0<x<l\\ a, & l<x<2l\end{cases}$ over $[0, 2l]$.	6	3	L2
(b) Find the cosine half range series for $f(x)=x(l-x);\ 0\le x\le l$	7	3	L3
(c) Express y as a Fourier series up to the third harmonic given the following data:			

x	0	π/3	2π/3	π	4π/3	5π/3	2π
y	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

UNIT- IV			
7. (a) Find the Fourier transform of $f(x)=\begin{cases}1-x^2, & \lvert x\rvert<\alpha\\ 0, & \lvert x\rvert\ge\alpha\end{cases}$ and hence find the value of $\int_0^\infty \frac{x\cos x-\sin x}{x^3}dx$	6	4	L2
(b) Find the Fourier sine transform of $f(x)=e^{-\lvert x\rvert}$ and hence evaluate $\int_0^\infty \frac{x\sin mx}{1+x^2}dx, m>0$.	7	4	L2
(c) Solve the integral equation $\int_0^\infty f(x)\cos\alpha x\,dx=e^{-a\alpha}$.	7	4	L3
8. (a) Obtain the Z-transform of $\cos n\theta$ and $\sin n\theta$.	6	4	L1
(b) Compute the inverse Z-transform of $\frac{3z^2+2z}{(5z-1)\ (5z+2)}$	7	4	L2
(c) Solve by using Z-transforms: $y_{n+2}+2y_{n+1}+y_n=n$ with $y_0=0=y_1$.	7	4	L3

UNIT- V			
9 (a). Form the partial differential equations by elimination of arbitrary function in $f(x^2+2yz, y^2+2xz\ )=0$.	6	5	L1
(b). Solve by the method of separation of variables $4\frac{\partial u}{\partial x}+\frac{\partial u}{\partial y}=3u$ given that $u(0,y)=2e^{5y}$.	7	5	L3
(c). Solve: $(mz-ny)p+(nx-lz)q=(ly-mx)$.	7	4	L2
10 (a) Find the various possible solutions of the one dimensional heat equation $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables	10	5	L3
(b) Solve the wave equation $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(0,t)=0,\ u(l,t)=0$ for $t\geq 0$ and $u(x,0)=0,\ \frac{\partial u}{\partial t}(x,0)=x(l-x),\ 0\leq x\leq l.$	10	5	L3

Course title: Digital Design			
Course Code: P15IS32	**Semester:** III	**L-T-P-H** : 4-0-0-4	**Credit:**3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage: CIE:**50%, SEE: 50%	

Prerequisites: Computer Concepts and C Programming

Course Learning Objectives (CLOs)

This course aims to

1. Explain how digital circuit of large complexity can be built in a methodological way, starting from Boolean logic and applying a set of rigorous techniques – L2, L3.
2. Discuss Arithmetic Circuits and Data processing Circuits – L2.
3. Design different units that are elements of typical computer's CPU using VHDL – L3.
4. Discuss flip-flops, latches and registers – L2.
5. Analyse and design Asynchronous and Synchronous Sequential circuits – L3.

Relevance of the Course: This course is one of the foundation courses in Information Science and Engineering program, which helps students to understand the importance of logic design and the basic building blocks used in digital systems, in particular digital computers. It starts with a discussion of combinational logic: logic gates, minimization techniques, arithmetic circuits, and modern logic devices such as field programmable logic gates. The rest part of the course deals with sequential circuits: flip-flops, synthesis of sequential circuits, and case studies, including counters, registers, and random access memories.

Course Content

Unit – I

Boolean Algebra and Combinational Networks & Simplification of Boolean Expressions:

Definition of a Boolean Algebra-Boolean Theorems and Functions-Canonical Formulas-Manipulations of Boolean Formulas-Gates and Combinational Networks-Incomplete Boolean Functions and Don't Care Conditions-Additional Boolean operations and Gates Formulation of the simplification problem. Prime Implicants and Irredundant Disjunctive Expressions-Prime Implicates and Irredundant Conjunctive Expressions and 2, 3 and 4 variable K-Map and The Quine-Mccluskey Method-To find Prime Implicants using decimal method and binary method upto 5 variables. **10 Hrs**

Unit – II

Arithmetic Circuits and Data processing Circuits:

Binary Adders and Subtracters, Decimal Adders, Code converter full Adder and Full Subtractor. Magnitude Comparators, Multiplexers and Demultiplexers, Decoders, Parity generator and checkers, Encoders. **10 Hrs**

Unit – III

Memory and Programmable logic, DAC Converters, VHDL Language:

Programmable Logic Devices- RAM, ROM, PROMs, PLA's, PAL. D/A Conversion and A/D Conversion: Variable, Resistor Networks, Binary Ladders, D/A Converters, D/A Accuracy and Resolution, VHDL – Introduction to VHDL, describing data flow, behavioural, structural and mixed design style, Simulating design for arithmetic and combinational circuits.

11 Hrs

Unit – IV

Flip-Flops and Registers:

Clock Waveform – Characteristics of ideal Clock Waveforms, synchronous operation, propagational delay time. The Basic Bistable Element-Latches-Timing Considerations-JK Master –Slave Flip-Flops, Pulse-Triggered Flip flops, Edge-Triggered Flip-Flops-Characteristic Equations. Conversions of Flip Flop. Types of Registers, Serial In – Serial Out, Serial In – Parallel out, Parallel In – Serial Out, Parallel In – Parallel Out using JK or D Flip Flops. Applications of Shift Registers. Ring counter, Johnson counter, sequence detector and sequence generator. **11 Hrs**

Unit – V

Asynchronous and Synchronous Counter:

Asynchronous counter – Up, Down, Up and Down Counter, Design of Synchronous up counter and down counter, decade counter. Counter design as a synthesis problem.

Design of Synchronous and Asynchronous Sequential Circuits:

Design of Synchronous Sequential Circuits- Model Selection, State Transition Diagram, State Synthesis Table, Design Equations and Circuit Diagram, State Reduction Technique. Analysis of Asynchronous Sequential Circuit, Problems with Asynchronous Sequential Circuits, Design of Asynchronous Sequential Circuit. VHDL code for counters. **10 Hrs**

Text Book:

1. "Digital Principles & Design", Donald D Givone, 4th Reprint, Tata McGraw Hill.
2. "Digital Principles and Applications", Donald P Leach, Albert Paul Malvino and Goutham Saha, TMH, 7th Edition.

Reference Books:

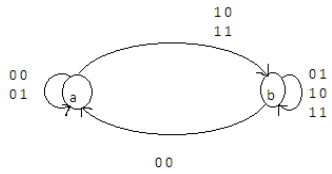
1. "Fundamentals of Digital Logic Design with VHDL", Stephen Brown, Zvonko Vranesic, 2nd Edition, Tata McGraw Hill.
2. "Digital Systems Principles and Applications", Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss, 10th Edition, Pearson Education.
3. "Digital Logic and Computer Design", M Morris Mano.

Course Outcomes

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

1. Apply the principles of Boolean algebra/K - Map to manipulate and minimize logic expressions/functions. – L3
2. Analyse and design Arithmetic Circuits and Data processing Circuits. – L4, L5
3. Design different units that are elements of typical computer's CPU using VHDL. – L5
4. Design logic circuits using flip-flops/latches/registers. – L5
5. Analyse and design Asynchronous and Synchronous Sequential circuits. – L4, L5

		Model Question Paper	Marks	CO's	Levels
		UNIT - I			
1	a.	Simplify the given Boolean function by using k-map method and express it in SOP form Realize logic circuit by using NAND gate only f(A,B,C,D)=∑(M(7,9,10,11,12,13,14,15))	**10**	CO 1	L3
	b.	Find prime implications for the Boolean expression by using Quine - mccluskey method f(A,B,C,D,)= ∑(1,3,6,7,9,10,12,14,15)+d(11,13)	**10**	CO 1	L3
2	a.	Define logical gate. List out the universal gates and implement NAND gate using only NOR gate.	**8**	CO 1	L1, L3
	b.	A two input NAND gate has Vcc = +5 V and 1 kΩ load connected to its output. Calculate the output voltage. i) When both inputs are LOW ii) When both inputs are HIGH	**8**	CO 1	L3
	c.	What are universal gates? Implement the following function using universal gates only $\overline{((A+B)C)D}$	**4**	CO 1	L1, L3
		UNIT - II			
3	a.	Define decoder. Draw logic diagram of 3:8 decoder with enable input.	**10**	CO 2	L1, L2
	b.	With a neat diagram explain the decimal to BCD encoder.	**10**	CO 2	L2
4	a.	Write the behavioural code for 2:1 multiplexer using case statement.	**8**	CO 2	L2
	b.	Draw a block diagram 4 bit adder -subtract circuit using full adder and give a brief description.	**8**	CO 2	L2
	c.	Write a HDL code for a full adder.	**4**	CO 2	L3
		UNIT – III			
5	a.	Implement the following Boolean function using an appropriate PLA F1(A,B,C)=∑m(0,4,7);F2(A,B,C)=∑m(4,6)	**10**	CO 3	L3
	b.	What is binary ladder? Explain the binary ladder with a digital input of 1000.	**10**	CO 3	L1, L2
6	a.	Explain a 2-bit simultaneous A/D convertor.	**12**	CO 3	L2
	b.	Explain 4-bit D/A converter using R/2R resistors and explain its working.	**8**	CO 3	L2
		UNIT - IV			
7	a.	Design synchronous MOD-5 up counter using JK flip-flop. Give excitation table of JK flip-flop, state diagram and state table.	**8**	CO 4	L5, L2
	b.	Explain behavioural model of a D flip-flop with reset input by giving behavioural code.	**6**	CO 4	L2
	c.	Define Register. List out the applicator of shift register.	**6**	CO 4	L1
8	a.	What is clock cycle time? Calculate the same for a system that user a 100 kHz clock.	**8**	CO 4	L1, L3
	b.	Explain behavioural model of D flip-flop with reset input by giving behavioural code.	**6**	CO 4	L2
	c.	Explain 4-bit shift register of serial with timing diagram.	**6**	CO 4	L2
		UNIT - V			
9	a.	Design an asynchronous sequential logic circuit for state transaction diagram shown in Fig.	**10**	CO 5	L5

				
b.	Explain the following asynchronous counter : i) up counter ii) Down counter	**10**	CO 5	L2
10 a.	Design a synchronous counter for 4->6->7->3->1->4....Avoid lockout conduction.	**10**	CO 5	L5
b.	Explain Moore model with state synthesis table and also obtain the circuit diagram for Moore model.	**10**	CO 5	L2
	*** * * ***			

Course title: Data structures			
Course Code: P15IS33	**Semester**: III	**L-T-P-H :** 4-0-0-4	**Credit:**4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisite: Computer Concepts and C Programming

Course Learning Objectives (CLOs)

This course aims to

1. Analyze the need for data structuring techniques, and Design and Implement standard data structures like stack using recurssion.-L4
2. Learn the different types of linked list and Design and implement operations on SLL, DLL, Circular SLL and Circular DLL using header nodes.-L6
3. Learn the Basic operations on - Linear queue, Circular queue, Priority Queue and Double ended Queue and Design and Implement different types of queues Using SLL.-L6
4. Identify the different tree traversal techniques and Design and implement different tree traversal techniques using iteration and recursion. -L6
5. Learn the different sorting and searching techniques and Analyze the performance of the different sorting and searching techniques. -L4

Relevance of the Course: This course is one of the foundation courses in Information Science and Engineering program, which helps the student to understand the importance of Data Structures and its applications usage in problem solving in Information Science and Engineering .

Data structure is one of the way of organizing and storing the data in different formats such as Stack, Queue, Linked list and Trees. Every Data structure has its advantages and disadvantages .This Course is helps the student to understand which data structure is best suited for problem need to be solved in Information Science and Engineering.

Course Content

Unit – I

Introduction to data structures-Definition, Abstract Data Types-ADT for rational numbers, ADT for varying length Character String, Classification of Data Structures.

Stacks: Representing stack in C- Implementation of Push, Pop and display operations using arrays and pointers. Example 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 Hrs**

Unit – II

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. 1**0 Hrs**

Unit – III

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 Hrs**

Unit – IV

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 Hrs

Unit – V

Sorting Techniques: Insertion sort, Quick sort, Binary tree sort, Heap sort, Merge sort. **Searching Techniques:** sentinel search, probability search, ordered list search **10 Hrs**

Text Book:

1. "Data Structures using C and C++ ", Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum , 2nd Edition , PHI.
2. "Data Structures – A pseudo code Approach with C ", Richard F Gilberg and Behrouz A forouzan, 2nd Edition .

Reference Books:

1. "Fundamentals of Data Structures in C ", Horowitz, Sahani, Anderson-Freed , Second Edition, University Press .

Course Outcomes

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

1. Understand primitive and derived data structure and Understand Abstract data types, Stacks and recursion. -L2
2. Develop and implement linked list.-L6
3. Develop programs to implement different queues.-L6
4. Understand and create trees.-L2
5. Design an algorithm to Sorting Techniques and Searching techniques.-L6

	Model Question Paper	Marks	CO's	Levels
	Unit- I			
1. a.	Write the algorithm to evaluate a valid postfix expression and hence evaluate the postfix expression : 6 2 3 + – 3 8 2 / + × All the operands are single digit positive integers and operators are binary in nature.	8	CO1	L3
b.	Define stack. Briefly explain the primitive operations on the stack.	6	CO1	L1
c.	Differentiate b/w iterations and recursive functions.	6	CO1	L4
2 a.	Write a recursive function fact(n) to find the factorial of an integer. Diagrammatically explain, how the stacking and unstacking takes place during execution for fact(4)	10	CO1	L3
b.	Show using the tabular columns, how the expression (A+B)*C is converted into a postfix expression according to the infix to postfix conversion algorithm.	10	CO1	L1
	UNIT-II			
3 a.	List out applications of Linked list and advantages of doubly linked list over singly linked list	6	CO2	L1
b.	Write a c Program to simulate an ordinary queue using singly linked list.	8	CO2	L3
c	Give an alogorithm to insert a node at a specified position for a given singly linked list.	6	CO2	L3
4 a.	Write a C program to perform the following operations on a doubly linked list (I) To create the list by inserting a node at the front end. (ii) To display all the elements in the reverse order.	10	CO2	L6
b.	Write a C program to create a singly linked list and interchange the elements to the list at position m and n and display the list before and after interchanging the elements.	10	CO2	L3
	UNIT-III			
5 a.	What is the advantage of circular queue over ordinary queue? Mention any 2 applications of queues. Write an algorithm for static implementation of circular queue.	10	CO3	L1,L3
b.	Explain the working principle of a ordinary Queue.	10	CO3	L2
6a.	Write a C program to implement Priority Queue. Explain the application of priority queues.	10	CO3	L3,L2
b.	What is Double ended Queue. Write a program to implement Input restricted Dqueue.	10	CO3	L1,L3
	UNIT-IV			
7 a.	Define the following Terms (I) Binary tree (ii) complete Binary Tree (iii) Almost complete Binary Tree (iv) Strictly Binary Tree (v) Binary Search Tree (vi) Height of the tree	6	CO4	L1

b	Write a program to create a Binary Search Tree and also delete a node from the Binary Search Tree(BST).	14	CO4	L3
8a1.	Construct a evaluation tree for the following postfix expression and evaluate the expression. 6 2 3 + – 3 8 2 / + ×	10	CO4	L3
b	List and explain the applications of binary trees.	10	CO4	L1
	UNIT-V			
9 a.	Write a algorithm to Sort given set of numbers using Quick sort. Trace the same for the following set of values 42 ,37 , 11 , 98, 36 ,72 ,65 ,10 ,88 ,78	10	CO5	L3
9 b.	Write an algorithm to Sort given set of numbers using simple merge sort.	10	CO5	L3
10 a.	Write an algorithm to search an element using Sentinel Search. Trace the algorithm by taking appropriate example.	10	CO5	L3
b.	Write an algorithm to search an element using Probability Search. Trace the algorithm by taking appropriate example.	10	CO5	L3

Course title: Discrete Mathematical Structures			
Course Code: P15IS34	**Semester**: III	**L-T-P-H** : 4-0-0-4	**Credit:**4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites:

Course Learning Objectives (CLOs)

This course aims to

1. Analyze and Solve problems using simple techniques of counting theory and set theory.-L1, L2
2. Learn and identify the fundamentals of logic and use of Quantifiers. –L1, L2, L3
3. Understand the importance of induction principle and pigeonhole principle in proving statements-.L2, L3, L4
4. Learn and understand the basic concepts relations and functions, and their representations.-L1, L2, L3
5. Learn the concepts of group theory and learn and apply coding theory concepts to code and decode a message.-L1, L5

Relevance of the Course: This course is to develop the mathematical ability of the student in the application areas such as set theory, counting theory, logic theory, coding theory, data structures, theory of computer languages and the analysis of algorithms. The student gets introduced to applications in engineering, physical and life sciences, statistics and social sciences. The student will be exposed to the idea that generates applications of mathematical expressions to the real time problems and develop ability to think in that direction.

Course contents

Unit-I

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. **10Hrs**

Unit-II

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 Hrs**

Unit-III

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 theSecond Kind, The Pigeon-hole Principle, Function Composition and Inverse Functions. Special functions-characteristic function, Permutation function, Hashing function. **10 Hrs**

Unit-IV

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. Extremal elements, Lattices. **12 Hrs**

Unit-V

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 Hrs**

Text Books :

1. Discrete and Combinatorial Mathematics, RalphP. Grimaldi &B.V. Ramana, 5th Edition, PHI/Pearson education. Chapter 8, 9, 10, 11, 12.
2. "Discrete Mathematical structures", Dr D. S. Chandrashekariah, Prism.

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.
3. "Discrete Mathematical structures", Kolman Busby Ross , 5th edition , PHI.

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.-L5
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

	Model Question Paper	Marks	CO's	Levels
	Unit-I			
1.a	Find the number of license plates created which contains two English alphabets followed by four digits i) with repetition ii) without repetition.	6	Co1	L2
b.	How many arrangements are there of all the letters in SOCIOLOGICAL such that (i) letters A and G are adjacent? (ii) are all the Vowels adjacent?	7	CO1	L2
c.	i) Determine the coefficient of $x^2y\,z^2$ in the expansion $(2x+y+3z)^{5.}$ ii) Find the number of positive integer solutions of the equation $x_1+x_2+x_3+x_4+x_5 = 32$ each is greater than or equal to zero.	6	CO1	L2
2.a	Define power set, subset, super set of A. For any three sets A, B, C Verify (A - C) - (B - C) = A- (B U C) = (A - B) – C	6	CO1	L2
b.	In a class of 31 students, a test of three questions was given and every student answered atleast one question, 6 students did not answer the first question, 7 failed to answer the second question and 8 did not answer the third question and 8 students answered all questions answered . Find the number of students who answered (i) exactly one question? (ii) atleast one question?	7	CO1	L3
c.	(i)If two integers are selected at random and without replacement from {1,2,…,99,100} .what is the probability that their sum is even. (ii) If a fair coin is tossed tour times what is the probability that two heads and two tails occur	7	CO1	L2
	UNIT - II			
3.a	Define tautology Is $(p \vee q) \rightarrow (p \rightarrow (p \wedge q))$ a tautology?(Justify your answer) using truth table and without using truth table.	6	CO2	L1,L 2
b.	Define logical equivalence and using laws verify $(\neg p \vee q) \wedge (p \wedge (p \wedge q)) \equiv (p \wedge q)$	6	CO2	L2
c.	Express symbolically and check the validity. It is not sunny this afternoon and is colder than yesterday. We will go for swimming if and only if it is sunny. If we do not go for swimming then we will take a trip. If we take a trip then we will be home by sunset. Therefore we will be home by sunset.	8	CO2	L3
4.a	Write the statements in the symbolic form with a specific universe for each (i) All students have greater than 80% attendance. (ii) Some students have enrolled in sports (iii) Some integers are divisible by 5 and are even	6	CO2	L2
b.	Define Rule of universal specification and generalization.	4	CO2	L2
c.	Expressing symbolically check the validity " No junior or senior has enrolled in sports. Raju has enrolled in sports. Therefore , Raju is not a senior."	6	CO2	L3
d.	Prove or disprove directly "The sum of any five consecutive integers is always divisible by 5"	4	CO2	L2
	Unit III			
5.a.	State mathematical Induction principle and Prove that $1.3+2.4+\ldots\ldots+n(n+2)= n(n+1)(2n+7) / 6$ for all integers $n \geq 1$.	6	CO3	L2

b.	(i) Write the given sequence in explicit form $a_1=8$, and $a_n=a_{n-1}+n$ for $n \geq 2$ (ii)Express the sequence recursively $a_n=3n+2$ for all $n \geq 1$	7	CO3	L2
c.	Define one-one fuctions, onto functions and find the number of one-one and onto functions from a set of m elements to a set of n elements.	7	CO3	L1, L2
6.a.	Prove that any subset of size 6 from the set S={1,2,3,…,9}must contain two elements whose sum is 10.	6	CO3	L2
b.	Let f and g be two functions from R to R defined by f(x)=2x+1 and g(x) = x/3 , Find i) fog and gof (ii) $(gof)^{-1}$ and $f^{-1}o\ g^{-1}$	7	CO3	L2
c.	Define permutation function, Hashing function, characteristic function.	7	CO3	L1
	UNIT- IV			
7.a	Define an equivalence relation i)P.T. if R is a relation defined as "x+y =even" on Z ii) find the partition induced by R on A={1,3,5,6,8}.	8	CO4	L2
b	Define partially ordered set and draw the Hasse diagram of all positive divisors of 36.	8	CO4	L2
c	Write the relation matrix for the relations defined as(i) " x + y > 2 x" for the set given A={2,3,4,6,7}	4	CO4	L2
8.a.	Define least element, greatest element, minimal , maximal element of a relation R on A.	6	CO4	L1
b.	Draw four graphs that represent a lattice with valid reason	7	CO4	L2
c.	Define Supremum and infimum of a subset B of A where (A,R) is a poset.	7	CO4	L1
	UNIT - V			
9a	Define a group, Isomorphism between two groups.	6	CO5	L1
b	State and prove Lagrange's theorm	7	CO5	L1, L2
c	Prove that identity element and inverse of every element is unique in a group G	7	CO5	L2
10.a.	An encoding function $E:Z_2^2 \rightarrow Z_2^5$ is given by the generator matrix $G=\begin{bmatrix}1 & 0 & 1 & 1 & 0\\ 0 & 1 & 0 & 1 & 1\end{bmatrix}$ i) Determine all code words. What can be said about the error detection capability of this code? ii)'What about its error correction capability? iii) Find the associated parity check matrix H.	10	CO5	L3
b.	Write short notes on i)Encoding and Decoding of a message ii)Hamming metric iii)Generator matrix.	10	CO5	L2

Course title: Computer Organization			
Course Code: P15IS35	**Semester:** III	**L-T-P-H:** 4-0-0-4	**Credit:**4
Contact Period: Lecture: Lecture:52Hr, Exam: 3 Hr		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: Digital Design and Computer Concepts and C Programming

Course Learning Objectives (CLOs)

This course aims to

1. Understand the basic structure of a computer and execution of instructions.- L2
2. Understand the various approaches to I/O transfer.-L2
3. Design the memory system using various technologies.-L5
4. Analyse different algorithms for performing arithmetic operations.-L4
5. Explain the concept of bus organization, pipelining and multiprocessors.-L2

Relevance of the Course: This course provides detail of computer system's functional components, their characteristics, performance and interactions including system bus, different types of memory and input/output organization and CPU. This course also covers the architectural issues such as instruction set program and data types. The students are also introduced to the increasingly important area of parallel organization. This course also serves as a basic to develop hardware related projects.

Course Content

Unit-1

Basic structure of computers: Computer types, Functional units, Basic operational concepts, Bus structures, Performance.

Machine instructions & programs: Numbers, arithmetic operations & characters, Memory location & addresses, Memory operations, Instructions & instruction sequencing; Addressing modes, Assembly language, Basic input/output operations, Stacks & queues, Subroutines, Additional instructions, Encoding of machine instructions.**11Hrs**

Unit-II

Input/output Organization: Accessing I/O devices, Interrupts-Interrupt hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct memory access, Buses, Interface circuits, Standard I/O Interfaces. **10Hrs**

Unit-III

Memory system: Basic concepts, Semiconductor RAM memories, Read-Only memories, Cache memories-Mapping Functions, Replacement Algorithms, Performance considerations, Introduction to Virtual memory. **10 Hrs**

Unit-IV

Arithmetic: Addition & subtraction of signed numbers, Design of fast adders; Multiplication of positive numbers, Signed-operand multiplication, Fast multiplication, Integer division, Floating point numbers and operations. **10 Hrs**

Unit-V

Basic processing unit: Some fundamental concepts, Execution of a complete instruction, Multiple bus organization, Hardwired control; Micro programmed control, Basic concepts of pipelining, The structure of general purpose multiprocessors, memory organization in multiprocessors. **11 Hrs**

Text Book:

1. "Computer Organization", Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5th Edition, TMH, 2011.

Reference Books:

1. "Computer Organization & Architecture", William Stallings, 7th Edition, PHI, 2009.
2. "Computer Systems Design and Architecture", Vincent P. Heuring & Harry F. Jordan, 2nd Edition, Pearson Education, 2004.

Course Outcomes:

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

1. Understand and analyze the machine instructions and program execution.-L2, L4
2. Explain the I/O organization. -L2
3. Explain the organizational details of memory design.-L2
4. Apply the algorithms used for performing various arithmetic operations.-L3
5. Understand the execution of instruction with different bus architecture; the operation of pipelining and multiprocessor. –L2

	Model question paper	Marks	CO's	Levels
	Unit 1			
1.a	With the help of a block diagram, explain how the processor and memory are interconnected.	10	CO1	L2
b.	Define arithmetic overflow. Perform the following operation and check whether the overflow occurs or not. i) 5 + 6 ii) -7 -(-3)	05	CO1	L1,L3
c.	Write a program to evaluate the expression Z=A+B*C+D using two-address and three-address instruction format.	05	CO1	L3
2.a	Define addressing modes. Explain any four of them with example.	10	CO1	L1,L2
b.	Explain how the parameters are passed to a subroutine? Write a program to add a list of 'n' numbers stored in memory, which calls a subroutine namely, LISTSUM and trace the program.	10	CO1	L2,L4
	Unit 2			
3.a	What is an interrupt? Explain vector interrupts and interrupt nesting.	10	CO2	L1,L2
b.	Define DMA. Explain registers in a DMA interface.	04	CO2	L1
c.	Explain the distributed arbitration, with a neat diagram.	06	CO2	L2
4.a	Draw and explain the block diagram of a serial port interface.	10	CO2	L2
b.	What is synchronous bus? Explain the timing of an input transfer on a synchronous bus with a timing diagram.	10	CO2	L2,L3
	Unit 3			
5.a	With the help of diagram, explain the internal organization of bit calls in a memory chip.	06	CO3	L2
b.	Explain a static RAM cell.	04	CO3	L2
c.	Explain synchronous DRAM, with a diagram.	10	CO3	L2
6.a	What is cache? Explain any two cache mapping functions	10	CO3	L3
b.	Explain a simple method of translating virtual address of a program into physical address, with the help of a diagram	10	CO3	L2
	Unit 4			
7.a	Design and explain 5-bit ripple carry adder.	06	CO4	L6
b.	Perform 13x11 using sequential technique.	04	CO4	L3
c.	Perform -20 x -20 using booth's algorithm and bit pair recording algorithm.	10	CO4	L3
8.a	With the help of block diagram, explain the 4-bit carry-lookahead adder.	10	CO4	L2
b.	Draw circuit diagram for binary division. Explain the restoring and non restoring division algorithm with suitable examples.	10	CO4	L4
	Unit 5			
9.a	Explain various units used in single bus organization of the data path inside a processor with a neat diagram.	12	CO5	L2
10.a	Explain the basic idea of instruction pipelining.	10	CO5	L2
b.	In detail, explain hardwired control.	10	CO5	L2

Course Title: Object Oriented Programming and Java			
Course Code: P15IS36	**Semester** : III	**L- T- P-H** : 3-0-2-5	**Credits:**4
Contact period : 52 Hrs, Exam: 3 Hrs	**Weightage:** CIE: 50%; SEE: 50%		

Prerequisites: Computer Concepts and C Programming

Course learning objectives(CLOs)

This course aims to

1. Explain the need of using Object Oriented Programming in the real world applications and write C++ programs using classes and objects – L2, L3.
2. Write C++ programs for automatic initialization of objects and destroy objects that are no longer required and discuss the mechanism of deriving new class from older classes through inheritance – L2, L3.
3. Develop methods to select appropriate member functions during run time and write C++ programs by overloading the given operators – L3.
4. Write C++ programs to demonstrate the use of stream handling, templates and exception handling – L3.
5. Ability to implement features of Java programming to solve real world problems. – L3.

Relevance of the Course:

This course is one of the foundation courses in Information Science and Engineering program, which helps students to understand the importance of Object Oriented Programming.

One of the most important concepts in modern programming is OOP. It is important to learn OOP because you can assign an object of real life a variable in your program, give all the little details about that object and define how you want to deal with them. For example, you might want to define a new way of subtracting/adding on some object of real life.

Course Content

Unit – I

Introduction: A review of structures, Procedure Oriented programming systems, OOPS, Comparison of C++ with C, Console input/ Output in C++, variables in C++, Reference variable in C++, function prototyping, function overloading, Default values for formal arguments of functions, Inline functions.

Class and Objects: Introduction to Classes and Objects, Member functions and Member data, Objects and functions, Objects and arrays, Namespace. **10 Hrs**

Unit – II

Dynamic Memory Management: Introduction, Dynamic Memory Allocation, Dynamic Memory Deallocation.

Constructors and Destructors: Constructors, Destructors

Inheritance: Introduction to Inheritance, Base Class and Derived class Pointers, Function Overriding, Base Class Initialization, The Protected Access Specifier, Deriving by Different Access Specifiers, Different Kinds of Inheritance. **10 Hrs**

Unit – III

Virtual Functions: The Need for Virtual Functions, Virtual Functions, the Mechanism of

Virtual Functions, Pure Virtual Functions, Virtual Destructors and Virtual Constructors.
Operator Overloading: Operator Overloading, Overloading the Various Operators – Overloading the Increment and the Decrement Operators (Prefix and Postfix), Overloading the Unary Minus and the Unary Plus Operator, Overloading the Arithmetic Operators. Overloading the Relational Operators, Overloading the Assignment Operator, Overloading the Insertion and Extraction Operators. **10 Hrs**

Unit – IV

Stream Handling: Streams, The Class Hierarchy of Handling Streams, Opening and Closing Files, Files as Objects of the fstream Class, File Pointer, Random Access to Files
Templates: Introduction, Function Templates, Class Templates
Exception Handling: Introduction, C-Style Handling of Error generating Codes, C++ Style Solution – the try/throw/catch Construct, Limitation of Exception Handling. **10 Hrs**

Unit – V

Introduction to JAVA: Java AS A PROGRAMMING TOOL, Features of Java, Two control statement, using blocks of code, Lexical Issues, The java class Libraries, Data Types, Variables & Arrays: the primitive types, integers, floating-point types, Characters, Booleans, Arrays operators and arithmetic operators, the bitwise operators, relational operators, Boolean logical operators, the assignment operators, operator precedence, using parentheses, control statements: java's selection statements, iteration statements, jump statements
Classes & Inheritance: Class Fundaments, Declaring Objects, Assigning Object Reference Variables, introducing methods, constructors, the finalize() Method, A stack class, overloading methods, using objects as parameters, argument passing, returning objects, recursion, introducing access control, understanding static, introducing final, Arrays revisited, introducing nested & inner classes, exploring the string class, using command-line arguments, Inheritance: using super, creating a multilevel Hierarchy, when constructors are called, method overriding, dynamic method dispatch, using abstract classes, using final with inheritance. **12 Hrs**

Text Book:

1. "Object-Oriented Programming with C++ 2/e", Sourav Sahay, Oxford University Press, 2012.
2. "The Complete Reference JAVA, J2SE", Herbert Schildt, 6th Edition, TMH, 2010.

Reference Books:

1. "C++ Primer", Stanley B. Lippman, Josee Lajoie, Barbara E. Moo, 5th Edition, Addison Wesley, 2012.
2. "The Complete Reference C++", Herbert Schildt , 4th Edition, TMH.
3. "Programming with Java", Balaguruswamy E, 4th Edition, 2010.

Course outcomes

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

1. Use object oriented programming language like C++ and associated libraries to develop object oriented programs – L3.
2. Write C++ programs for automatic initialization of objects and destroy objects that are no longer required and discuss the mechanism of deriving new class from older classes through inheritance – L3, L2.
3. Develop methods to select appropriate member functions during run time and write C++ programs by overloading the given operators – L3.

4. Write C++ programs to demonstrate the use of stream handling/templates/exception handling – L3.
5. Use object oriented programming language like Java and associated libraries to develop object oriented programs – L3.

	Model Question Paper	Marks	CO's	Levels
	UNIT - I			
1 a.	State the important features of object oriented programming. Compare the object oriented system, with procedure oriented system.	**8**	CO 1	L1, L4
b.	What is function overloading? Illustrate function overloading through add function which adds two integers, two float numbers.	**6**	CO 1	L1, L2
c.	Explain the working of inline function, with an example.	**6**	CO 1	L2
2 a.	What are friend non-member functions and friend member functions? Explain with suitable examples.	**8**	CO 1	L1, L2
b.	Explain "this" pointer with an example.	**4**	CO 1	L2
c.	Explain with an example to illustrate the different features of keyword "namespace" and "using".	**8**	CO 1	L2
	UNIT - II			
3 a.	Explain "new" and "delete" operators used in dynamic memory allocation.	**10**	CO 2	L2
b.	What is a constructor? Explain different types of constructors.	**8**	CO 2	L1, L2
c.	What is a destructor?	**2**	CO 2	L1
4 a.	What is inheritance? Explain the different types of inheritance possible in C++.	**10**	CO 2	L1, L2
b.	Write a C++ program to create a class STUDENT with data members USN, name and age. Using inheritance, create class UGSTUDENT having fields semester, fees and stipend. Enter data for at least 5 students and compute the semester wise average age for UG students.	**10**	CO 2	L3
	UNIT – III			
5 a.	What is a Virtual function? Explain with a suitable example.	**10**	CO 3	L1, L2
b.	What is a Pure virtual function? Explain with an example.	**5**	CO 3	L1, L2
c.	Explain Virtual destructor with an example.	**5**	CO 3	L2
6 a.	What is operator overloading? Explain with examples the circumstances under which operator overloading becomes mandatory.	**12**	CO 3	L1, L2
b.	Illustrate the overloading of ++ operator.	**8**	CO 3	L2
	UNIT - IV			
7 a.	Write a short note on I/O stream classes, with hierarchy for C++ stream handling.	**8**	CO 4	L2
b.	Distinguish between text and binary files.	**6**	CO 4	L4
c.	How are opening and closing of files handled in C++?	**6**	CO 4	L2
8 a.	Define a function template giving its syntax. Write a C++ program to implement array representation of a Stack for integers, characters and floating point numbers using class template.	**10**	CO 4	L1, L3
b.	Explain the C++ style solution for handling exceptions with an example.	**10**	CO 4	L2
	UNIT - V			
9 a.	List and explain the characteristics features of Java language.	**10**	CO 5	L1, L2
b.	With example, explain the working of >> and >>>.	**6**	CO 5	L2
c.	List down various operators available in Java language.	**4**	CO 5	L1

10 a.	Differentiate C++ language and Java language with respect to inheritance, and also mention the use of “super” and “this” in Java inheritance.	**10**	CO 5	L4
b.	Explain the following: i) Inner classes ii) overriding and overloading	**10**	CO 5	L2

Course title: Data Structure Lab			
Course Code: P15ISL37	**Semester:** III	**L-T-P-H:** 0 - 0 – 0 -3	**Credit:**1.5
Contact Period: Lecture: 36 Hr, Exam: 3 Hr		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: Computer Concepts and C Programming.

Course Learning Objectives (CLOs)

This course aims to

1. Apply different concepts of data structures to solve real time problems.L3
2. Distinguish between iterative method and recursive method.L4
3. Apply the concept of recursion, stack, queues and Linked list to solve various applications.L3
4. Solve non-linear data structures, such as binary tree.L3
5. Implement different sorting and searching techniques.L6

Course Content

1. Write the C programs using Recursion.
2. Write a C program to implement the stack of integers. The program should print appropriate messages for stack overflow, stack underflow and stack empty.
3. Write a C program to convert and print a given valid parenthesized infix arithmetic expression to postfix expression.
4. Write a C program to evaluate a valid suffix/postfix expression using stack.
5. Write a C program using dynamic variables and pointers, to implement a singly linked list.
6. Write a C program to implement the applications of single linked list.
7. Write a C program to implement Queue of integers using an array.
8. Write a C program to implement circular Queue of integers using an array.
9. Write a C program using dynamic variables and pointers to construct a queue of integers using singly linked list.
10. Write a C program to simulate the working of a Double Ended Queue of integers using an array.
11. Write a C program to design a priority queue.
12. Write a C program to demonstrate the working of binary search tree.
13. Write a C program to sort the given list of N numbers.
14. Write a program to search an element in a given list of N numbers.

Course title: Digital Design Lab			
Course Code: P15ISL38	**Semester:** III	**L-T-P-H:** 0 - 0 – 3 - 3	**Credit:**1.5
Contact Period: Lecture: 36 Hr, Exam: 3 Hr		**Weightage:** CIE:50%, SEE: 50%	

Course Learning Objectives (CLOs)

This course aims to

1. Design and implement different combinational circuits.L6
2. Design and implement different sequential circuits.L6
3. Design and implement D/A converter. L6

Course Content

PART A

1. Design a circuit for Full Adder.
2. Design a circuit for code Conversion.
3. Application of MUX/DEMUX.
4. Application of Decoder.
5. Design of 3 bit Synchronous Counter.
6. Design of Asynchronous Counter.
7. Design of Ring Counter/Johnson Counter.
8. Design of Sequence generator/detector.
9. Digital to analog Converter.

PART B

1. Write the Verilog/VHDL code for a Full Adder. Simulate and verify it's working.
2. Write the Verilog/VHDL code for 8:1 MUX. Simulate and verify its working.
3. Write the Verilog/VHDL code for a 3:8 decoder. Simulate and verify it's working.
4. Write the Verilog/VHDL code for a Flip-Flop with positive-edge triggering. Simulate and verify its working.
5. Write the Verilog/VHDL code for a mod-8 up counter. Simulate and verify it's working.
6. Write the Verilog/VHDL code for a Ring Counter. Simulate and verify it's working.
7. Write the Verilog/VHDL code for a Johnson Counter. Simulate and verify it's working.

Note: In SEE, student has to pick a lot for question that contains subsections from PART A and PART B and has to execute both the subsections compulsorily.

Course Title: Aptitude and Reasoning Development - BEGINNER. (ARDB)			
Course Code : P15HU39	**Semester :** III	**L - T - P :** 0 - 0 - 2	**Credits:** NA
Contact Period: Lecture: 32 Hrs, Exam: 3 Hrs		**Weightage :**CIE:100% - [P/NP]	

Prerequisites: Basics of mathematics.

Course Learning Objectives (CLOs)

This course aims to

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

Course Content

Unit – I

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

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. **8 Hrs**

Unit – II

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. **6 Hrs**

Unit – III

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.

6 hrs

Unit – IV

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. **6 hrs**

Unit – V

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. **6 hrs**

Reference Books:

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

6. Analytical reasoning by M.K Pandey BSC PUBLISHING.CO.PVT.LTD

Course Outcomes

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

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

Course Title : Additional Mathematics-I (A Bridge course for Diploma qualified students of III Sem. B. E.)			
Course Code : P15MADIP31	**Semester :** III	**L :T:P:H :** 2:2:0:4	**Credits:** NA
Contact Period: Lecture: 52 Hrs,		**Weightage: CIE:**100%, [P/NP]	

Course contents

UNIT -I

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.

12Hrs

UNIT -II

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 Hrs**

UNIT -III

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 Hrs**

UNIT-IV

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 Hrs

UNIT-V

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 Hrs**

Text Book:

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

References:

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

Course Title: Indian Constitution, Human Rights and Professional Ethics (A course for Diploma qualified students of III Sem. B. E.)			
Course Code: P15HMDIP310	**Semester :** III	**L-T-P-H:** 2–0-0-0-2	**Credits:** NA
Contact Period : Lecture :26 Hr		**Weightage :** CIE:100% - [P/NP]	

COURSE CONTENT

I. Indian Constitution:

1. Introductory Part - The preamble, Fundamental rights
2. Directive principles of state policy - and fundamental duties
3. The union executive, union legislature and the union judiciary
4. The state executive, state legislature and the high court in the states
5. Special provision for scheduled caste and scheduled tribes
6. Election commission - Functions - Emergency provisions and amendment of the constitution

II. Human rights:

Aims and objectives to create responsible citizenship with awareness of human rights and latest development.

1. Protection of human rights and protection of human rights act - 1993
2. Human right - with related to rights of women, children disabled, tribal's, aged and minorities

III. Professional Ethics:

1. Aims, objects - advantages with national and international, recent development.

IV Semester

Course Title: Engineering Mathematics-IV (Common to E&C, E&E, CS&E and IS&E Branches)		
Course Code: P15MAES41	**Semester: 4**	**L – T – P – H : 3 –2 – 0 – 5**
Contact Period - Lecture: 52Hrs.; Exam: 3Hrs.	**Weightage: CIE: 50%; SEE: 50%**	

Prerequisites: The student should have acquired the knowledge of Engineering Mathematics-I, II and III of I, II and III semester B.E.

Course Learning Objectives (CLOs):

This Course aims to;

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

Relevance of the Course:

Engineering Mathematics-IV deals with solving algebraic, transcendental and ordinary differential equations arising in various engineering flow and design data problems.

In linear algebra deals with vector space, subspace, Rank and nullity, linear Transformation related to engineering problem

Complex Analysis. Here we understand the basics of complex variable, analyticity and potential fields through complex potential and conformal transformations interpret the solution in fluid flow and electromagnetic problems.

The process of complex integration and series representation of functions of complex variables in field theory and other Engineering applications.

In Statistics interpretation and analyzing the data, fitting of curves of best fit for experimental data arising in engineering calculations and analyze the same by expressing in the form of regression lines.

Probability distributions and use them in analyzing and solving engineering problems associated with probability models

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

Understand series solution of ODE's and special functions in engineering fields.

Course Content

UNIT-I

Numerical Methods-II: Solution of algebraic and transcendental equations : Bisection method, Regula-Falsi method, Newton–Raphson method and Fixed point iteration method: Aitken's Δ^2 - process - Illustrative examples only.

Numerical solution of ordinary differential equations (ODE's): Numerical solutions of ODE's of first order and first degree – Introduction. Taylor's series method. Euler's and modified Euler's method. Runge - Kutta method of IV order. Milne's and Adams predictor & corrector methods (All formulae without proof) - Illustrative examples from engineering field. **10Hrs**

UNIT-II

Linear Algebra-II: Introduction to vector spaces – subspaces, linearly independent/dependent sets ; Bases and dimension. Linear transformation - rank and nullity. 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 method**.** Determination of largest eigen value and corresponding eigen vector by power method **10 Hrs**

UNIT-III

Complex Analysis: Introduction to functions of complex variables. Definitions- limit, continuity and differentiability. Analytic functions. Cauchy–Riemann equations in Cartesian and polar forms, properties of analytic functions (No proof). Construction of analytic function : Milne-Thomson method.

Conformal transformation–Definitions. Discussion of transformations:

$w=z^2$, $w=e^z$, $w = z + 1/z \ (z \neq 0)$ and Bilinear transformations.

Complex integration: Complex line integrals. Cauchy's theorem, Cauchy's integral formula. Taylor's and Laurent's series (Statements only).and problems. Singularities, poles and residues. Cauchy's residue theorem (statement only). Simple illustrative examples.**11 Hrs**

UNIT-IV

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. **11 Hrs**

UNIT – V

Joint probability distributions and Markov chains:
Concept of joint probability. Joint probability distributions of discrete random variables. Expectation, covariance, correlation coefficient – simple examples. Probability vectors, stochastic matrices. Fixed point and regular stochastic matrices.

Series solutions of ODE's and special functions: Series solution-Frobenius method. Series solution of Bessel's equation 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. Rodrigue's formula(No Proof)- simple illustrative examples. **10 Hrs**

Text Books:

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

References:

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

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 models

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

Engineering Mathematics-IV(P15MAES41)			
Time- 3Hrs			**Max. Marks- 100**
Note: Answer any FIVE full questions choosing at least one full question from each unit			
Model Question Paper	Marks	CO's	Levels
UNIT- I			
1. a) Using Regula–Falsi method find the approximate root of the equation $x\log_{10}x = 1.2$ (perform three iterations)	6	1	L2
b) Use Newton – Raphson method to find a real root of $x\sin x + \cos x = 0$ near $x = \pi$. Carry out the iterations upto four decimal places of accuracy.	7	1	L2
c) Find the smallest root of the equation $x^2 + 2x - 2 = 0$, using fixed point iteration method and accelerate the convergence by Aitken's Δ^2 – method.	7	1	L2
2. a) From Taylor's series method, find $y(0.1)$ considering upto fourth degree term if $y(x)$ satisfies the equation $\frac{dy}{dx} = x - y^2, y(0) = 1$	6	1	L2
b) Using modified Euler's method find y at $x = 0.2$ given $\frac{dy}{dx} = 3x + \frac{1}{2}y$ with $y(0) = 1$ taking $h = 0.1$. Perform three iterations at each step	7	1	L3
c) Apply Milne's method to compute $y(1.4)$ correct to four decimal places given $\frac{dy}{dx} = x^2 + \frac{y}{2}$ and the data: $y(1) = 2,\quad y(1.1) = 2.2156,\quad y(1.2) = 2.4649,\quad y(1.3) = 2.7514$	7	1	L2

UNIT- II			
1. a) Define (i) vector space and (ii) subspace with suitable examples.	6	2	L2
b) Define basis of a vector space. Is the set $\{(1,1,2),(-3,1,0),(1,-1,1),(1,2,-3)\}$ a basis for the vector space $R^4(R)$?	7	2	L2
c) Define a linear transformation. Find the matrix of linear transformation $T: V_2(R) \to V_3(R)$ defined by $T(x,y) = (x+y,\ x,\ 3x-y)$ with respect to bases $\{(1,0),(0,1)\}$ and $\{(1,1,0),(1,0,1),(0,1,1)\}$	7	2	L3
2. a) Solve the system of the equations $x + y + 54z = 110,\quad 27x + 6y - z = 85,\quad 6x + 15y + 2z = 72$ by Gauss –Seidel method to obtain the numerical solution correct to three places of decimals.	6	2	L2
b) Solve the system equations $2x_1 + 8x_2 - x_3 = 24; 12x_1 + x_2 + x_3 = 31;$ $3x_1 + 4x_2 + 10x_3 = 58$ by relaxation method?	7	2	L2
c) Find the dominant eigen value and the corresponding eigen vector of A= $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ by Power method taking the initial eigen vector a $[1,1,1]^T$	7	2	L2

UNIT- III

5 a) If $\phi + i\psi$ represents the complex potential of an electrostatic field where $\psi = (x^2 - y^2) + \frac{x}{x^2 + y^2}$, find ϕ and also the complex potential as a function of the complex variable z.	6	3	L2
b) Discuss the transformation $w = z + 1/z$, $z \neq 0$.	7	3	L3
c) Find the bilinear transformation which maps the points $z = \infty, i, 0$ into $w = -1, -i, 1$. Also find the invariant points of the transformation.			
6 a) Evaluate $\int_0^{2+i} (\bar{z})^2 dz$ along (i) the line $x = 2y$ (ii) the real axis up to 2 and then vertically to $2+i$.	7 6	3 3	L3 L2
b) Expand $f(z) = \frac{z+1}{(z+2)(z+3)}$ as Laurent's series in the regions $(i)\ |z| > 3$ *and* $(ii)\ 2 < |z| < 3$.	7	3	L3
c) Evaluate $\int_C \frac{e^{2z}}{(z+1)^2(z-2)} dz$ where C is the circle $|z| = 3$ by Cauchy residue theorem.	7	3	L3

UNIT- IV

7. a) The first four moments about an arbitrary value 5 of a frequency distribution are -4 , 22, -117 and 560. Find the skewness and kurtosis based on moments.	6	4	L1
b) Fit a best fitting parabola $y = a + bx + cx^2$, by the method of least squares for the data:			

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

	7	4	L2
c) The following data gives the age of husband (x) and the age of wife (y) in years. Find the correlation coefficient and hence obtain the regression lines. Also calculate the age of husband corresponding to wife of 16 years age :			

x	36	23	27	28	28	29	30	31	33	35
y	29	18	20	22	27	21	29	27	29	28

	7	4	L2
8. (a) Find the value of k such that the following distribution represents a finite probability Distribution:			

x	-3	-2	-1	0	1	2	3
$p(x)$	k	$2k$	$3k$	$4k$	$3k$	$2k$	k

Also, find $P(x \leq 1), P(x > 1)$ *and* $P(-1 < x \leq 2)$	6	4	L2
(b) The number of telephone lines at an instant of time is a binomial variate with probability 0.1 that a line is busy. If 10 lines are chosen at random , what is the probability that (i) no line is busy (ii)all lines are busy (iii)at least one line is busy (iv)almost 2 lines are busy	7	4	L2
(c) State probability density function of Gaussian (normal) distribution. An analog signal received at a detector (measured in micro-volts) may be modeled as a Gaussian random variable with mean 200 and variance 256 at a fixed point of time. What is the probability that the signal will exceed 240 micro-volts?	7	4	L3

UNIT- V

9. a) A random variable of X and Y having the following joint distribution — 6 | 5 | L2

Y / X	-3	2	4
1	0.1	0.2	0.2
2	0.3	0.1	0.1

Find (i) Marginal distributions of X and Y (ii) Cov (X,Y) (iii) Are the variables X,Y statically independent?

b) Define (i) stochastic matrix (ii) regular stochastic matrix. Find the unique probability vector for the regular stochastic matrix $\begin{bmatrix} 0 & 1 & 0 \\ 1/6 & 1/2 & 1/3 \\ 0 & 2/3 & 1/3 \end{bmatrix}$ — 7 | 5 | L3

c) Verify that $f(x,y)=\begin{cases} e^{-(x+y)}, & x\geq 0,\ y\geq 0 \\ 0, & otherwise \end{cases}$ is a probability density function of two -dimensional probability function. Evaluate $P(x<1), P(x\leq y)$ and $P(1/2<x<2,\ 0<y<4)$ — 7 | 5 | L2

10.a) Develop a series solution of the equation $(1+x^2)y'' + xy' - y = 0$ — 6 | 5 | L3

b) Solve the Bessel's differential equation : $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$) — 7 | 5 | L3

c) Express $4x^3 - 2x^2 - 3x + 8$ in terms of Legendre's polynomials. — 7 | 5 | L2

Course title: Operating System			
Course Code: P15IS42	**Semester:** IV	**L-T-P-H :** 3-0-2-5	**Credit:**4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: Computer Organization, Strong programming skills, elementary data structures and algorithms and introduction to concurrency.

Course Learning Objectives (CLOs)

This course aims to

1. Extend the knowledge on principles and modules of operating systems L2
2. compare performance of processor scheduling algorithms L4
3. Create algorithmic solutions to process synchronization problems L5
4. Compare the performance of disk scheduling algorithms.L4
5. Understand the protection and security mechanisms in Operating system.L2

Relevance of the Course: An operating system is an essential part of any computer system. The purpose of this course is providing a clear understanding of the concepts that underlie operating systems. This course covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management, file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity. The course may be taken by other students with sufficient Computer Science background who have an interest in learning how an operating system works.

Course Content

Unit - I

introduction to operating systems, system structures and process concepts: Need of operating systems; Computer System organization; Computer System architecture; Operating System structure; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Special purpose systems; Computing environments. Operating System Services; User- Operating System interface; System calls; Types of system calls; System programs; Operating System design and implementation; Operating System structure; Virtual machines. Process concepts, Process scheduling, operations on processes, Inter-process communication. Multi-Threaded Programming: Overview; Multi-threading models. **11 Hrs**

Unit - II

PROCESS SCHEDULING AND PROCESS SYNCHRONIZATION: Basic concepts of process scheduling; Scheduling criteria; Scheduling algorithms; Multiple-Processor scheduling. Synchronization: The Critical section problem; Peterson's solution; Synchronization hardware; Semaphores; Classical problems of synchronization; Monitors.

10 Hrs

Unit - III

DEADLOCKS: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

MEMORY MANAGEMENT: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Structure of page table; Segmentation. **10 Hrs**

Unit - IV

VIRTUAL MEMORY MANAGEMENT, FILE SYSTEM AND IMPLEMENTATION OF FILE SYSTEM: Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement; Allocation of frames; Thrashing. File System: File concept; Access methods; Directory structure; File system mounting; file sharing; Protection. Implementing File System: File system structure; File system implementation; Directory implementation; Allocation methods; Free space management. **11 Hrs**

Unit - V

SECONDARY STORAGE STRUCTURES, PROTECTION: Mass storage structures; Disk structure; Disk attachment; Disk scheduling; Disk management; Swap space management. Protection: Goals of protection, Principles of protection, Domain of protection, Access matrix, Implementation of access matrix, Access control, Revocation of access rights, Capability-Based systems, case study **10 Hrs**

Text Books:

1. **Operating System Principles –** Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, 9th edition, Wiley-India, 2014.

References:

1. William Stallings, Operating System: Internals and Design Principles, Prentice Hall, 8th Edition, 2014.
2. Rohit Khurana, ITLESE, "Operating System" Vikas Publishing Ltd. First Edition, 2011.

Course Outcomes

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

1. Explain the basic structure and functioning of operating system.L2
2. Solve problems related to process management and synchronization as well as able to apply learned methods to solve basic problems.L3
3. Understand the cause and effect related to deadlocks and is able to analyze them related to common circumstances in operating systems.L2.L3
4. Explain the basics of memory management, the use of virtual memory in modern operating system as well as the structure of the most common file system.L2
5. Understand how the operating system abstractions can be used in the development of mass storage structure application programsL2

<table>
<tr><th></th><th>Model Question Paper</th><th>Marks</th><th>CO's</th><th>Levels</th></tr>
<tr><td></td><td>UNIT - I</td><td></td><td></td><td></td></tr>
<tr><td>1.a</td><td>Explain the different types of operating system structure.</td><td>14</td><td>CO1</td><td>L2</td></tr>
<tr><td>b.</td><td>Explain the features of multiprogramming system and real time system</td><td>06</td><td>CO1</td><td>L2</td></tr>
<tr><td>2.a</td><td>Explain the different multithread models</td><td>12</td><td>CO1</td><td>L2</td></tr>
<tr><td>b.</td><td>List and explain different type of schedulers</td><td>06</td><td>CO1</td><td>L1, L2</td></tr>
<tr><td>c.</td><td>Write the comparison b/w program & process.</td><td>02</td><td>CO1</td><td>L3</td></tr>
<tr><td></td><td>UNIT - II</td><td></td><td></td><td></td></tr>
<tr><td>3.a.</td><td>For the following example calculate average turnaround time and average waiting time for the following algorithms
i) FCFS ii) Preemptive SJF iii)Round robin (1 time unit)
<table>
<tr><th>process</th><th>Arrival time</th><th>Burst time</th></tr>
<tr><td>P1</td><td>0</td><td>8</td></tr>
<tr><td>P2</td><td>1</td><td>4</td></tr>
<tr><td>P3</td><td>2</td><td>9</td></tr>
<tr><td>P4</td><td>3</td><td>5</td></tr>
</table></td><td>15</td><td>CO2</td><td>L3</td></tr>
<tr><td>b.</td><td>Discuss multilevel feedback queue scheduling.</td><td>5</td><td>CO2</td><td>L2</td></tr>
<tr><td>4.a</td><td>What is dining philosopher's problem? Give the monitor solution for dining philosopher problem.</td><td>10</td><td>CO2</td><td>L1</td></tr>
<tr><td>b.</td><td>Define the term critical section. Explain the producer consumer problem with bounded buffer using semaphores.</td><td>10</td><td>CO2</td><td>L1, L2</td></tr>
<tr><td></td><td>UNIT - III</td><td></td><td></td><td></td></tr>
<tr><td>5.a</td><td>Write a deadlock detection algorithm for a resource allocation system with multiple instances of each resource type.</td><td>08</td><td>CO3</td><td>L3</td></tr>
<tr><td>b.</td><td>Write a short note on safe state.</td><td>05</td><td>CO3</td><td>L3</td></tr>
<tr><td>c.</td><td>What are the necessary conditions for a deadlock to occur?</td><td>07</td><td>CO3</td><td>L1</td></tr>
<tr><td>6.a</td><td>Give the partitions of 100K,500K,200K,300K, and 600K(in order).how would each of the first fit ,best fit and worst fit algorithms place processes of 212K,417K,112K and 426K(in order)? Which algorithm makes the most efficient use of memory?</td><td>10</td><td>CO3</td><td>L5</td></tr>
<tr><td>b.</td><td>What hardware is required for paging explain</td><td>06</td><td>CO3</td><td>L1</td></tr>
<tr><td>c.</td><td>Write any 4 differences b/w paging & segmentation.</td><td>04</td><td>CO3</td><td>L3</td></tr>
<tr><td></td><td>UNIT - IV</td><td></td><td></td><td></td></tr>
<tr><td>7.a</td><td>Describe the SOAP message structure with an example.</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>b.</td><td>Explain how does intermediary SOAP node function?</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>8.a</td><td>List out and explain the seven elements that help in describing the web services.</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td>b.</td><td>Explain the following:
i) Service publication ii) Service discovery</td><td>10</td><td>CO4</td><td>L2</td></tr>
<tr><td></td><td>UNIT - V</td><td></td><td></td><td></td></tr>
<tr><td>9.a</td><td>Describe the UDDI defined Information Model.</td><td>10</td><td>CO5</td><td>L2</td></tr>
<tr><td>b.</td><td>Explain tModel.</td><td>10</td><td>CO5</td><td>L2</td></tr>
<tr><td>10.a</td><td>Differentiate between synchronous and asynchronous web services.</td><td>6</td><td>CO5</td><td>L4</td></tr>
<tr><td>b.</td><td>Discuss Messaging middleware.</td><td>6</td><td>CO5</td><td>L2</td></tr>
<tr><td>c.</td><td>Differentiate between Orchestration and Choreography.</td><td>8</td><td>CO5</td><td>L4</td></tr>
<tr><td></td><td>* * * *</td><td></td><td></td><td></td></tr>
</table>

Course title: Finite Automata and Formal language			
Course Code: P15IS43	**Semester:** IV	**L-T-P-H :** 4-0-0-4	**Credit:**4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisite: Knowledge in Discrete mathematics and in programming

Course Learning Objectives (CLOs)

This course aims to

1. Design finite automata and Explain equivalence and minimization of finite automata. L6
2. Design regular expression for regular languages, convert between finite automata and regular expressions for regular languages and apply the pumping lemma for regular languages to determine if a language is regular. L6
3. Design grammars for various languages and Demonstrate that grammar is ambiguous. L6
4. Design grammars from push-down automata and Design push-down automata from grammars.L6
5. Design Turing machines for simple languages and functions and Design problem reductions to determine the un-decidability of languages.L6

Relevance of the Course: This course is one of the foundation courses in Information Science and Engineering program, It helps the student to design an abstract machine to accept any languages, Which will helps the student to understand the design process need to be followed for any problem.

Course Content

Unit-I

Introduction to Finite Automata, Regular Expression

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. **10Hrs**

Unit-II

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. **10Hrs**

UNIT-III

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.

12Hrs

Unit-IV

Pushdown Automata Definition of the Pushdown automata; The languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata. **10Hrs**

Unit-V

Introduction to Turing Machine, Un-decidability Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers. Un-decidable problem that is RE; Post's Correspondence problem. 10**Hrs**

Text books:

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

Referenced books:

1. Raymond Greenlaw, H.James Hoover: Fundamentals of the Theory of Computation, Principles and Practice, Morgan Kaufmann.
2. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGraw-Hill.
3. Daniel I.A. Cohen: Introduction to Computer Theory, 2nd Edition, John Wiley & Sons.
4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition, Pearson Education.

Course Outcomes

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

1. Design finite automata and Explain equivalence and minimization of finite automata. L4,L2
2. Design regular expression for regular languages, convert between finite automata and regular expressions for regular languages. L3
3. Design grammars for various languages L3
4. Design push-down automata from grammars. L2
5. Design Turing machines for simple languages and functions and Design problem reductions to determine the un-decidability of languages. L3

<table>
<tr><th>Q. No</th><th>Model Question Paper</th><th>Marks</th><th>CO's</th><th>Levels</th></tr>
<tr><td colspan="5">UNIT -I</td></tr>
<tr><td>1. a.</td><td>Define DFA. Design a DFA to accept the language, L= { W: N_a(W) mod 2=0 and N_b(W) mod 2=0 }</td><td>6</td><td>CO1</td><td>L2,L6</td></tr>
<tr><td>b.</td><td>By applying Lazy evaluation method Convert the following NFA to DFA.</td><td>8</td><td>CO1</td><td>L3</td></tr>
<tr><td>c.</td><td>Differentiate b/w NFA and DFA and explain the applications of Finite automata.</td><td>6</td><td>CO1</td><td>L4</td></tr>
<tr><td>2.a.</td><td>Consider the following è-NFA
<table>
<tr><td></td><td>è</td><td>a</td><td>b</td><td>c</td></tr>
<tr><td>p</td><td></td><td></td><td></td><td></td></tr>
<tr><td>q</td><td></td><td></td><td></td><td></td></tr>
<tr><td>r</td><td></td><td></td><td></td><td></td></tr>
</table>
i) Compute è-closure of each state ii) Give all the strings of length three or less accepted by the automata iii) Convert the automata to DFA.</td><td>10</td><td>CO1</td><td>L2</td></tr>
<tr><td>b.</td><td>Find the minimized DFA for the following.
<table>
<tr><td>S</td><td>0</td><td>1</td></tr>
<tr><td>A</td><td>B</td><td>A</td></tr>
<tr><td>B</td><td>A</td><td>C</td></tr>
<tr><td>C</td><td>D</td><td>B</td></tr>
<tr><td>* D</td><td>D</td><td>A</td></tr>
<tr><td>E</td><td>D</td><td>F</td></tr>
<tr><td>F</td><td>G</td><td>E</td></tr>
<tr><td>G</td><td>F</td><td>G</td></tr>
<tr><td>H</td><td>G</td><td>D</td></tr>
</table></td><td>10</td><td>CO1</td><td>L2</td></tr>
<tr><td colspan="5">UNIT -II</td></tr>
<tr><td>3.a.</td><td>Define regular expression and obtain a regular expression to
i) Accept strings of a's and b's whose length is either even or multiples of 3 or both.
ii) Accept strings of a's and b's end with ab or ba.</td><td>6</td><td>CO2</td><td>L1</td></tr>
<tr><td>b.</td><td>List and explain the applications of Regular Expressions.</td><td>6</td><td>CO2</td><td>L2</td></tr>
<tr><td>c.</td><td>By applying state elimination method Convert the following Finite Automata to Regular Expression.</td><td>8</td><td>CO2</td><td>L3</td></tr>
<tr><td>4.a.</td><td>Prove that if L and R are regular language then L U R is also regular.</td><td>6</td><td>CO2</td><td>L6</td></tr>
<tr><td>b.</td><td>State and prove kleen's theorem.</td><td>8</td><td>CO2</td><td>L1,L2</td></tr>
<tr><td>c.</td><td>Convert the following Regular expressions into finite automata (a+b)*ab(a+b)*</td><td>6</td><td>CO2</td><td></td></tr>
<tr><td colspan="5">UNIT -III</td></tr>
<tr><td>5.a.</td><td>State and prove pumping Lemma for CFG's.</td><td>7</td><td>CO3</td><td>L1,L3</td></tr>
<tr><td>b.</td><td>Obtain a CFG for the following languages
1. To generate strings consisting of any number of a's and b's with atleast one a.
2. To generate strings of a's and b's having substring ab.
3. L={w : na(w) mod 2 =0 where w€ {a,b}*}</td><td>6</td><td>CO3</td><td>L5</td></tr>
</table>

c.	Explain the applications of CFG.	4	CO3	L2
6.a.	Define ambiguous grammar? Prove that the following grammar is ambiguous. S → AB | aaB A → a | Aa B → b	10	CO3	L1,L5
b.	Eliminate useless productions from the grammar S → aA | a | B | C A→aB | € B → aA C → cCD D→ abd	10	CO3	L3
	UNIT -IV			
7.a.	Define PDA? Design a PDA by empty stack method to accept the Language L={WW^R | w€ {a,b}*}	10	CO4	L1,L5
b.	Write an Algorithm to convert CFG to PDA and obtain the corresponding PDA for the following grammar? S → aABC A→ aB | a B→ bA | B C → a	10	CO4	L5
8.a.	Is the PDA corresponding to the language L={a^nb^n | n>=1 } by a final state method is determistic or not. Justify your answer.	6	CO4	L6
b.	Describe the application of GNF notation of a CFG?	6	CO4	L1
c.	Write down the procedure for conversion of PDA to CFG.Convert the following PDA to CFG. α (q_0 , a, Z) = (q_0 , AZ) α (q_0 , a, Z)= (q_0 , A) α (q_0 , b, A)=(q_1 , €) α (q_1 , € , Z)=(q_2 , €)	8	CO4	L2
	UNIT -V			
9.a.	Define Turing machine? Design a Turing machine to accept a languages L={a^nb^n | n>=1 }.	10	CO5	L1,L5
b.	Explain working Principle of Multi Tape turing machine.	10	CO5	L2
10.a.	Explain Post correpondence Problem with example.	10	CO5	L2
b.	Explain recursively Enumerable problems with example.	10	CO5	L2

Course title: Analysis and Design of Algorithms			
Course Code: P15IS44	**Semester:** IV	**L-T-P-H :** 4-0-0-4	**Credit:**3
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: The Students are required to have familiarity with programming language and the following data structures such as Arrays, Linked List, Stack, Queue, Graphs, Trees, and Binary search trees, Heap and Priority Queues.

Course Learning Objectives(CLOs)

This course aims to

1. Know about **what** is algorithm and its properties. **Understand** the concepts of algorithm methods for problem solving and **describe** the concepts of time complexity and concept of space complexity.**Analyze** the asymptotic performance of algorithms.L1,L2,L6
2. **Describe** the methodologies of how to analyze an algorithm based on Brute Force method, divide and conquer method and decrease and conquer strategies.L2,L6
3. **Identify** the complexity in the transform and conquer strategy and the input enhancement methods. **Apply** and solve the ideas designed by dynamic programming method and greedy techniques.L4,L3
4. **Explain** the concept backtracking N P NP complete problems L2
5. To **develop** proficiency in problem solving and programming. **Identify** and analyze criteria and specification appropriate to new problems, and choose the appropriate algorithmic design techniques for their solution.L6, L4

Relevance of the Course: Analysis and Design of Algorithm Course is very important in information science engineering as the world wants applications to be time and space efficient. This course enables to understand and analyze efficient algorithm for various application all around the world. The course introduces the student to the classical techniques and paradigms used in the design and analysis of algorithms. This course applies design and analysis techniques to numeric and nonnumeric algorithms which act on data structures. Analysis of algorithms is concerned with the resources an algorithm must use to reach a solution. Students will be able to practice their skills on many well-known algorithms designed to solve real-life problems.

Course contents

UNIT- I

Introduction to Algorithms and Algorithm Efficiency:

What is an algorithm? Fundamentals of algorithmic problem solving, important problem types, Fundamental data structures.

Fundamentals of the analysis of algorithm efficiency – Analysis framework, asymptotic notations and basic efficiency classes, Mathematical analysis of recursive and non recursive algorithms **10 Hrs**

UNIT- II

Algorithm Design Methods-I:

Brute Force – introduction, selection sort and bubble sort, Sequential search and brute-force string matching, Exhaustive search.

Divide and conquer – introduction, Merge sort, Quick sort, Binary search, Multiplication of Large integers and strassen's matrix multiplication. **12 Hrs**

UNIT- III

Algorithm Design Methods-II:

Decrease and conquer – introduction, insertion sort, depth-first and breadth-first search, Topological sorting. **Transform and conquer** – introduction, Presorting, Balanced search trees, Heap and Heap sort. **10 Hrs**

UNIT- IV

Algorithm Design methods-III:

Space and time tradeoffs – sorting by counting, sorting by distribution, introduction to Input enhancement, Horspool's string matching, Hashing

Dynamic programming – introduction, Warshall's and Floyd's algorithms, the knapsack problem and memory functions. **10 Hrs**

UNIT- V

Greedy Method and Limitations of Algorithmic power:

Greedy technique – Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman's trees.

Limitations of Algorithmic power - Lower-bound arguments, Decision trees, P, NP, and NP-complete problems. Coping with the limitations of algorithm power – Backtracking.

10 Hrs

Text Book:

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, 3nd edition, Pearson Education, 2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 3rd edition, PHI, 2011.

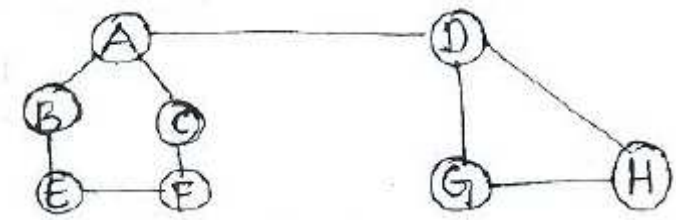
Reference Books:

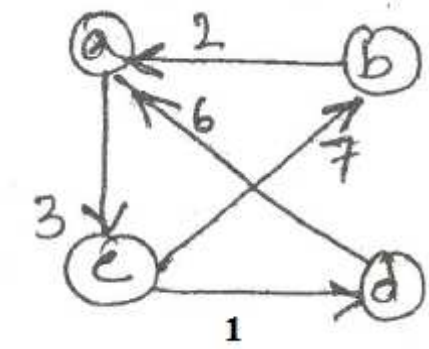
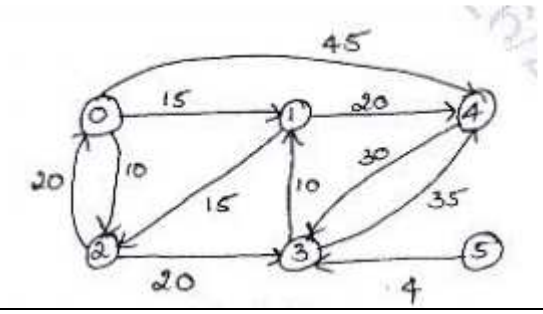
1. E Horowitz, S Sahni, S Rajsekaran: Fundamentals of Computer Algorithms, 1st Edition, Galgotia Publication, 2012.
2. Richard Neopolitan, Kumarss Naimipour: Foundations of Algorithms using C++ pseudocode, 4th Edition, Jones & Bartlett India, 2011.
3. Sara Baase and Allen van Gelder: Computer algorithms - Introduction to Design and Analysis, 3rd Edition, Pearson Education, 2011.

Course Outcomes

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

1. **Analyze** and compare complexity for different types of algorithms for different types of problems. **Choose** among different types of data structures the best one for different types of problems. L4,L3
2. **Apply** mathematical preliminaries to the analyses and design stages of different types of algorithms.L3
3. **Recognize** the general principles and good algorithm design techniques for developing efficient computer algorithms.L5
4. **Familiarizing** students with specific algorithms for a number of important computational problems like sorting, searching, and graphs, etc. and **decide** on the suitability of a specific algorithm design technique for a given problem. **Design** efficient algorithms for new situations, using as building blocks the techniques learned. L2,L3,L5
5. **Apply** algorithm design techniques to solve certain NP-complete problems.L3

	Model Question Paper	Marks	CO's	Levels
1. a.	Define algorithm. Explain the characteristics of the algorithm	7	CO1	L2
b.	Describe the methodologies of how to analyze an algorithm	9	CO1	L2,L4
c.	Design an algorithm for computing GCD of two numbers using repetitive substitution method.	4	CO1	L5
2 a.	Explain how time complexity of an algorithm is computed	6	CO1	L2
b.	What are best case, average case, and worst-case performance? Explain	9	CO1	L2
c.	Compute time complexity of recursive Fibonacci procedures where F(n)= F(n-1) + F(n-2)	5	CO1	L3
	UNIT II			
3 a.	Analyze the computing time of selection sort.	4	**CO2**	**L4**
b.	Write a Brute force algorithm for counting the number of vowels in a given text.	8	**CO2**	**L5**
c.	Find the number of comparisons required to search for "6" in the given sequence of numbers: 10, 19, 7, 9, 6, 15.	8	**CO2**	**L3**
4 a.	Apply the recursive and iterative versions of binary search and compare times.	**6**	**CO2**	**L3,L4**
b.	Trace the quick sort algorithm to sort the list C, O, L, L, E, G, E in alphabetical order	**8**	**CO2**	**L4**
c.	Explain the Strassen's matrix multiplication concept with an example	6	**CO2**	**L2**
	UNIT III			
5a.	Differentiate between Depth First Search and Breadth First Search Techniques	5	**CO3**	**L2**
b.	Apply DFS for the following graph: 	**5**	**CO3**	**L3**
c.	Describe Tree edge, Cross edge and Back edge with respect BFS and DFS. Apply the Depth First search based algorithm to solve the topological sorting problem for the following digraph.	**10**	**CO3**	**L2,L3**
6 a.	Define the three variations of Transform and conquer algorithm. Construct an AVL tree for the list 5,6,8,3,2,4,7 by successive insertions. State four rotation types used in the construction of AVL tree, and explain the same.	**10**	**CO3**	**L1,L5 ,L2**
b.	Construct Heap for the list 2,9,7,6,5,8 using bottom up construction algorithm. Explain clearly procedure of adding new element in that method. Explain in brief heap sort algorithm and obtain its complexity.	**10**	**CO3**	**L5,L2 ,L6**
	UNIT IV			
7 a.	Design the Horspool's string matching algorithm.	**10**	**CO4**	**L5**
b.	Trace the Sorting by distribution algorithm to sort the list C, O, L, L, E, G, E in	**10**	**CO4**	**L4**

	alphabetical order			
8 a.	Generate the Transitive closure of the graph given below: 	**10**	**CO4**	**L5**
b.	Explain the Dynamic Programming with Floyd's algorithm in detail. Apply Floyd's all pair shortest path problem for the digraph given below.  **1**	**10**	**CO4**	**L2,L3**
	UNIT V			
9 a.	Prove that Kruskal's algorithm generates a minimum-cost spanning tree for every connected undirected graph G.	**10**	**CO5**	**L6**
	Using Greedy Technique, compute the single source shortest path from vertex 5 to all other vertices. 	**10**	**CO5**	**L3**
10.a	Define the following terms: i. Class P. ii. Class NP iii. NP Complete iv. NP hard problem	**8**	**CO5**	**L1**
b	Explain N-Queens Problem. Establish lower bounds for sorting by comparison of keys (both average and worst case).	**12**	**CO5**	**L2,L5**

Course title: Graph theory and Combinatorics			
Course Code: P15IS45	**Semester:** IV	**L-T-P-H :** 4-0-0-4	**Credit:** 4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: set theory, relations and functions, basic knowledge of counting theory.

Course Learning Objectives (CLOs)

This course aims to

1. **Develop** the ability to identify different types of graphs and its properties.(L1,L2,L3)
2. **Learn** the concept of planar graphs and dual graph and Summarize the knowledge of coloring a graph and its applications.(L2)
3. **Apply** and Construct optimal Prefix code tree for the given set of codes**.(**L3)
4. **Apply** the generalized principle of inclusion and exclusion theorem, concept of generating functions to solve the given problems of counting theory(L3)
5. **Learn** the methods to solve simple recurrence relations of second and third order.(L2)

Relevance of the Course: Is to develop the mathematical ability of the student in the application areas such as data structures, networks, computer graphics..The student gets introduced to applications in engineering ,physical and life sciences, statistics and social sciences of converting the problem into a pictorial representation which makes the analysis easier . The student will be exposed to the idea that generates applications of mathematical expressions to the real time problems and develop ability to think in that direction. Find opportunity to establish results by counting a combinatorial identities in the expression forms.

Course contents

UNIT- I

Introduction to Graph Theory: Definitions and examples, finite and infinite graphs, sub graphs, Operations on graphs, complements, and Graph isomorphism.

Applications: 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. **10Hrs**

UNIT- II

Planar graphs, Kuratowski's two graphs, different representations of a planar graph, Euler's formula, Detection of planarity, Geometric dual.

Coloring: Cutsets, some properties of a cut-set Graph colouring, chromatic number, chromatic partitioning and chromatic polynomials. **10Hrs**

UNIT- III

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. **10Hrs**

UNIT- IV

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– calculation techniques, partitions of integers, The exponential generating function, The summation operator. **12 Hrs**

UNIT- V

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

Third and higher –order Homogenous Recurrence relations, The non homogeneous recurrence relation, The method of generating functions for second order recurrence relations. **10 Hrs**

Text Book:

1. Discrete and Combinatorial Mathematics, Ralph.P. Grimaldi & B.V. Ramana, 5th Edition, PHI/Pearson education. Chapter 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, 5, 8.1 to 8.4.

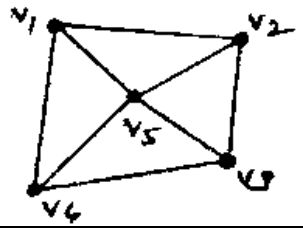
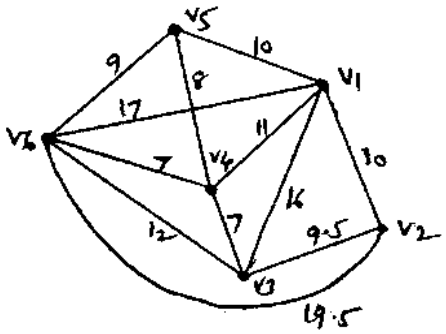
Reference Books:

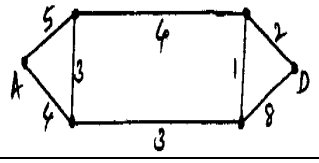
1. Graph Theory and Combinatorics, Dr. D.S. Chandrasekharaiah, Prism.
2. Introduction to Graph Theory, Chartrand Zhang, TMH.

Course Outcomes

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

1. Identify different parameters of graphs and its applications –L1
2. Understand planar graphs and its properties To detect planarity of a given graph –L2
3. Apply optimization techniques to construct a minimal spanning tree of a graph, Prefix code for a given message.-L3
4. Apply and understand the principle of inclusion and exclusion, generating functions to solve the given problem. –L3
5. Solve simple récurrence relation of second and third order.- L3

	Model Question Paper	Marks	CO's	Levels
1. a.	Define a complete graph and Prove that the number of edges in a complete graph of n vertices is always n(n-1)/2 edges	6	CO1	L1,L2
b.	i) Draw two graphs that are isomorphic. ii) Draw two graphs that are not isomorphic but have same number of vertices and same number of edges	7	CO1	L2
c.	Write short notes on Konigsberg's bridge problem	7	CO1	L1
2 a.	Define Bipartite graph .Can a bipartite graph contain a cycle of odd length, Explain	6	CO1	L1,L2
b.	Define Hamiltonian graph and Draw all edge disjoint Hamiltonian cycles of K_7	7	CO1	L1,L2
c.	Determine the |V| for the following graphs (i) regular with 15 edges (ii) 10 edges with two vertices of degree 4 and remaining of degree 3	7	CO1	L3
	UNIT II			
3 a.	Define a planar graph and prove that K_5 is non planar graph.	6	CO2	L1,L2
b.	List the properties between the graph and its dual and draw a self dual graph	7	CO2	L2
c.	Prove that a connected planar graph with "n" vertices of "e" edges has e – n + 2 regions.	7	CO2	L3
4 a.	Define chromatic number, chromatic polynomial of a graph and find the same for the graph given below. 	7	CO2	L3
b.	Define vertex connectivity and edge connectivity . Find the relation between them .	7	CO2	L1
c.	How to detect planarity in a graph?	6	CO2	L2
	UNIT III			
5a.	Prove that a tree with n vertices always has n-1 edges and also list all other properties of a tree.	7	CO3	L2
b.	Find the minimal spanning tree of the weighed graph given below using Krushkal's algorithm 	7	CO3	L3
c.	Obtain an optimal Prefix code for the message "ROAD IS GOOD" using labeled binary tree. Indicate the code	7	CO3	L3

6 a.	Explain the steps involved in Dijikstra's algorithm with an example	7	CO3	L2
b.	Find the maximum flow between the two vertices A and D in the following graph.  	6	CO3	L3
c.	Obtain an optimal Prefix code for the message "ROAD IS GOOD" using labeled binary tree. Indicate the code	7	CO3	L3
	UNIT IV			
7 a.	Define derangement. Find the number of derangements of 1,2,….10 in a line so that no even number is in its natural place	6	CO4	L1,L2
b.	An apple, a banana, a mango and an orange are to be distributed to four boys A, B, C, D. The boys A and B do not wish to have the apple; the boy C does not want the banana or mango and D returns the orange. In how many ways the distribution can be made so that no boy is displeased?	7	CO4	L3
c.	Find the number of permutations of the English letters which contain (i) exactly two (ii)atleast two (iii)exactly three and (iv)at least three of the patterns CAR, DOG, PUN and BYTE.	7	CO4	L3
8 a.	Write the sequences generated by the following functions (i)$(3+x)^3$ii)$2x^2(1-x)^{-1}$ (iii)$2x^3+1/(1-x)$	6	CO4	L2
b.	Find a generating function for each of the following sequences (i) 1,2,3,4,5,…… (ii) 1,-2,3,-4,…….. (iii) 1^3 ,2^3 ,3^3 ,4^3,……..	7	CO4	L2
c.	Find the number of ways of forming a committee of 9 students drawn from3 different classes so that students from the same class do not have an absolute majority in the committee.	7	CO4	L3
	UNIT V			
9 a.	The number of bacteria in a culture is 1000(approximately) and this number increases 255% every two hours. Use a recurrence relation to determine the number of bacteria present after one day.	6	CO5	L3
b.	Solve the recurrence relation $a_n+ a_{n-1}- 6a_{n-2}= 0$ for n>=2 given that $a_0= -1$ and $a_1= 8$	7	CO5	L3
c.	Solve the recurrence relation $a_n+ 4a_{n-1}+ 4a_{n-2}= 5(-2)^n$ for n>=2 .	7	CO5	L3
10.a	A bank pays a certain % of annual income on deposits, compounding the interest in 3months. If the amount doubles in 6years and 6months. What is the annual % of interest paid by the bank.	6	CO5	L3
b.	Solve the recurrence relation $a_n- 6a_{n-1}+ 9a_{n-2}=0$ for n>=2 given that$a_0=5$ and $a_1=12$.	7	CO5	L3
c.	Find the generating function for the recurrence relation $a_{n+1}- a_n = 3^n$ for n>=0 and $a_o=1$.Hence solve the relation. A bank pays a certain % of annual income on deposits, compounding the interest in 3months. If the amount doubles in 6years and 6months. What is the annual % of interest paid by the bank.	7 6	CO5 CO5	L3 L3

	Solve the recurrence relation $a_n - 6a_{n-1} + 9a_{n-2} = 0$ for $n >= 2$ given that $a_0 = 5$ and $a_1 = 12$.	7	CO5	L3

Course title: Microprocessor			
Course Code: P15IS46	**Semester:** IV	**L-T-P-H :** 4-0-0-4	**Credit:** 4
Contact Period: Lecture: 52 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: Computer Organization.

Course Learning Objectives (CLOs)

This course aims to

1. Identify the various elements of 8086 microprocessor architecture, its bus organization including control signals.L2
2. Understand in-depth the hardware and software included in micro computer systems.L2
3. Analyze the concept considered are general in nature, the discussion is based on the particular microprocessor, the Intel 8086/8088 and its associated supporting devices and software.L4
4. Learn the programming concept of 8086 programming using (Microsoft assembler) MSAM Assembler.L3
5. Understand 32/64 bit architectures supporting pipelined and superscalar architectures. L**2**

Relevance of the Course: The modern digital systems including computer systems are designed with microprocessor as central device connected to memory and I/O devices. The subject introduces the students with basics of microprocessor, microprocessor architecture and programming, interfacing microprocessor with memory and various I/O (Input/Output) devices.

Course contents

UNIT- I

8086 Architecture and Instructions: CPU architecture, Internal Operation, Machine Language Instructions, addressing modes, Instruction formats, Instruction Execution Timing, Assembler instruction format, Data transfer Instructions, Arithmetic instructions. **10Hrs**

UNIT- II

Assembly language programming Instructions continued : Branch instructions- conditional branch instruction, unconditional branch instructions, Loop instructions, NOP and HLT instructions, Logical Instructions, Shift and Rotate 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 **11Hrs**

UNIT- III

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. **11Hrs**

UNIT- IV

Byte and String Manipulation: String Instructions, REP prefix, table translation. **I/O programming:** Fundamental I/O considerations, Programmed I/O, Interrupt I/O, Block transfers and DMA**.** **10Hrs**

UNIT- V

System Bus Structure : Basic 8086/8088 configurations – Minimum mode, Maximum mode, System Bus Timing, Interrupt Priority Management – Interrupt System based on Single 8259A, Interrupt System Based on Multiple 8259As, Bus Standards**.** **10 Hrs**

Text Book:

1. **Microprocessor Systems: the 8086/8088 Family,** Glenn A.Gibson, Prentice-Hall of India, 2nd edition.

Reference Books:

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

Course Outcomes

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

1. **Understand** the architecture of 8086 microprocessor. L1
2. **Apply 8086** instruction set for the given problems L3
3. **Develop** different modules & link them. L6
4. **Apply** string instruction set and I/0 Interrupt in 8086 programming. L3
5. **Understand** min & max mode of 8086. L1

	Model Question Paper	Marks	CO's	Levels
1. a.	List-out the functional units of EU and BIU. Explain the instruction queue and base register of 8086	8	CO1	L2
b.	With respect to 8086 processor explain the following : i) Segment registers ii) Flag register	6	CO1	L2
c.	Obtain the machine code for the following instructions i) MOV DX, 0FCB4h ii) MOV AX, CS:[BX]	6	CO1	L3
2 a.	Briefly explain the internal block diagram of 8086.	6	CO1	L2
b.	Find the addressing modes for the following instructions and also explain the generations of physical address in each instruction. Assume SI=0100h , DS=1000h, BX=0020h i) MOV CL,DL ii) MOV CL,BX[SI] iii) MOV CX,BX[SI+4]	6	CO1	L5
c.	Explain the significance of MOD and R/M fields in instruction formats.	8	CO1	L2
	UNIT II			
3 a.	Write a machine code for the instruction: MOV AL, [BX] Give the use of following instructions with example? i) DAA ii) AAM iii) TEST iv) SAR	6	CO2	L3
b.	Write a sequence of instructions to check whether auxiliary flag bit is set or not. If set store 1 to the location SET else store 0 in the location RESET.	6	CO2	L4
c.	Write a program to evaluate the expression $3x^2 + y$. Where x and y are signed 16 bit data.	8	CO2	L5
4 a.	Explain the following instructions with example. i) MOVSB ii) LEA iii) LDS iv) XLAT v) STOSB	5	CO2	L2
b.	Explain shift and rotate operations of 8086 with example	5	CO2	L2
c.	Write a program to convert BCD to Excess-3 code using XLATB and LEA instructions	10	CO2	L3
	UNIT III			
5a.	Differentiate between Macro and Procedure. Write a procedure to add 8 bytes of data.	10	CO3	L4
b.	Write an assembly language program to read a character from keyboard, convert it to upper case and display it using Macros.	10	CO3	L3
6 a.	With an illustrative program explain far procedure.	6	CO3	L2
b.	Explain different parameter passing techniques in procedures of 8086.	6	CO3	L2
c.	Write an assembly language program to convert a binary number into its ASCII equivalent and to display it using procedures	8	CO3	L4
	UNIT IV			
7 a.	Write a program to count the frequency of occurrence of a given character in a string	10	CO4	L4
b.	Define an interrupt. How is the address of NMI calculated?	10	CO4	L2
8 a.	List out string instructions and explain any two of them with example.	6	CO4	L2
b.	Write an assembly language program find the substring from main string.	8	CO4	L4
c.	What are interrupts and interrupt vector table? What are the steps involved in handling interrupts?	6	CO4	L2
	UNIT V			

9 a.	Explain the function of 8086 processors in Maximum mode	10	CO5	L2
b.	With a neat timing diagram explain read and write operation of 8086.	10	CO5	L2
10.a	Write the timing diagram for the instruction MOV AL, LIST in minimum mode.	6	CO5	L4
b.	Explain the function of the following pins with respect to 8086 processors. Also write the mode to which it belongs. i) QS0 ii) READY	6	CO5	L2
c.	Explain with a block diagram the working of 8259 programmable interrupt controller.	8	CO5	L2

Course title: Analysis and Design of Algorithms Lab			
Course Code: P15ISL47	**Semester:** IV	**L-T-P-H** : 0-0-3-3	**Credit:** 1.5
Contact Period: Lecture: 36 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Prerequisites: Programming Knowledge of C/C++.

Course Learning Objectives (CLOs)

This course aims to

1. Distinguish between the basic concepts of time and space complexity and various design strategies. L4
2. Apply the methodologies of Brute force and Divide and conquer and evaluate the complexity.L3
3. Solve a problem using Transform and conquer algorithms and evaluate its correctness.L3
4. Formulate the time-complexity analysis for Dynamic programming and greedy techniques. L6
5. Apply Analyze and Design Branch and Bound techniques. L3,L4

Course Content

NOTE: Design and Implement programs for the following Algorithms using C or C++.

1. Programs to implement Brute Force method.
2. Programs to implement Divide and Conquer method.
3. Programs to implement Decrease and conquer method.
4. Programs to implement Space and Time Tradeoffs.
5. Program to implement Dynamic Programming Method.
6. Program to implement Greedy method.

Course title: Microprocessor Laboratory			
Course Code: P15ISL48	**Semester:** IV	**L-T-P-H :** 0-0-3-3	**Credit:** 1.5
Contact Period: Lecture: 36 Hrs, Exam: 3 Hrs		**Weightage:** CIE:50%, SEE: 50%	

Course Learning Objectives (CLOs)

This course aims to

1. Implement programs related to Searching, sorting and strings. L3
2. Implement programs using Macro, procedure and files. L3
3. Implement Data conversion, number generation. L3
4. Interface hardware device to 8086 processor

Course Content

Part - A

1. Program on searching and sorting,
2. Macros and Procedures (subroutines)
3. Data conversions
4. Strings
5. Recursion
6. File (Read and write)
7. Number Generation

Part - B
(Using Interfacing concepts)

1. Programs on logic controller,
2. Programs on7-segment display,
3. Programs on stepper motor interface,
4. Programs on 8X3 Keypad,
5. Programs on elevator interface.

Note: Out of the exercises executed in the regular laboratory classes, each students will be allotted one question from Part A and one question from Part B, by taking lots in the SEE which he has to execute individually.

Course Title : Aptitude and Reasoning Development - INTERMEDIATE (ARDI)			
Course Code : P15HU49	**Semester :** IV	**L - T - P :** 0 - 0 - 2	**Credits:** 01
Contact Period: Lecture: 32 Hr, Exam: 3 Hrs		**Weightage**: CIE:50%;SEE:50%	

Prerequisites :ARDB

Course Learning Objectives (CLOs)

This course aims to

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

Course Content

Unit – I

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. **6 hrs**

Unit – II

Analytical reasoning 2: The basics of logic, some informal tips, **Assumptions**– Some standard categories of assumptions, Where is the assumption invalid?, **Forcefulness of arguments**– Preliminary screening, Will the results really follow?, Is the result really desirable?, Are the argument and suggested course of action properly related?, **Evaluating Inferences**– A study of key words, How to avoid confusion?, **Evaluating given course of action**– Problem -solution relation, Fact-follow-up action relationship. **8 Hrs**

Unit – III

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. **6 Hrs**

Unit – IV

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. **8 hrs**

Unit – V

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. **4 hrs**

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 statements and identify the assumptions and infer the results based on the arguments or premises. L5
3. Apply the concept of L.C.M in the module time and work to solve the problems with comprehension. L2
4. Analyze the concepts in Co-ordinate geometry by spatial visualization. L4
5. Interpret the logic in the statements of syllogism by critical thinking and apply venn diagram for the effectives ways of deriving at the conclusion. L4
6. Determine the solutions for complicated problems of set theory using the concept of venn diagram. L4

Course Title : Additional Mathematics-II (A Bridge course for Diploma qualified students of IV Sem. B. E.)			
Course Code : P15MADIP41	**Semester :** IV	**L :T:P:H :** 2:2:0:4	**Credits:** NA
Contact Period: Lecture: 52 Hr,		**Weightage: CIE:**100%, [P/NP]	

UNIT –I

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 Hrs**

UNIT –II

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators.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 Hrs**

UNIT –III

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

Vector Integration : Vector Integration :Integration of vector functions. Concept of a line integrals, surface and volume integrals. Green's, Stokes's and Gauss theorems (without proof) problems. Orthogonal curvilinear coordinates. **10 Hrs**

UNIT –IV

Laplace transforms: Laplace transforms of elementary functions. Transforms of derivatives and integrals**,** transforms of periodic function and unit step function-Problems only. Inverse Laplace transforms: Definition of inverse Laplace transforms. Evaluation of Inverse transforms by standard methods. Application to solutions of Linear differential equations and simultaneous differential equations. **12 Hrs**

UNIT –V

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples. Bayes's theorem-examples. **06 Hrs**

Text Book:

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

References:

1.E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 6th Ed., 2007

2.N.P.Bali and Manish Goyal: Engineering Mathematics, Laxmi Publishers,7th Ed., 2007.

Course Title : Environmental Studies			
Course Code: P15EVDIP410	**Semester :** I/II	**L-T-P-H:** 2–0-0-2	**Credits:** NA
Contact Period : Lecture :26 Hr		**Weightage :**CIE:100% - [P/NP]	

Prerequisites:

The student should have undergone the course on Environmental Studies (Code: P15EV19/29)

a) ***Course Learning Objectives (CLO) :***

At the end of the course the students should be able to:

1 Explain the need for Environmental Management
2 Implement standard data like water, wastewater and air pollution.
3 Demonstrate the use of standard data to compare with the field data.
4 Choose appropriate data to protect environmental.
5 Design environmental amenities based on the needs.

b) Relevance of the Course

Environmental Studies is a foundation course in BE (Environmental Engineering) program, that builds the program design and implementation competence in student through choice of appropriate areas.

The course aims at developing the understanding variations in water, wastewater and air pollution and also the ability to build new ideas.

Course Content

Unit – I

Environment – Definition, Ecosystem – Balanced Ecosystem, Human activities – Food Shelter, Economic and Social Security. Transportation activities, Environmental impact Assessment, Sustainable Development. **6 Hrs.**

Unit – II

Natural Resources – Water resources – Availability and Quality aspects, Mineral Resources, Forest Wealth, Material Cycles – (Carbon, Nitrogen and Sulphur Cycles) Water borne diseases, water induced diseases, Fluoride problem in drinking water. 5**Hrs.**

Unit – III

Energy – Different types of energy, Conventional and Non-Conventional sources – Hydro Electric, Fossil fuel based, Nuclear, Solar, geothermal, tidal, wind, Biomass and Bio-gas. Hydrogen as an alternative future source of energy. **5 Hrs.**

Unit – IV

Environmental Pollution and their effects. Water pollution, Land pollution, Noise pollution Public Health aspects. Current Environmental issues of importance: Population Growth Climate change and Global warming – Effect, Urbanizations industrialization. **5 Hrs.**

Unit –V

Acid Rain, Ozone layer depletion, Animal Husbandry. Environmental protection – Role o Government, Legal aspects, initiatives by Non-Governmental Organizations (NGO Environmental Education, Women Education. **5 Hrs.**

Text Book:

1)Environmental Studies – Benny Joseph – Tata McGraw Hill – 2005

References:

1)Principles of Environmental Science and Engineering – .VenugopalaRao P, Prentice Hall 2005
2)Elements of Environmental Science and Engineering – Meenakshi P, Prentice Hall of India, 2
3)Environmental Studies – Anil Kumar D.C, New age International Publishers, 2007