Syllabus

(With effect from 2015-2016 Academic year)

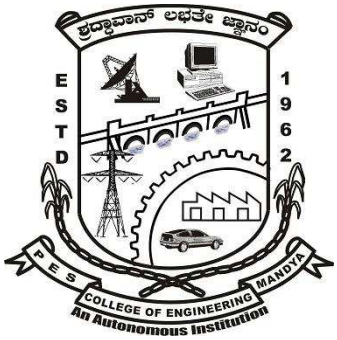
ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2015–16)

III & IV Semester

Bachelor Degree
in
Electrical & Electronics Engineering

Out Come Based Education
with
Choice Based Credit System



P.E.S. College of Engineering, Mandya - 571 401, Karnataka

(An Autonomous Institution Affiliated to VTU, Belagavi)

Grant -in- Aid Institution

(Government of Karnataka)

Accredited by NBA, New Delhi

Approved by AICTE, New Delhi.

ಪಿ.ಇ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ

ಮಂಡ್ಯ–571 401, ಕರ್ನಾಟಕ

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

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Preface

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

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

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

Vision :

Nurturing excellence in Electrical & Electronics Engineering by imparting professional education with values through innovative learning solutions to develop competent engineers.

Mission:

- Enhance the competence of faculty and staff through FDP.
- Provide students with strong theoretical foundation, research and innovation skills.
- Develop interpersonal communication, team work and ethics.
- Promote entrepreneurial qualities among students.

A. **Program Educational Objectives (PEO)**

PEO1: Excel in professional career and/or higher education by acquiring knowledge in mathematical, computing and engineering principles

PEO 1.1.Progressing professional career
PEO 1.2.Higher education

PEO2: Analyze real life problems, design computing systems appropriate to its solutions that are technically sound, economically feasible and socially acceptable

PEO 2.1.Analyzereal life problem
PEO 2.2.Design and develop economically feasible and socially acceptable Computing Solutions

PEO3: Exhibit professionalism, ethical attitude, communications kills, team work in their profession and adapt to current trends by engaging in lifelong learning.

PEO 3.1.Professional conduct and interpersonal skills
PEO 3.2.Adapting to current trends in technology

B. Programme Outcomes (PO)

PO-1: Graduates will apply the knowledge of mathematics, Physics, chemistry and allied engineering subjects to solve problems in Electrical and Electronics Engineering.

PO-2: Graduates will Identify, formulate and solve Electrical and Electronics Engineering problems.

PO-3: Graduates will design Electrical and Electronics systems meeting the given specifications for different problems taking safety and precautions into consideration.

PO-4: Graduates will design, conduct experiments, analyze and interpret data

PO-5: Graduates will use modern software tools to model and analyze problems, keeping in view their limitations.

PO-6: Graduates will understand the impact of local and global issues / happenings on Electrical Engineers.

PO-7: Graduates will provide sustainable solutions for problems related to Electrical and Electronics Engineering and also will understand their impact on environment.

PO-8: Graduates will have knowledge of professional ethics and code of conduct as applied to Electrical engineers.

PO-9: Graduates will work effectively as an individual and as a member or leader in diverse teams and in multi-disciplinary settings.

PO-10: Graduates will communicate effectively in both verbal and written form.

PO-11: Graduates will have the ability for self- education and lifelong learning.

PO-12: Graduates will plan, execute and complete projects.

PES COLLEGE OF ENGINEERING, MANDYA
(An Autonomous Institution, Under VTU)
Department of Electrical and Electronics

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

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P15MAT31	Engineering Mathematics-III	Maths	3:2:0:5	4	50	50	100
2.	P15EE32	Network Analysis	E & E E	3:2:0:5	4	50	50	100
3.	P15EE33	Analog Electronics Circuits	E & E E	3:2:0:5	4	50	50	100
4.	P15EE34	Digital Electronics Circuits	E & E E	4:0:0:4	4	50	50	100
5.	P15EE35	Data Structures with C	E & E E	4:0:0:4	4	50	50	100
6.	P15EE36	Measurement & Instrumentation	E & E E	4:0:0:4	3	50	50	100
7.	P15EEL37	Analog Electronics & Digital Electronics Lab	E & E E	0:0:3:3	1.5	50	50	100
8.	P15EEL38	Circuit Simulation & Measurement Lab	E & E E	0:0:3:3	1.5	50	50	100
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)	--	--
12	P15MADIP31	*Additional Maths-I	Maths	4:0:0:4	0	--	---	---
13	P15HMDIP310	* Indian Constitution, Human Rights & Professional Ethics	Human& Science	2:0:0:2	0	--	---	---
Total					26 [28]	400 [450]	400 [450]	800 [900]

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

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

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/ Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P15MAES41++	Engineering Mathematics-IV	Maths	3:2:0:5	4	50	50	100
2.	P15EE42	Signals and Systems	E & E E	3:2:0:5	4	50	50	100
3.	P15EE43	Electrical Machines-I	E & E E	4:0:0:4	4	50	50	100
4.	P15EE44	Power Plant Engineering	E & E E	4:0:0:4	3	50	50	100
5.	P15EE45	Microcontrollers	E & E E	4:0:0:4	4	50	50	100
6.	P15EE46	Electromagnetic Field Theory	E & E E	3:2:0:5	4	50	50	100
7.	P15EEL47	Electrical Machines Lab-I	E & E E	0:0:3:3	1.5	50	50	100
8.	P15EEL48	Microcontroller Lab	E & E E	0:0:3:3	1.5	50	50	100
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	P15EVDIP410	*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

+ Common to BE (AU, CV, ME and I&PE)

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

Evaluation Scheme							
Scheme	**Weightage**	**Marks**	**Event Break Up**				
CIE	50%	50	**Test I**	**Test II**	**Quiz I**	**Quiz II**	**Assignment**
			35	35	05	05	10
SEE	50%	50	**Questions to Set: 10**		**Questions to Answer: 5**		

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.

Semester III

Course Title: Engineering Mathematics			
Course Code: P15MA31	**Semester**: III	**L – T – P – H :** 3– 2 – 0 – 5	Credits: 4
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

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**.**

Course Outcomes

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

1. Apply forward, backward difference formulae and central differences formulae in solving interpolation- extrapolation problems in engineering field.
2. Apply Numerical differentiation and integration rules in solving engineering where the handling of numerical methods is inevitable.
3. Recognize the importance of Fourier series & Fourier transforms, difference equations and Z-transforms in the field of signals and systems, communication and network theory signal and image processing, control theory, flow & heat transfer and theory of elasticity.

4. Learn modeling in terms of partial differential equations and also, learn different exact/analytical methods of solving with special emphasis on interpretation of the solution.
5. Interpret the solution of one-dimensional wave, heat and Laplace equations with given initial and boundary conditions in the context of various engineering and technological applications.

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

UNIT- I

1. a) Find the missing values in the following data:

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

Marks	CO's	Levels
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:

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

Find the values of y when $x = 410\ ft$.

Marks	CO's	Levels
7	1	L2

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.

Marks	CO's	Levels
7	1	L2

2. a) Use Lagrange interpolation to fit a polynomial to the following data.

x	0	1	3	4
y	-12	0	6	12

Hence find f (1.5) and f(5).

Marks	CO's	Levels
6	1	L2

b) Using Gauss backward difference formula, find y(8) from the following table:

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

Marks	CO's	Levels
7	1	L2

c) Using sterlings formula find y_{35} given

$y_{20} = 512$, $y_{30} = 439$, $y_{40} = 346$, $y_{50} = 243$

Marks	CO's	Levels
7	1	L3

UNIT- II

3 a).Given the data

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

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

Marks	CO's	Levels
6	2	L3

b) Find the $f''(6)$ from the following data

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

using Newton's divided difference formula

Marks	CO's	Levels
7	2	L3

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

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

Marks	CO's	Levels
7	2	L3

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 $f(x)=x-x^2$. Hence deduce that $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\cdots=\frac{\pi^2}{12}$.	7	3	L2
(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:	7	3	L3

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

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 $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$	7	5	L3
given that $u(0, y) = 2e^{5y}$.	7	4	L2
(c). Solve: $(mz-ny)p + (nx-lz)q = (ly-mx)$.	10	5	L3
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 $u(0,t) = 0,\quad u(l,t) = 0$ for $t \geq 0$ and $u(x,0) = 0,$ $\frac{\partial u}{\partial t}(x,0) = x(l-x),\ 0 \leq x \leq l.$			

Course Title: Network Analysis			
Course Code: P15EE32	**Semester:** III	**L.T.P.H**: 3-2-0-5	**Credits:**4
Contact Period: Lecture:50Hrs., Exam 3 Hrs		**Weightage:** CIE:50%; SEE:50%	

Prerequisites: The student should have undergone the course on Basic electrical engineering.

Course Learning Objectives (CLOs)

This course aims to:

1. To obtain solution to problems on electrical network using different techniques and Theorems and resonance concepts.
2. To determine graphical solution to electrical networks using Network Topology.
3. Analyze and obtain the time domain Response of RLC circuits for all types of excitations using Laplace transforms
4. Realization of network functions
5. Driving point immittance functions, Properties, Poles & zeros
6. Provide sufficient knowledge to characterize two port networks with a set of parameters

Relevance of the Course: This course deals with dependent and independent sources, source transformation, theorems, resonance concepts , network topology, to analyze networks under transient condition due to switching and obtain time domain response of RLC circuits with DC and for all types of excitations using Laplace transforms and have some practical applications to all these chapters. Enable the students to effectively utilize the knowledge obtained in this course to analyze the circuit models of electrical machines, power systems, electronic circuit etc.

Course content

UNIT-I

Basic Circuit Concepts: Introduction, Dependent and Independent sources, Source transformation, Star - Delta transformation, Mesh and Super mesh, Nodal &Super node analysis with dependent and independent sources for DC and AC networks.

Resonant circuits: Basic definition, Conditions for Series & Parallel resonance, frequency response, Quality factor, Bandwidth**.** **10 Hrs**

UNIT-II

Network theorems: Superposition,Thevenin's and Maximum power theorems as applied to DC and AC circuits.

Network Topology: Graph of network, concept of a tree and co-tree, incidence matrix, tie-set and cut-set schedules. Formulation of equilibrium equations in matrix form, solution of resistive networks, principle of duality, determination of dual circuits. **10Hrs**

UNIT-III

Transient behavior and Initial and Final Conditions In Networks: Integro-differential equations for networks, Transient behavior of series R-L, R-C, R-L-C Circuits for DC excitation only, Behavior of R, L and C at the instant of switching and at final conditions where the excitation is D.C. Meaning of initial and final conditions in networks. Importance and need for determination of initial conditions. Laplace Transform and its applications: Laplace transform of standard signals - step, ramp,impulse, Gate function. Shifting theorem, Waveform synthesis of Recurring and Non Recurring signals. Determination of Laplace transform of waveforms using waveform Synthesis. **10 Hrs**

UNIT-IV

Network Analysis Using Laplace Transforms: Analysis of R, L, C, R-L, R-C and R-L-C Circuits to various functions such as step, ramp, impulse.

Concept of transformed impedance and transformed network: Analysis of circuits by using transformed network. Convolution integral and its applications. Borell's theorem and Duhamel's Superposition Integral and its applications to networks. **10Hrs**

UNIT-V

Network Functions: Driving point immittance functions, Properties, Poles & zeros, Significance and time domain response from pole zero plot.Two Port Network Parameters: Network configurations, Z - parameters, Y-parameters,Transmission parameters, h-parameters, Relationship between these parameter sets. Calculation of these parameters for resistive networks. **10Hrs**

Text Books:

1). Hayt, Kemmerly and Durbin, "Engineering circuit analysis", McGraw-Hill Education, 8th Edition, 2011.
2). Joseph Edminister & Mahmood Nahvi, "Theory and problems of Circuits", McGraw Hill Professional, 6thEdition, 2002.
3). VanValkenburg, "Network Analysis", PHI, Pearson Education, 2012.
4). Franklin F.Kuo, Network Analysis & Synthesis, Wiley International.

Reference Books:

1). N.N.Parkersmith, "Problems in Electrical Engineering", CBS Publishers, 9thedition, 2003
2). R.P Punagin, "Electrical Network Analysis" Swapna book House, 1st Edition, Sept 2002 2002.
3). Roy Choudary, "Networks and system", New age Publication, 2nd edition, 2013

Course Outcomes

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

CO1: To solve problems on electrical network using different techniques and theorems, resonance concepts

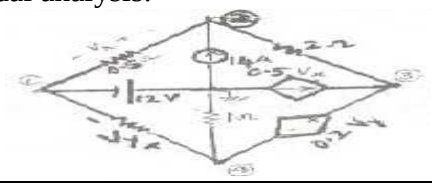
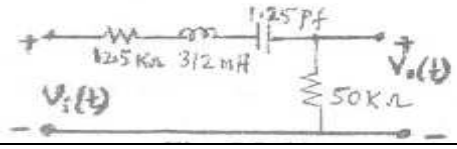
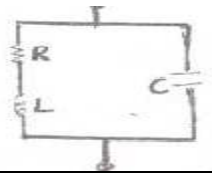
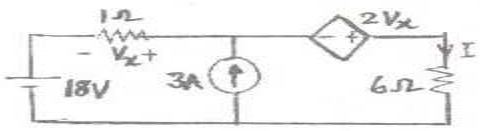
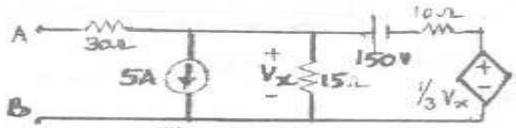
CO2: To obtain graphical solution to electrical networks using Network Topology.

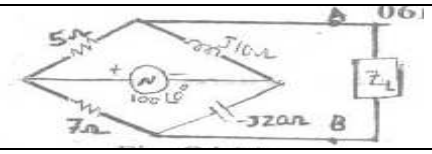
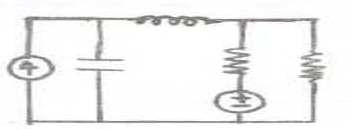
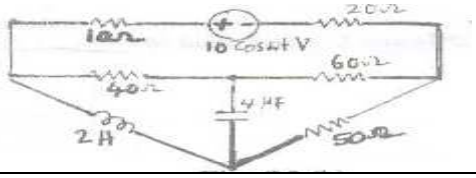
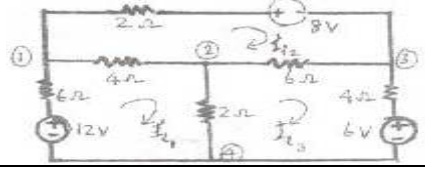
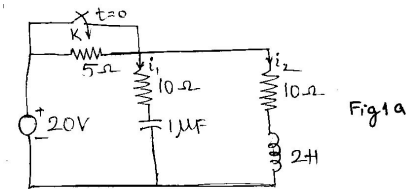
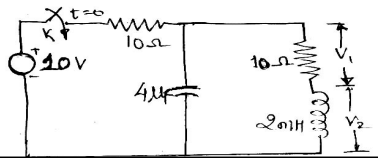
CO3: Analyze the network under transient condition due to switching

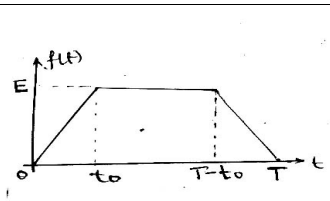
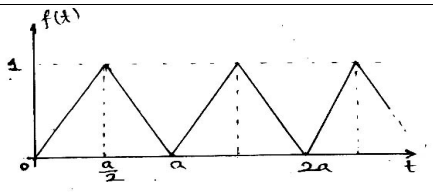
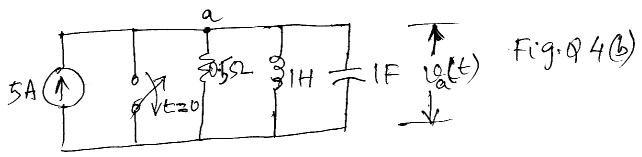
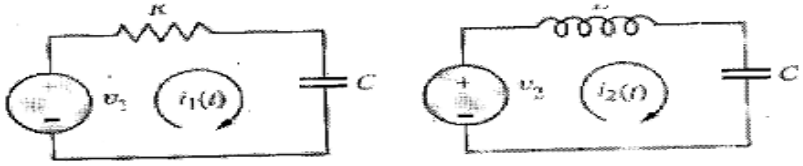
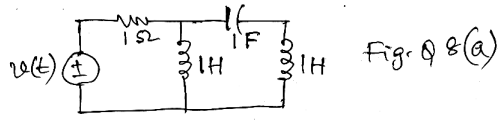
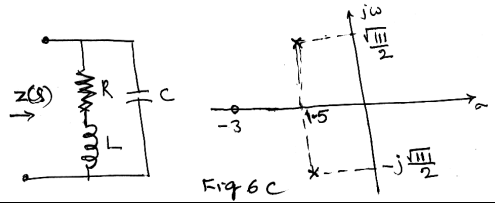
CO4: Analyze and obtain the time domain response of R, L, C circuits for all types of excitations using Laplace transforms

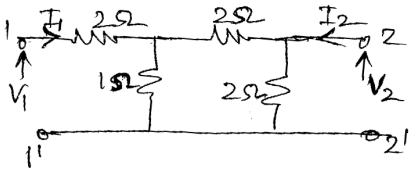
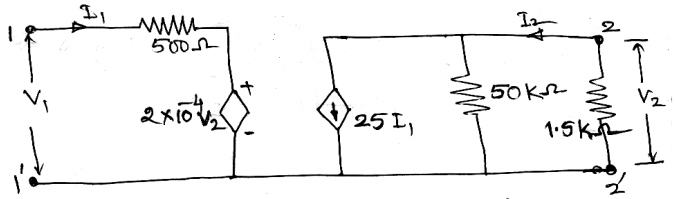
CO5: Represent the two port networks by Z, Y, ABCD and h Parameters and Assessment of stability of network from network function.

Model Question Paper

SI.NO	Model Question Paper	Marks	CO's	Levels
UNIT-I				
1.a)	Derive an expression for i) Star to delta transformation ii) delta to star transformation	10	CO1	L2
b)	Find the voltages at nodes 1,2,3 & 4 for the network shown in figure using nodal analysis. 	10	CO1	L4
2.a)	A series RLC circuit has R=50Ω, L=0.01H & C=0.04 μF and is connected to ac source of 100V. Find the i) Resonant frequency ii) circuit impedance at resonant frequency iii) maximum value of voltage across capacitance and the frequency at which it occurs iv) voltage across inductance at resonance.	06	CO1	L4
b)	For the network shown in figure determine the following i) f_0 ii) Q iii) half power frequencies iv) Band width. 	07	CO1	L3
c)	Derive the expression for resonant frequency for the parallel resonant circuit shown in figure. If R=25Ω, L=0.5H and C=5μF. Find W_0 , Q and bandwidth for the circuit.  Fig	07	CO1	L3
UNIT-II				
3.a)	Using superposition principle, find the current in 6 ohm resistor in the network shown in figure 	06	CO2	L4
b)	Calculate Thevenin's equivalent circuit across AB for the network shown in figure. 	07	CO2	L5
c)	Find the value of Z_L for which maximum power is transferred to the load Z_L from the network in figure	07	CO2	L3

				
4.a)	Find the maximum possible number of trees for the network shown in figure 	07	CO2	L3
b)	Draw the dual of the network shown in figure 	06	CO2	L4
c)	For the network shown in figure calculate I_1, I_2, I_3 using graph theory and network equilibrium equation based on KVL 	07	CO2	L4
UNIT-III				
5.a)	For the circuit shown in Fig1a steady state is reached with switch K open. Switch K is opened at t = 0. Determine the values of i_1, i_2, $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ all at t = 0+. Also find $\frac{d^2i_1}{dt^2}$ & $\frac{d^2i_2}{dt^2}$ at t = 0+.  Fig1a	10	CO3	L5
b)	For the network shown in Fig 1b switch K is closed at t = 0. Find the values i) V_1 & V_2 at t =0+ ii) V_1 & V_2 at t = ∞ ii) $\frac{dv_1}{dt}$ & $\frac{dv_2}{dt}$ at t = 0+ iii) $\frac{d^2v_1}{dt^2}$ at t = 0+  Fig 1b	10	CO3	L4
6.a)	Show that Laplace transform of $\delta(t) = 1$	04	CO3	L2
b)	Find the Laplace transform of the wave form shown in Fig 2.b.	06	CO3	L4
c)	Find the Laplace transform of the periodic wave form shown, in fig 2.c by waveform synthesis.	10	CO3	L3

	 Fig 2b  Fig 2c			
UNIT-IV				
7.a)	For the circuit given in Fig. Q.4.(b), the switch is opened at t = 0. Determine the terminal voltage $v_a(t)$ using Laplace Transformation method.  Fig. Q 4(b)	10	CO4	L4
b)	In the two circuits shown in Fig 4(a) $v_1(t) = \sin 10^3 t$ and $v2(t) = e^{-1000t}$ and c = 1 μF. Determine the values of R and L to satisfy $i_1(t) = i_2(t)$ 	10	CO4	L3
8.a)	A series RL circuit is excited by a source $V(t) = 4e^{-3t}$ with R = 2 Ω & L = 1 H. Find an expression for the voltage across the inductor $V_L(t)$ by using convolution theorem	10	CO4	L4
b)	A pulse is of amplitude 5V for duration of 4 sec with its starting point t = 0, Find the convolution of this pulse with itself and draw the convolution versus time.	10	CO4	L3
UNIT-V				
9.a)	For the network shown in Fig. Q.8 (a), Obtain driving point impedance function.  Fig. Q 8(a)	10	CO5	L4
b)	For the network shown in Fig. 6(c) the pole zero plot is also shown. Find the values of R, L and C if Z (0) = 1.  Fig 6 c	10	CO5	L3
10.a)	For the network shown in Fig. Q.6 (b), Obtain Z and Y parameters.	10	CO5	L5

	 Fig. Q 6(b)			
b)	For the hybrid transistor circuit shown in Fig. 5(b) determine current gain and voltage gain.  Fig 5b	10	CO5	L4

Course Title: Analog Electronics Circuits			
Course Code: P15EE33	**Semester: III**	**L-T-P-H: 3-2-0-5**	**Credits – 4**
Contact period : Lecture: 50Hrs, Exam 3 Hrs		**Weightage : CIE:50; SEE:50**	

Course Learning Objectives (CLO)

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

1. Analyse and design Diode and Transistor circuit such as Clippers, Clampers, Voltage Multipliers and Amplifiers
2. Analyse and design two port hybrid equivalent model for BJT amplifier and Various BJT Oscillator Circuits
3. Understand the effect of negative feedback in transistor amplifier
4. Analyse and design various Power amplifier circuits and study the effect of distortion Power amplifier Analysis of OP-AMP Circuits

Relevance of the Course:

- This course will enable the students to extend their knowledge to analyze and designDiode Circuits, Transistor biasing circuits, BJT amplifiers, Power amplifiers ,Oscillators
- Students are introduced to OP-AMP, and special purpose diodes (zener), feedbacktechniques used in amplifier and representation of transistor circuits by hybridmodel
- Sufficient knowledge is provided so that students will be able to use this course asthe basis for other advanced courses on Electronics.

Continue to enhance oral and written communications skills specifically directedto the practice of electrical engineering

Course content

Unit – I

Diode Circuits: Introduction, Clipping Circuits, Clipping at two independent levels, Clampers, Voltage multiplier Circuits, Zener Regulator

Transistor Biasing & Amplifiers: Operating point, DC Load line, Voltage divider bias. Classification of Amplifiers, Distortion in Amplifiers, RC Coupled Amplifiers, frequency response of Amplifier. **10Hrs**

Unit – II

BJT Transistor Modeling: Introduction, Two port approach & hybrid Model, CB,CE,CC Hybrid equivalent Model, The Important Parameters: *Zi, Zo, Av, Ai,*

BJT Oscillators: Oscillator operation, Phase shift oscillator, Wien bridge oscillator, Tuned oscillators (Hartley &Colpitts), Crystal oscillator. **10Hrs**

Unit – III

FeedBack Concepts: Feedback concept, Loop gain, Feedback connections type, Characteristics, Effect of Negative Feedback on Input Resistance, Output Resistance and Advantages. **10Hrs**

Unit – IV

Power Amplifiers: Definitions and Amplifier types, Series fed Class A Amplifier, Transformer coupled Class A Amplifier, Transformer coupled Push pull Circuits, Amplifier Distortion, Second Harmonic Distortion. **10Hrs**

Unit –V

Op –Amp: Introduction, Characteristics of Op-Amp, Inverting and non- inverting amplifier, voltage follower Differential Amplifier, Comparators, Schmitt Trigger. R-2R ladder D/A, successive approximation A/D Converter, Sample and Hold Circuit. **10Hrs**

Text Book

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 8th Edition, 2008.
2. SudhakarSamuel,U B MahadevaSwamy "Electronic circuits", Sanguine publications, 2004

References:

1. Albert Malvino & David J Bates, Electronic Principles, 7th Edition, TMH, 2007.David A Bell, "Electronics Device and Circuits" 5nd Edition, Oxford

Course Outcomes

CO1: Analyse and design Diode and Transistor circuit such as Clippers, Clampers, VoltageMultipliers and Amplifiers

CO2: Analyse and design two port hybrid equivalent model for BJT amplifier and Various BJT Oscillator Circuits

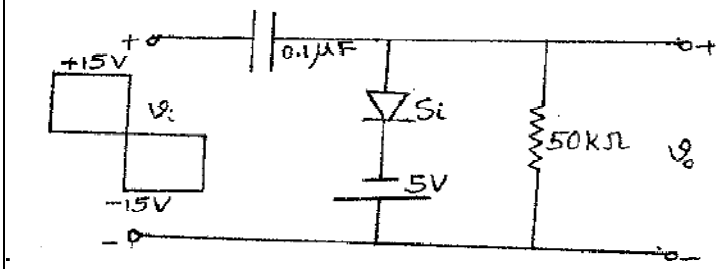
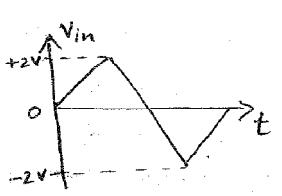
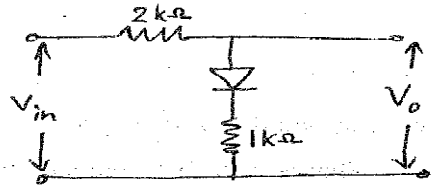
CO3: Understand the effect of negative feedback in transistor amplifier

CO4: Analyse and design various Power amplifier circuits and study the effect of distortionson Power amplifier

CO5: Analysis of OP-AMP Circuits

SEE SCHEME

Semester End Examination (SEE) is of three hours duration of 100 marks with 50% Weightage.

SI.NO	**Model Question Paper**	**Marks**	**CO's**	**Levels**
UNIT-I				
1.a)	For the clamping circuit shown draw the output waveform assume $V_T = 0.7V$ 	07	CO1	L3
b)	For a voltage divider bias configuration derive an expression for I_c & V_{CE}	07	CO1	L2
c)	Explian Frequency Response of RC Coupled Amlifier	06	CO1	L4
2.a)	Assume ideal diode for the circuit shown below, Draw the output waveform for the given input signal  	07	CO1	L3
b)	Explain various distortions of amplifiers	06	CO1	L1
c)	With Circuit diagram explain voltage doubler circuit	07	CO1	L2

UNIT-II				
3.a)	Explain RC Phase shift oscillator? State condition for sustained oscillations	07	CO2	L2
b)	A transistor connected as a commmon emitter amplifier is driving a load of 10k. It is supplied by a source of 1K internal resistance. The hybrid parameters of the transistors used are hie =1100Ω, hfe=$2.5x10^{-4}$, hoe=1/40k. Find a) current gain b)voltage gain c) input impedence d)output impedence	07	CO2	L3
c)	Explain working of crystal oscillator	06	CO2	L2
4.a)	Differentiate between RC Phase shift and wein bridge oscillator.	06	CO2	L2
b)	Transisitor amplifier using h-Parameter derive an expression for i) Current gain ii) input impedenceiii) Voltage gain	08	CO2	L3
c)	From the two port network & hybrid model, Derive an expression for hybrid parameters	06	CO2	L4
UNIT-III				
5.a)	Derive an expression for gain of a negative feedback amplifier	05	CO3	L3
b)	Obtain magnitude and phase angle of gain at different frequecies for a low frequecy response of the amplifer and plot gain and phase	08	CO3	L3
c)	Explain voltage series and shunt Feedback amplifier	07	CO3	L2
6.a)	Obtain magnitude and phase angle of gain at different frequecies for a High frequecy response of the amplifer and plot gain and phase	08	CO3	L3
b)	Explain RC Coupled amplifier and explain its frequency response	05	CO3	L4
c)	Explain Current series & Current shunt feedback amplifier	07	CO3	L2
UNIT-IV				
7.a)	Explain series fed class A power amplifer ? Derive an expression for $P_{O(ac)}$	07	CO4	L2
b)	A class A transformer coupled audio powr amplifier is required to derive a maximum of 100W into a loud speaker of 10Ω resistance. If the output resistance of the amplifier is 1000Ω calculate a) turns ratio of the transformer required b) Power supply voltage . assume an ideal transformer h	08	CO4	L3
c)	A transistor supplies 0.85W to a 4K load. The zero signal DC Collector current is 31 Ma and the dc collector current with signal is 34mA. Determine the second harmonic	05	CO4	L3
8.a)	Explain the working of Class-B push-pull power amplifier	08	CO4	L4
b)	what is harmonic distortion ? obtain an expression for collector current interms of second harmonic distortion	08	CO4	L2
c)	A class A Series fed power amplifier is required to deliver a maximum power of 20W to a load of 4Ω. Calculate the rquired supply voltage	04	CO4	L3
UNIT-V				
9.a)	Explain inverting and non-inverting opamp circuit	08	CO5	L4
b)	Explain the working of Schmitt Trigger using opamp	06	CO5	L2
c)	List the characteristics of Ideal OP-Amp	06	CO5	L1

10. a)	with neat figure explain the working of R-2R ladder D/A, successive approximation A/D Converter	10	CO5	L2
b)	Explain following opamp cirucits 1. Differential Amplifier,2. Comparators, 3.Sample and Hold Circuit	10	CO5	L2

Course Title: Digital Electronics			
Course Code: P15EE34	**Semester: III**	**L-T-P-H: 4-0-0-4**	**Credits - 4**
Contact period : Lecture: 52Hrs, Exam 3 Hrs		**Weightage :** CIE:50; SEE:50	

Course Learning Objectives (CLOs)

This course aims to

1. To optimize logic expressions using Karnaugh map and Tabular method(L1)
2. To simplify Boolean equation and design combinational circuits with optimal gates (L4)
3. To Analyze the working principles of Flip-Flops and design asynchronous sequential circuits(L4)
4. Understand the basic concepts of Counters and shift registers(L2)
5. Understand the concepts of A/D & D/A converters(L2)

Course Content

Unit – I

Digital Electronics: Introduction to Digital & Analog Systems, Logic levels,elements of digital logic, Functions of digital logic, Digital Integrated Circuits &level of integration

Digital Circuits: Introduction, Logic operations, axioms & laws of Boolean algebra, Duality, Reduction of Boolean expressions, Boolean functions and their representation, Expansion in SOP & POS form Boolean Expression conversation into logic, Conversation of Basic gates into Universal **10 Hrs**

Unit – II

Combinational Logic: Minimization of switching functions using K-Map, 2, 3 & 4 variable, mapping and minimization. Don't care combination solutions.Minimization by Quine - Mclusky method

Combinational Circuits: Half adder, Full adder, half, full Subtractor, Parallel binary adder, Look ahead carry Adder . **10 Hrs**

Unit – III

Encoder: octal to binary, decimal to BCD , Priority encoder: 4 input, decimal to BCD

Decoder:3 to 8 Line, BCD to Decimal ,Multiplexer: 2 input, 4 inputs, 8 inputs. Demultiplexer: 1 to 4 line, 1 to 8 line.

Sequential circuits: Basic stable element, latches, S R latches, Gated S-R latch, Gated D-Latch, SR, D, JK, and T F/Fs, Master- Slave ,SR,D,JK F/Fs, Conversion of SR to JK and SR to D F/Fs and vice versa **12 Hrs**

Unit –IV

Counters: Synchronous & Asynchronous Counters divide by 2,4& 8, Mealy and Moore models, State M/c equations, construction of state diagrams, Modulo-8 Synchronous counter design

Shift registers: Types of Shift registers - SISO, SIPO, PISO and PIPO, shift left and shift right register **10 Hrs**

Unit –V

D/A and A/D converters: Introduction, R-2R DAC , R-2R Ladder DAC,weighted DAC, Flash Type ADC, Dual slope ADC, Successive Approximation ADC

Logic families: Two input TTL NAND gate, ECL, MOS and CMOS circuits & their operation. **10 Hrs**

Text books:

1). A.Anand Kumar, Fundamentals of Digital Circuits ,PHI,2011
2). Givone,Digital Principles & Design, Mc Graw Hill,2011

Reference:

1.Morries Mano, Digital Logic Design, PHI,2012
2. A.K.Maini, Digital Electronics, Wiley,India,2010
3. Kharate, Digital Electronics, Oxford,2011

Course Outcomes

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

CO1: To understand the different switching algebra theorems and apply them for logic functions.

CO2: To define the Karnaugh map for a few variables| & combinational circuits: half adders/subtractors ,encoders/decoders

CO3: To understand the bistable element and the different latches and flipflops.

CO4: To understand sequential circuits, like counters and shift registers

CO5: To understand the concepts of A/D & D/A converters

Model question paper

	UNIT - I	M	Blooms level	COs
1. a.	with the help of circuit diagram explain the working of i) AND ii) OR iii) NOT Gate	8	L2	CO1
b.	Prove that i) (X + Y). (W'X'Z) + (X + Y). (W'X'Z)'= x+y ii) ABC + ABC' + AB'C + A'BC = AB + AC + BC	6	L5	CO1
c.	Complement of function in sum-of-products form i) F= A'B'C' + A'BC' + AB'C' ii) F = A'B'C + A'BC + AB'C + ABC' + ABC	6	L1	CO1
2 a.	what are the different levels of integration? Give examples?	6	L1	CO1
b.	State and prove i) consensus theorem ii) transposition theorem	8	L5	CO1
c.	Complement of function in product-of-sums form i) (A + B + C') (A + B' + C') (A' + B + C') (A' + B' + C) (A' + B' + C') ii) (A + B + C) (A + B' + C) (A' + B + C)	6	L1	CO1
	UNIT - II			
3 a.	F(A,B,C,D)=∑ (0,1,3,5,6,11,12,13,14) reduce by k-map i) SOP form ii) POS form realize using i) AOI Logic ii) NAND Gates	10	L1	CO2
b.	Obtain the minimal expression for F=(A,B,C,D)=∑ (1,2,3,5,6,7,8,9,12,13,15) using Tabular method	10	L2	CO2
4 a.	What is Full adder? Realize Full adder using i) NAND Gates ii) NOR Gates	10	L1	CO2
b.	What is parallel adder? Design four bit look ahead carry generator	10	L1	CO2
	UNIT - III			
5 a.	Give the comparison between encoder and decoder	4	L1	CO3
b.	Convert the following i) SR Flip-Flop to JK Flip-Flop ii) JK Flip-Flop to T Flip-Flop	8	L2	CO3
c.	Obtain the characteristic equations of: i) JK Flip-flop ii) T-flip-flop iii) D-Flip-flop	8	L2	CO3
6. a	Give the comparison between multiplexer and demultiplexer	5	L1	CO3
b.	Configure a 5:32 decoder using four 3:8 decoder IC's and a 2:4 decoder IC	7	L4	CO3

c	What is race around condition in Flip-flops? Explain how it is eliminated?	8	L1	C03
	UNIT - IV			
7 a.	with neat timing diagram, explain the working of a 4 bit SISO register.	10	L2	CO4
b.	Design a synchronous mod 6 up counter using JK flip flop	10	L6	CO4
8 a.	Explain mealy and Moore models of a clocked synchronous sequential network	10	L1	CO4
b.	With the help of logic diagram and state diagram explain the operation of Johnson Counter and ring counter	10	L1	CO4
	UNIT - V			
9 a.	With the aid of a circuit diagram, explain the operation of 2-input TTL NAND gate With Totem-pole output	10	L1	CO5
b.	Draw a 4 bit D/A converter using R-2R resistors and explain its working	10	L1	CO5
10 a.	what is accuracy and resolution of the D/A converter? What is the resolution of a 12-bit D/A converter which uses a binary ladder? If the full scale o/p is +10Volts what is the resolution in volts.	10	L1	CO5
b.	Explain the operation of 2-input CMOS NOR gate with the help of a circuit diagram	10	L1	CO5

Course Title: Data structures with C			
Course Code: P15EE35	**Semester: III**	**L.T.P.H: 4-0-0-4**	**Credits: 4**
Contact Period: Lecture:50 Hrs., Exam 3 Hrs		**Weightage: CIE:50%; SEE:50%**	

Prerequisites: The students should have undergone the course on C- programming so that they should have Basic C programming skills and also should know the Basics of computers.

Course Learning Objectives (CLOs)

This course aims to:

1. Understand and Practice the fundamentals of data structures and their applications essential for Programming/problem solving (L1).
2. Describe, Analyze and Learn the Basic operations on Linear Data Structures: Stack, Queues, Lists (L2).
3. Describe, Analyze and Design the Non-Linear Data Structures: Trees, Graphs (L2, L3).
4. Identify the different tree traversal techniques (L3).
5. Learn the different searching (viz., Binary Search) algorithms (L4).

Relevance of the Course

This course gives the students a basic understanding of the computer software related subject–'Data structures' with examples using Clanguage. It is a very useful basic subject for the students who wants to have a software skill in developing any software programming or software projects of any field. Developinga software involves effective way of handling the data and its storage. Because it consumes lots of memory space and to manipulate such large data, the data should be stored or structured in a useful way.This subject facilitates programmer to implement his project effectively in different data types. Also it covers the knowledge about searching and sorting the data used or stored.

Course Content

Unit – I

Basic Concepts: Pointers and Dynamic Memory Allocation, Algorithm Specification, Data Abstraction, Performance Analysis, Performance Measurement.

Arrays and Structures: Arrays, Dynamically Allocated Arrays, Structures and Unions, Polynomials, Sparse Matrices, Representation of Multidimensional Arrays. **10 Hrs**

Unit – II

Stacks and Queues: Stacks, Stacks Using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. **10 Hrs**

Unit – III

Linked Lists: Singly Linked lists and Chains, Representing Chains in C, Linked Stacks and Queues, Polynomials, Additional List operations, Sparse Matrices, Doubly Linked Lists. **10 Hrs**

Unit –IV

Trees &Graphs: Introduction, Binary Trees, Binary Tree Traversals, Threaded Binary Trees, Heaps. Binary Search Trees, Selection Trees, Forests, Representation of Disjoint Sets, Counting Binary Trees, Graphs- definition - representation of graph. The Graph Abstract Data Type**.** **10 Hrs**

Unit –V

Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees, Red-Black Trees, Splay Trees. **10 Hrs.**

Text Books:

1. "Fundamentals of Data Structures in C " by: Horowitz and SartazSahni, Anderson-Freed, 2ndEdition,Universities-Press, 2007. Chapters 1, 2.1 to 2.6, 3, 4, 5.1 to 5.3, 5.5 to 5.11, 6.1,10).

2. “Data Structures – A pseudo code Approach with C” – Richard F Gilberg andBehrouz A forouzan, 2ndEdition.

Reference Books:

1. Data Structures using C, second edition, Reemathareja, Oxford press.
2. Debasis Samanta: Classic Data Structures, 2nd Edition, PHI, 2009.

Course Outcomes

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

CO1: Design and Implement various standard data structures
CO2: Design and implement operations on Stacks & Queues
CO3: Develop programs to implement different Linked Lists.
CO4: Analyze the performance of Trees, Graphs
CO5: Design and implement different tree traversal techniques.

SI.NO	Model Question Paper	Marks	CO's	Levels
UNIT-I				
1.a)	What is a pointer variable? What are the uses of pointers in C	05	CO1	L1
b)	What is static and dynamic memory allocation? Explain with examples , the dynamic memory allocation functions	10	CO1	L2

c)	What is the output of the following code?
	intnum[5]= { 3,4,6,2,1};
	int *p=num;
	int*q=num+2;
	int *r =&num[1];
	printf("%d%d",num[2],*(num+2));
	printf("%d%d", *p,*(p+1));
	printf("%d%d", *q,*(q+1));
	printf("%d%d", *r,*(r+1));
		05	CO1	L4

2.a)	Can we have multiple pointers to a variable? Explain Lvalue and Rvalue with examples	06	CO1	L3
b)	Write a C program using pass by reference method to swap two characters.	07	CO1	L4
c)	Write C program to read the ten integers and store them in an array using pointers. Print their sum and average	07	CO1	L4
UNIT-II				
3.a)	How does a structure differ from a union? Mention any 2 uses of structure.	06	CO2	L2
b)	What is a bit field? Why are bit fields used with structures?	06	CO2	L3
c)	Write a C program to represent a complex number, using structure and multiply the 2 complex numbers.	08	CO2	L3
4.a)	What is a string? How string is declared and initialized?	05	CO2	L1
b)	Explain briefly the following string functions, with examples: (i)STRTOK (ii) STRCMP (iii) STRTOL (iv) STRSTR	08	CO2	L2
c)	Write function that given a binary file, copies the odd items (i.e item 1,3,5,7…n) to a second binary file and even items to a third binary file.	07	CO2	L4
UNIT-III				
5.a)	How do you define a data structure? List the operations on the stack. Write the C implementation of these operations.	08	CO3	L2
b)	Implement reversing a string , using stack in C.	07	CO3	L4
c)	Explain the working of a simple queue.	05	CO3	L1
6.a)	How is stack a data structure? Give a C program to construct a stack of integers and perform all the necessary operations on it.	08	CO3	L2
b)	Write an algorithm to convert a valid infix expression to a postfix expression. Also evaluate the following suffix expression for the values: A=1 B=2 C=3. AB+C-BA+C$-	06	CO3	L4
c)	Mention is the advantage of the circular queue over ordinary queue? Mention any two Applications of queues.	06	CO3	L1

UNIT-IV				
7.a)	List out any two applications of linked list and any two advantages of doubly linked list over singly linked list.	08	CO4	L2
b)	Write a C program to simulate an ordinary queue using a singly linked list.	06	CO4	L4
c)	Give an algorithm to insert a node at a specified position for a given singly linked list.	06	CO4	L1
8.a)	Briefly explain the structures of different types of linked lists. Write a C function to count number of elements present in a singly linked list.	07	CO4	L3
b)	Write a C program to create a linked list and interchange the elements to the list at position m and n and display contents of the list before and after interchanging theelements.	07	CO4	L4
c)	Write a C program to perform the following operations on doubly linked list : (i) insert a node (ii) delete a node.	06	CO4	L3
UNIT-V				
9.a)	Define the following: i) Binary tree. ii) Complete binary tree. iii) Almost complete binary tree. iv) Binary search tree.v) Depth of a tree.	10	CO5	L2
b)	What is threaded binary tree? Explain right in and left in threaded. Construct a binary tree for: ((6+(3-2)*5)^2+3).	10	CO5	L1
10.a)	Describe the following with an e.g.: i) Height balanced trees ii) optimal binary search trees.	06	CO5	L2
b)	Explain the Red-black tree. State its properties.	07	CO5	L2
c)	What is splay tree? Briefly explain the different types of splay tree	07	CO5	L2

Course Title: Measurements & Instrumentation			
Course Code: P15EE36	**Semester:** III	**L.T.P.H:** 4-0-0-4	**Credits:** 3
Contact Period: Lecture:52Hrs., Exam 3 Hrs		**Weightage:** CIE:50; SEE:50	

Prerequisites: The student should have undergone the course on Basic electrical engineering

Course Learning Objectives (CLOs)

This course aims to:

1. To understand the principle of operation & working of different electrical & electronic instruments (L2).
2. To understand the principle of operation & working of different Bridges (L2).
3. To understand different types of standards, methods of calibration used in measurements also to get idea about statistical and regression analysis (L4).
4. To create awareness of different Electrical transducers by means of study about instrumentation used in process engineering (L5).

Relevance of the Course

This course gives the students a basic understanding of working and operation of different instruments. It facilitates the knowledge of different types of standards, methods of calibration used in measurements also to get an idea about statistical and regression analysis. Also it covers the knowledge about operation and major components of electric generating plants. Learning about different transducers by means of study about instrumentation used in process engineering.

Course Content

Unit – I

a) Units and Dimensions: Review of Fundamental and derived units, SI units, Dimensions and dimensional equations, illustrative problems.

b) Introduction to basic measuring concepts: Essential torques, Basic types of instruments, operating principle of Ammeters, voltmeters, wattmeter (LPF & UPF), Energy meter– errors& adjustments, illustrative example. **10 Hrs**

Unit – II

a) DC Bridges for Measurement of Resistance: Wheatstone bridge - sensitivity analysis & limitations, Kelvin's double bridge, Cable and Earth resistance measurement using Megger, Illustrative examples.

b) AC Bridges for Measurement of Inductance & Capacitance: Anderson's bridge, Schering bridge, Sources and detectors, Shielding of bridges, Wagner Earthing device, Illustrative Examples. **10 Hrs**

Unit – III

Extension of instrument ranges

a) Shunts and Multipliers, Illustrative examples.

b) Instrument Transformers - Construction and theory, Equations for ratio and phase angle errors of C.T. and P.T (derivations excluded), Turns compensation, Illustrative examples (excluding problems on turns compensation) **10 Hrs**

Unit –IV

a) Electronic Instruments: Introduction, True RMS responding voltmeter, Digital Multimeter, Digital voltmeters, Digital Tachometer, Electronic Energy meters

b) Transducers: Classification and selection of transducers, Strain gauges, LVDT, Temperature measurements, Interfacing resistive transducers to electronic circuits.

10Hrs

Unit –V

Oscilloscopes and Display Devices: Front panel details of a typical dual trace oscilloscope, Method of measuring amplitude, Phase, Frequency, Period, Use of Lissajous patterns, Working of a digital storage oscilloscope, X-Y recorders, LCD and LED displays.

10 Hrs

Text Books:

1. A.K.Sawhney, "**Electrical and Electronic Measurements and Instrumentation"**, Dhanpat Rai & Sons, 19th Revised Edition, 2012
2. David A Bell, "**Electronic Instrumentation and Measurements"**,PHI,2nd Edition, 2012.

Reference Books:

1.Golding and Widdies,"**Electrical Measurements and Measuring Instruments"**, Pitman,5th Edition.
2. Harris, "**Electrical Measurements"**,John Wiley, 2nd Edition.,1995.

Course Outcomes

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

CO1: Understand various units and dimensions associated with Electrical Quantities.
CO2: Apply fundamental knowledge of instruments/bridges characteristics for solving engineering problems.
CO3: Understand different types of standards; methods of calibration used in measurements and statistical and regression analysis.
CO4: Understand the principle of operation and working of different electronic instruments.
CO5: Apply the knowledge of different oscilloscopes like CRO, DSO for various applications.

Model Question Paper

SI.NO	Model Question Paper	Marks	CO's	Levels
UNIT-I				
1.a)	Bring out the difference between fundamental and derived units.	04	CO1	L1
b)	What are the advantages of SI system of units over other system of units?	06	CO1	L2
c)	The eddy current loss in a round wire/unit length is given by $P_e \alpha B^a_{max} f^b d^c p^e$, where B_{max}=maximum value of flux density; wb/m^2, f=frequency; Hz, d=diameter of wire; m and ρ= resistivity;Ω-m. Find the values of a,b,c and e using dimensional analysis and write the equation for P_e	10	CO1	L4
2.a)	Prove that the following equation is dimensionally correct, e=Blv where e=emf; volts, B=flux density; wb/m^2, L=length; m and v=velocity;m/s.	04	CO1	L4
b)	With a neat sketch, explain the operation of 1- Φ induction type energy meter and show that the number of revolutions made by the disc is proportional to energy consumed.	10	CO1	L3
c)	The name plate of a 1- Φ EM reads as; 250V, 20A, 1800 revolutions/Kwh. The meter is tested at ¾th and upf. The meter makes 20 revolutions in 10secs. Determine the % error in the reading of the energy meter.	06	CO1	L4
UNIT-II				
3.a)	Discuss the limitations of Wheatstone's bridge.	04	CO2	L2
b)	Derive the expression for the measurement of unknown resistance using Kelvin's double bridge. How the effect of connecting lead resistance is eliminated in this arrangement.	10	CO2	L3
c)	With a neat sketch explain the working of a Megger.	06	CO2	L3
4.a)	What are the sources and detectors used in AC bridges, explain.	04	CO2	L1
b)	Derive the expression for the measurement of capacitance and loss angle of lossy capacitor using Schering bridge. Draw the phasor diagram at balance condition.	10	CO2	L2
c)	An a.c, bridge circuit working at 1000Hz is having the following data: arm ab is a 0.2 µF pure capacitor, arm bc is a 500Ω pure resistance, arm cd contains unknown impedance and arm da has a 300Ω resistance in parallel with a 0.1µF capacitor. Find R and C or L constants of arm cd considering it as a series element.	06	CO2	L4
UNIT-III				
5.a)	Discuss how the range of ammeters and voltmeters can be extended using shunts and multipliers and thereafter obtain the expression for R_{sh} and R_{se} in terms of multiplying factor.	08	CO3	L2
b)	A moving coil instrument has a resistance of 5Ω and gives a full scale reading of 50mA.Calculate: (i)The shunt resistance required to increase the range to 200A (ii)The series resistance required to use it as a voltmeter of range	06	CO3	L4

	0-750V(iii)power consumption in R_{sh} and R_{se}			
c)	Write a short note on turns compensation in instrument transformers.	06	CO3	L1
6.a)	Explain the construction and working of CT and PT.	10	CO3	L2
b)	The exciting current of a ring core current transformer of ratio 500/5 A is 2 A at a pf of 0.5, when operating at full primary current. If the secondary burden is non inductive resistance of 2Ω, Find (i) Phase angle of CT and (ii) ratio error at full load.	06	CO3	L4
c)	Mention the advantages of instrument transformers	04	CO3	L1
UNIT-IV				
7.a)	With a neat sketch explain true RMS responding voltmeter.	06	CO4	L2
b)	With the help of block diagram explain the working of electronic energy meter.	08	CO4	L2
c)	What is transducer? Briefly explain the procedure for selecting a transducer.	06	CO4	L1
8.a)	What is stain guage? Obtain an expression for guage factor in terms of Poisson's ratio.	06	CO4	L3
b)	Explain the working of LVDT used in displacement measurement. Why a phase sensitive detector is employed along with LVDT?	08	CO4	L2
c)	Discuss the role of transducers in temperature measurement.	06	CO4	L1
UNIT-V				
9.a)	With the neat block diagram, explain the working of dual trace oscilloscope.	10	CO5	L2
b)	Write a short notes on(i)X-Y recorder(ii)LCD and LED displays	10	CO5	L1
10.a)	Discuss the method of measuring amplitude, phase and period using an oscilloscope.	10	CO5	L2
b)	With a neat sketch explain in brief the working of a digital storage oscilloscope.	10	CO5	L2

Course Title: Analog & Digital Electronics Lab			
Course Code: P15EEL37	**Semester**: III	**L-T-P-H**: 0-0-3-3	**Credits –** 1.5
Contact period : Lecture: 50Hrs, Exam 3 Hrs		**Weightage :** CIE:50; SEE:50	

Course Learning Objectives (CLOs)

This course aims to

1. Students should be able to Diode circuits such as clipping, clamping.
2. Students should be able to Design Transistor amplifier & oscillator circuit.
3. Students should be able to analyze various logic gates , flipflops, counters, shift registers

List of Experiments

1. Design of Diode Clipping circuits
   a. Positive Clipping
   b. Negative Clipping
   c. Double Ended Clipping
2. Design of clamping circuits
   a. Positive clamping
   b. Negative clamping
3. Design of an RC coupled single stage BJT amplifier and determination of the frequency response, input & output impedances
4. Design of BJT R-C phase shift oscillator
5. Design of BJT , Hartley and Colpitts oscillators
6. Design of Inverting and Non-Inverting OP-AMP Circuit
7. Simplification, realization of Boolean expressions using logic gates.
8. Realization of Adder and subtractor using logic gates
   a. Half/Full adder
   b. Half/Full subtractor
9. Realization of Multiplexer and Demultiplexer
10. Truth table verification of flip-flops: D, T, SR & JK
11. Realization of 3 bit counter, Mod N counter, ring/Johnson counter design.
12. Shift register operations: Shift left; Shift right, SIPO, SISO, PISO, PIPO

Self-study Experiment

Course outcome:

CO1. Designing and building circuits using diode and transistor.
CO2. Understanding working of various logic gates, counters, Flip-flops, counters
CO3. Designing own circuit using various analog and digital components.

Topic learning Objectives (TLOs):

1. Understanding diode clipping circuit working by connecting components and verifying results.
2. Understanding diode clamping circuit working by connecting components and verifying results for positive and negative clamping.
3. Designing and building RC Coupled amplifier circuit and verifying its frequency response.
4. Designing and building RC Phase shift oscillaotr circuit and verifying oscillator frequency

5. Design of hartley and colpitts oscillator for desired frequency of oscillations
6. Understanding opamp circuit by designing Inverting and Non Inverting opamp circuit
7. Verifying logic gates using suitable ICs & Simplification of boolean expressions
8. Realisation of Adder and Subtractor Using basic and universal gates
9. Understing and Realisation of MUX and DEMUX
10. Truth table verification of Flip-Flops
11. Understanding the working of different types of counters
12. Analyzing the working of various Shift register operations: Shift left; Shift right, SIPO, SISO, PISO, PIPO

Self-study Experiment: Outcome of the Study is implemented by designing own lab experiment by the student

Text Book:

1. A Practical Handbook to Analog Electronics, Second Edition, New Generation Publishing
2. A Practical Handbook to Digital Electronics, Second Edition, New Generation Publishing

References

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education, 8th Edition, 2008.

Course Outcomes:	**Program Outcomes:**											
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
CO1. Designing and building circuits using diode and transistor.	**L**	**S**	**M**									
CO2. Understanding working of various logic gates, counters, Flip-flops, counters	**M**	**L**	**S**									
CO3. Designing own circuit using various analog and digital components.	**M**	**S**	**L**									

Course Title: Circuit Simulation & Measurement Lab			
Course Code: P15EEL38	**Semester:** III	**L:T:P:H**-0-0-3-3	**Credits –** 1.5
Contact Period: Lecture: 39 Hrs, Exam: 3Hrs		**Weight age:** CIE: 50; SEE: 50	

Course Learning Objectives (CLOs)

This course aims:

To conduct practical experiments on circuits and measuring instruments; Kelvin's Double Bridge , Maxwell L-C Bridge, Schering & De-Sauty's bridges, Single Phase Energy meter, three phase circuit using two wattmeter for star & delta connected loads, Resonance characteristics in series and parallel circuits, KCL & KVL for multiloop electrical circuits, Thevenin's theorem, Maximum Power Transfer Theorem, RC coupled amplifier-Frequency response & determination of bandwidth,
Bridge rectifier, Diode clipping & clamping circuits.

List of Experiments

1. Measurement of low Resistance using Kelvin's Double Bridge.
2. Measurement of inductance using Maxwell L-C Bridge.
3. Measurement of capacitance and dissipation factor by using Schering & De Sauty's bridges.
4. Adjustment and calibration of Single Phase Energy meter
5. Measurement of power in three phase circuit using two wattmeter for star & delta connected loads.
6. Verification of Resonance characteristics in series and parallel circuits using
    a) Conventional method
    b) PSPICE
7. Verification of KCL & KVL for multiloop electrical circuits, with DC & AC sources using PSPICE.
8. Verification of Thevenin's theorem using
    a) Conventional method
    b) PSPICE
9. Verification of Maximum Power Transfer Theorem using
    a) Conventional method
    b) PSPICE
10. RC coupled amplifier-Frequency response & determination of bandwidth using PSPICE.
11. Bridge rectifier, Diode clipping & clamping circuits using PSPICE.

Self-Study experiment.

Course Outcomes

Student will be able to:

CO1: Learn the measurement of resistance, inductance & capacitances using bridges.
CO2: Conduct experiment on single phase energy meter.
CO3: Learn the measurement of active and reactive power in three phase circuits.
CO4: Determine the resonance characteristics in series and parallel circuits.
CO5: To become familiar with theorems both in conventional and simulation method.

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, 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: 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.

SEMESTER IV

Course Title: Engineering Mathematics-IV **(Common to E&C, E&E, CS&E and IS&E Branches)**			
Course Code: P15MAES4**1**	**Semester**: 4	**L – T – P – H :** 3 –2 – 0 – 5	**Credits:** 4
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 $\Delta^2 -$ 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: $y(1) = 2$, $y(1.1) = 2.2156$, $y(1.2) = 2.4649$, $y(1.3) = 2.7514$	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 $x + y + 54z = 110$, $27x + 6y - z = 85$, $6x + 15y + 2z = 72$ 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.	7	3	L3
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 $2+i$.	6	3	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:	7	4	L2

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

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 :	7	4	L2

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

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

Course Title : Signals & Systems			
Course Code : P15EE42	**Semester :** IV	**L - T - P - H:** 3- 2 - 0 -5	**Credits**: 4
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage:** CIE:50; SEE:50	

Course Learning Objectives (CLOs)

This course aims to

1.Analyze the types of signals, operations which can be performed on signals and properties of systems.
2.Describe the concept of impulse response.
3.Use the knowledge of impulse response to solve differential and difference equations
4.Describe the concept of discrete-time Fourier series (DTFS).
5.Explain the concept of Z-Transform.

Course Content

UNIT-I

Introduction: Definitions of signals and systems, Classification of signals, Basic operations on signals, Elementary signals, Systems viewed as interconnections of operations on signals, Properties of systems. **10 Hrs**

Unit – II

Impulse response, representation of signals using impulses,Convolution–impulse response representation for LTI systems.Properties of impulse response representation for LTI systems. **10Hrs**

Unit – III

Representation of Continuous Time Signal systems, Discrete time signal systems and their block diagram representation.

Fourier Representation of Signals: Introduction to Fourier representation of signals, Introduction to continuous and discrete time Fourier series **10 Hrs**

Unit – IV

Introduction to Discrete time Fourier transform and continuous time Fourier transform. Properties of Discrete time Fourier transform and continuous time Fourier transform **10 Hrs**

Unit – V

Introduction, Definition of the z-transform and its inverse, Region of Convergence, Properties of z-transforms, z-transform Inversions, z-Transform analysis of LTI Systems. **12Hrs**

Text Book:

1) Simon Haykin and Barry Van Veen, “Signals and Systems”, John Wiley & Sons, Second edition, 2008.

Reference Books:

1. Michel J Roberts, “Signals and Systems: Analysis of signals through Linear Systems”, Tata McGraw-Hill, 2003..
2. H. P. Hsu and R. Ranjan, “Signals and Systems”, Schaum’s Outline Series, T.M.H., 2006.
3. D. Ganesh Rao and SatishTunga, “Signals and Systems: A Simplified Approach”, Sanguine Technical Publishers.

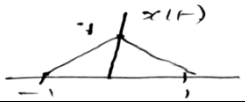
Course Outcomes

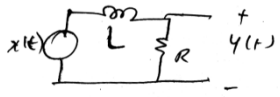
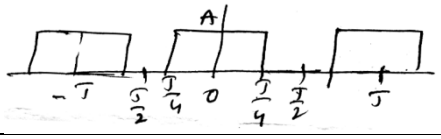
After learning all the units of the course, the student is able to

1. Understand the classification of signals, relate between elementary signals and identify the properties of a system.
2. Perform convolution operation on continuous and discrete time signals. apply the properties of impulse response representation.
3. Solve difference and differential equations and represent them as block diagrams.

4. Apply the properties of DTFS and DTFT to Discrete and continuous time signals.
5. Solve difference equations using Z-transforms

Model Question Paper

	UNIT-I	M	Blooms level	COs
1. a.	Determine the periodicity of the continuous signal given by $x(t)=2\cos\frac{2\pi t}{3}+3\cos\frac{2\pi t}{7}$ and prove the same.	8	L5	CO1
b.	Determine the even and odd parts of $x(t)=\sin 2t+\cos t+\sin t\cos 2t$	6	L5	CO1
c.	A triangular pulse $x(t)$ is shown below. Sketch (i) $y_1(t)=x(2t)$ (ii) (iii) $y_3(t)=x\left[2(t-2)\right]$ 	6	L5	CO1
2 a.	Determine the power and Energy of the $x(t)=3\cos 5\Omega_0 t$	8	L5	CO1
b.	For the system given by $y(n)=\sum_{k=n_0}^{n}x(k)$ determine, whether the system is (i) memory less (ii) linear (iii) Time in variant (iv) Casual (v) Stable	6	L5	CO1
c.	Plot the standard continuous time signals. Write the functional relations of each of it.	6	L4	CO1
	UNIT-II			
3 a.	Perform the convolution of the following signals by graphical method. $x_1(t)=e^{-3t}u(t)$, $x_2(t)=t\,u(t)$.	10	L3	CO2
b.	Determine the linear convolution of the function: $x(n)=\begin{cases}1 & for\ n=\pm1\\ 2 & for\ n=0\\ 0, & otherwise\end{cases}$ $h(n)=\begin{cases}2 & n=0\\ 3 & n=1\\ -2 & n=2\\ 0 & otherwise\end{cases}$	10	L5	CO2
4 a.	A LTI system has impulse response given by $h(n)=u(n)-u(n-7)$. Determine the output of the system when the input is $x(n)=2\left[u(n-2)-u(n-5)\right]$.	10	L5	CO2
b.	Consider the linear Time variant system with impulse response $h(n)=\left[\frac{j}{2}\right]^n u(n)$. Determine the steady state response for large n, to the excitation $x(n)=\cos\pi n\,u(n)$	10	L5	CO2
	UNIT-III			
5 a.	Find the zero-input response and zero-state response and hence find total response of the functions given by $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+4y(t)=\frac{d}{dt}x(t)$ given by $y(0)=0,\quad \left.\frac{dy(t)}{dt}\right\|_{t=0}=1\quad x(t)=e^{-2t}u(t)$	8	L1	CO3
b.	Draw the direct form I and direct form II block diagram representatives of the system described by $\frac{d^2y(t)}{dt^2}+2\frac{dy(t)}{dt}+3y(t)=4\frac{dx(t)}{dt}+5x(t)$.	6	L1	CO3

c.	What are the conditions to be satisfied for the Fourier representation of a signal? Write the three forms of CTFS of periodic signal.	6	L1	CO3
6. a	The impulse response of the circuit shown is $h(t)=\frac{R}{L}e^{-\left(\frac{R}{L}\right)t}u(t)$. Find the expression for the frequency response and plot the magnitude of phase response. 	10	L1	CO3
b.	Determine the trigonometric form of Fourier series of the wave forms. 	10	L5	CO3
	UNIT-IV			
7 a.	State and prove linearity time shifting, frequency shifting and symmetry property of DTFT.	10	L5	CO4
b.	Use partial fractions expansion and linearity to determine the inverse Fourier transfer in the following functions. (i) $x(jw)=\frac{-jw}{(jw)^2+3jw+2}$ (ii) $x(jw)=\frac{4}{-w^2+4jw+3}$	10	L5	CO4
8 a.	Find the DTFT of the following finite durations sequence of length L. $x(n)=\begin{cases}A & for\ 0\le n\le L-1\\ 0 & otherwise\end{cases}$ also find the inverse DTFT to verify x(n) for L = 3 and A = 1 V.	10	L1	CO4
b.	Determine the IDFT of $x(n)=\{3,\ (2+j),\ 1,(2-j)\}$	10	L5	CO4
	UNIT- V			
9 a.	Find the initial value $x(0)$ and final value $x(\infty)$ of the following Z-domain (i) $X(z)=\frac{1}{1-z^{-2}}$ (ii) $X(z)=\frac{2z}{z^2-1.8z+0.8}$	8	L1	CO5
b.	Find the one sided Z-transform of the discrete time signal generates by mathematically simplify of Cartesians time signal $x(t)=e^{-at}\sin\Omega_o t$	6	L1	CO5
c.	Find the Z-transform of the following sequences (i) $x(n)=3\left(\frac{1}{2}\right)^n u(n)-2(3)^n u(-n-1)$ (ii) $x(n)=\left(\frac{1}{2}\right)^n[u(n)-u(n-10)]$ Write Time shifting property and linearity property.	6	L1	CO5
10 a.	Determine the IZT of $X(z)=\frac{1}{1-1.5z^{-1}+0.5z^{-2}}$ for ROC $\lvert z\rvert>1,\ \frac{1}{2}<\lvert z\rvert<1,\ \lvert z\rvert<\frac{1}{2}$	10	L5	CO5
b.	The impulse response of a discrete line LTI system is given by $h(n)=\left(\frac{1}{2}\right)^n u(n)+\left(-\frac{1}{3}\right)^n u(n)$ Find the Z-transform of $h(n)$ and its ROC and hence find	10	L1	CO5

	(i) is the system casual or non-casual (ii) is the system is stable (iii) Obtain the difference equation realization of the system.			

Course Title: Electrical Machines-1			
Course Code: P15EE43	**Semester**: III	**L-T-P-H:** 4-0-0-4	**Credits** - 4
Contact period : Lecture: 52Hrs, Exam 3 Hrs		**Weightage :** CIE:50%; SEE:50%	

Course Learning Objectives (CLOs)

This course aims to

1. Analyze the theory, construction, classifications and working principle of single phase, three phase transformers and single phase, three phases Induction motors.
2. Understand to carryout different tests on single phase, three phase transformers and single phase, three phase Induction motors.
3. To draw equivalent circuit, circle diagram to know the performance of three phase induction motor.
4. To find the efficiency and regulation of single phase transformers. Practical applications and to select the machine for various applications.

Course Content

Unit – I

TRANSFORMERS:

Principle of operation, constructional details of shell type and core type singlephase transformers. Description of Power transformers, distribution transformers, constant voltage transformers.

ANALYSIS AND PERFORMANCE OF SINGLE PHASE TRANSFORMERS:

Equation for EMF induced in the two windings. Voltage & Current transformation ratio, Concept of Ideal transformers, transformer on no-load and load with phasor diagrams. Concept of M.M.F. balance in transformers, Equivalent circuit of a transformer. Auto transformer, saving of copper in an auto trans-former, Advantages & Disadvantages, Applications **10Hrs**

Unit – II

TESTING OF TRANSFORMERS:

Polarity Test, O.C. & S.C. test, pre-determination of efficiency and regulation, determination of equivalent circuit parameters. All day efficiency. Sumpner'stest. Parallel operation: need, conditions for parallel operation & load sharing. **10 Hrs**

Unit – III

Three phase Transformer: Three-Phase transformer connections: delta-delta, delta-star, star-delta, star-star & open delta. Single phase transformers for three phase operation. Scott connection for three phase to two phase conversion. Labeling of three phase transformer terminals. Tap changing trans-formers, Parallel operation. Three winding transformer & its equivalent circuit, determination of parameters of three winding transformer, voltage regulation of three winding transformers. **10Hrs**

Unit –IV

Three Phase Induction Machines: Basic **c**oncepts of rotating magnetic field.Operating principle, construction, types: Squirrel-cage, Slip-ring.

Analysis of Three Phase Induction Motor: Induction motor operation on no-load and load conditions. Torque-slip characteristics of a three phase induction motor Need for starter. Qualitative analysis of DOL, Star-Delta, auto-transformer starting, Speed control by voltage, frequency, and rotor resistance methods. **10 Hrs**

Unit –V

Performance of Three Phase Induction Machines: Induction generator. No-load and blocked rotor tests. Performance evaluation - output power, torque, and efficiency, current and power factor using Circle diagram. Losses and efficiency in an induction motor. Cogging and crawling.

Single-phase Induction Motor: Principle of operation, production of rotatingfield double revolving field theory, determination of equivalent circuit parameters Types of single phase induction motors: split-phase,capacitor start, shaded pole motors, universal motors.

12Hrs

Text Books:

1. Alexander Langsdorf, "Theory of Alternating Current Machines", T.M.H, 2001
2. Dr.P.S.Bimbara, "Electrical Machinery" Khanna publications", 3rd edition,New Delhi, 2006

References:

1. M.G.Say, "Performance and Design of A.C.Machines", C.B.S. Publishers, 2005
2. AshfaqHussain, "Electrical Machines", Dhanapatrai and Co, 2nd edition, 2012

Course Outcomes

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

CO1: Understand the basic operation and construction of different types oftransformers

CO2: Analyze the various performance parameters of a single phase andthree phase transformer

CO3: Understand the various tests to be conducted on a transformer

CO4: Analyze the construction, operation and performance of various types ofsingle phase induction motors

CO5: Analyze the construction, operation and performance of various types ofthree phase induction motors

MODEL QUESTION PAPER

Q.No.	Question	Marks	CO	Blooms Level
1.a)	With a neat sketch, explain the working of a constant voltage transformer.	08	CO1	L2
b)	Derive an EMF equation of a single phase transformer.	06	CO1	L3
c)	The no-load current of a transformer is 10A at a power factor of 0.25 lagging, when connected to 400V, 50Hz supply. Calculate i) magnetising component of no load current ii) iron loss iii) maximum flux in the core. Assume primary winding turns as 500.	06	CO1	L3
	OR			
2.a)	With the help of phasor diagram, explain the operation of single phase transformer on load at 1. Lagging pf 2. Leading pf.	08	CO1	L3
b)	Derive an expression for the saving of copper in an autotransformer.	06	CO1	L3
c)	A 40KVA transformer with a ratio of 2000/250V has a primary resistance of 1.15Ω and a secondary resistance of 0.0155Ω. Calculate i) total resistance in terms of secondary winding ii) total resistance drop on full load iii) total copper loss	06	CO1	L3

	on full load.			
3.a)	The OC and SC test on a 10 KVA, 125/250V, 50 Hz single phase transformer gave the following results OC Test : 120 V, 0.6A, 50W (on LV side) SC Test : 15 V, 30A, 100W (on HV side) Calculate i) Copper loss at FL ii) Half FL efficiency at 0.8 pf lag iii) Regulation at FL 0.9 lagging and leading.	10	CO2	L3
b)	Describe in detail Sumpner's test for determining the efficiency of a transformer.What are the limitations of this test?	10	CO2	L2
	OR			
4.a)	A Transformer has its maximum efficiency of 0.98 at 15 KVA at unity p,f . During a day it is loaded as follows: For 12 hours: 2 KW at 0.5 pf lag For 06 hours: 12 KW at 0.8 p.f lag For 06 hours: 18 KW at 0.9 p.f lag Find its all day efficiency	10	CO2	L3
b)	Discuss the necessary conditions for parallel operation of transformers.	05	CO2	L2
c)	Derive an expression for Load division between two dissimilar transformers connected in parallel with equal voltage ratios.	05	CO2	L3
5.a)	Explain with necessary diagram how two phase transformers can be used to convert a 3-ph Supply to a two phase supply. If the load is balanced on one side, show that it will be balanced On other side.	10	CO3	L2
b)	A Δ -Δ bank consisting of three 20 KVA, 2300/230 V transformer supplies a load of 40 KVA, If one transformer is removed, find for the resulting V – V connections.i) KVA load carried by each transformer ii) Percent of rated load carried by each transformer iii) Total KVA rating of the V – V bank iv) Ratio of the V – V bank to Δ -Δ bank transformer rating v) Percent increase in load on each transformer when bank is converted into V – V bank.	10	CO3	L3
	OR			
6.a)	Show that open delta connection of 3 - ϕ transformer has KVA rating of 58% of that of delta – delta connections.	05	CO3	L3
b)	Write shot note on Scott Connection.	05	CO3	L2
c)	Two electric furnace are supplied with a single phase circuit at 80V from a 3-ph, 11000V system by means of two single phase scott connected transformers with similar secondary windings. When the load on one furnace is 500KW and on the other 800KW, what current will flow in each of the three lines at i) upf ii) 0.8 pf lag.	10	CO3	L3
7.a)	Explain the principle of operation of a 1 - ϕ. Induction motor using double revolving fieldtheory andprove that it cannot produce any starting torque.	10	CO4	L2
b)	With neat sketch, explain the construction and working	10	CO4	L2

	of; i) Split – phase Induction Motor ii) Shaded pole Induction Motor.			
	OR			
8.a)	Explain the concept of rotating magnetic field in 3 - ϕ Induction motor.	08	CO4	L2
b)	State merits and demerits of Squirrel cage and slipring Induction motor.	06	CO4	L1
c)	Explain the concept slip in a induction motor	06	CO4	L2
9.a)	Derive the equation for torque developed by the 3 phase Induction motor. Draw typical torque-Slip characteristics curve.	08	CO5	L3
b)	The power input to a 500 V, 50 Hz, 6 pole, 3Ø, Induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and friction and windage losses total are 2 kW. Calculate i) Slip ii) The Rotor copper loss iii) efficiency.	06	CO5	L3
c)	Explain the phenomenon of Cogging and crawling in 3 phase Induction motor.	06	CO5	L2
	OR			
10.a)	Draw the circle diagram from No – load and blocked motor test of a 3 - ϕ, 50 Hz, 15 kW. 400 V, 4 polesInduction motor gave the following results. No – load test (line values): 400 V, 9 A, 1310 W Blocked rotor test (line values): 200 V, 50 A, 7100 Rotor copper loss at stand still in half the total copper loss. From the diagram find (i) Line current (ii) Slip (iii) Efficiency (iv) Torque (v) power factor. (Choose a current scale – 1cm = 5A)	12	CO5	L3
b)	With the help of phasor diagram, explain the performance of an Induction motor as a generator.	08	CO5	L2

Course Title: Power Plant Engineering			
Course Code : P15EE44	**Semester : IV**	**L-T-P-H: 4-0-0-4**	**Credits – 4**
Contact Period: Lecture: 52 Hr. Exam 3 Hr		**Weightage : CIE:50: SEE:50**	

Course Learning Objectives (CLOs).

This Course aims to

1. Understand the conceptual working principles of conventional sources of electric power generation.
2. Explain the detail description of hydroelectric plants, nuclear power plants and gas power plants.
3. Analyze the power generation using non-conventional energy sources
4. Understand the concept of load curves, power factor improvement and different tariff
5. Understand the concept of interconnection system and grounding systems.

Relevance of the Course:

The students will understand the basic information and techniques underlying with Power Generation. The course deeply provides an understating in Generation of various power plants operations. The course intended to introduce analysis of Power generation. The control strategies involved will help the students to interpret about the control over the power, Power Generation and various components used to generate the power. The students will able to understand about the troubles caused faults which are involved in power generation.

COURSE CONTENT

Unit – I

Hydro Electric Power Generation: Selection of site, Classification of site, General arrangement and operation. Power station structure & control.

Thermal Power Generation: Introduction, Main parts, Working, Plant layout, Coal handling system, Ash disposal schemes. **10Hrs**

Unit – II

Nuclear Power Station: Introduction, Selection of site, Cost, Components, Reactors, Description of fuel sources, Adverse effects, Safety of nuclear power station, Disposal schemes of nuclear waste.

Diesel Electric Station: Introduction, Types of plants, Components, Plant layout and maintenance, Choice and characteristics **10Hrs**

Unit – III

Generation Using Non-Conventional Energy Sources: Solar, Wind, Tidal, Geo-thermal, Gas turbine plants (block diagram approach only)

Co-Generation: Mini, Micro and Bio fuel Generation, Distributed generation **10Hrs**

Unit – IV

Economic Aspects: Introduction, Terms commonly used in system operations: Diversity factor, Load factor, Plant capacity factor, Plant use factor, Plant utilization factor, Loss factor. Load duration curve, Power factor improvement and Tariffs. **10Hrs**

Unit – V

Interconnected stations: necessity of phase angle control, load sharing and transfer of load between stations, Power limit of interconnectors, Parallel operation of interconnectors

Grounding Systems: Introduction, Resistance grounding system, Neutral grounding, Ungrounded system, Resonant grounding, Solid grounding, Reactance grounding, Earthing transformer, Neutral grounding transformer. **12Hrs**

Text Book:

1. S. M. Singh, "Electrical power generation, transmission and distribution"-Prentice hall of India, New Delhi, 2nd 2008.
2. Chakrabarti, M-L Soni, P.V. Gupta, U.S. Bhatnagar, "Power system Engineering", Dhanpat Rai & Co., 2001.

Reference Books:

1.M.V. Deshapande, "Electrical Power System Design" T.M.H., 1993.
2. C.L. Wadwa, "Electrical Power System", Wiley Stern.2000.

Course Outcomes

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

CO1. Understand the conceptual working principles of conventional source of electric power generation

CO2. Explain the detail descriptions of hydroelectric plants, nuclear power plants and gas power plants

CO3. Analyze the power generation using non-conventional energy sources

CO4.Understand the concept of load curves, power factor improvement and different tariff

CO5. Understand the concept of interconnection system and grounding systems.

Model Question Paper

	UNIT – I	Marks	Blooms level	COs
1. a.	Write a brief note on site selection and classification of the site for hydroelectric power generation.	10	L1	CO1
b.	Explain main components of different types of hydroelectric power plants.	10	L2	CO1
2 a.	Explain the main parts of steam power plant.	10	L2	CO1
b.	Explain the coal handling and ash disposal schemes for thermal power plant.	10	L2	CO1
UNIT – II				
3 a.	Write a brief note on site selection nuclear power station and Explain main components of reactors of the nuclear power plants.	10	L1	CO2
b.	With a neat diagram, explain boiling water reactor (BWR) and pressurized water reactor (PWR).	10	L2	CO2
4 a.	What are the types of diesel plants? Explain the components of diesel electric station.	10	L2	CO2
b.	Write a brief note on choice & characteristic of the diesel station.	10	L1	CO2
UNIT – III				
5 a.	With a neat schematic diagram, write a note on solar power plant.	10	L1	CO3
b.	List out & explain the components of wind power plant.	10	L1	CO3
6. a	What are the different schemes for harnessing tidal energy?	10	L2	CO3

b.	What are all the common factors which are normally used in electricity system planning, operation and management?	10	L2	CO3
	UNIT – IV			
7 a.	Explain diversity factor and plant capacity factor.	10	L2	CO4
b.	What are the several measures by which low power factor can be avoided?	10	L2	CO4
8 a.	Explain two ways of improving power factor.	10	L2	CO4
b.	What do you understand by electrical tariff? Discuss two and three part tariff and power factor tariff.	10	L2	CO4
	UNIT – V			
9 a.	What are the main neutral grounding practices?	10	L2	CO5
b.	Explain the resistant grounding system and obtain an expression for screening coefficient for n electrodes.	10	L2	CO5
10 a.	What is neutral grounding? What are the advantages of neutral grounding?	10	L2	CO5
b.	Define resonant grounding. With a neat phasor diagram, explain 3-phase isolated neutral system.	10	L2	CO5

Course Title: Microcontrollers			
Course Code: P15EE45	**Semester:** IV	**L-T-P-H:** 4-0-0-4	**Credits** - 4
Contact period : Lecture: 52Hrs, Exam 3 Hrs		**Weightage:** CIE:50%; SEE:50%	

Course Learning Objectives (CLOs):

This course aims to:

1. Explain the difference between Microprocessor & Microcontrollers with their evolution and the choice of a microcontroller.
2. Understanding the basic architectures based on memory and instructions set.
3. Describe and analyze the different types of addressing modes used to access the data both from Internal and External memory.
4. Describe and analyze the various types of instructions sets that are used to perform the data related operations.
5. Explain and analyze the various conditional and unconditional JUMP and CALL instructions and their relative range of jump.
6. Describe and analyze the timer/counter operation with various modes
7. Explain and analyze the various modes of serial communications and interfacing circuits in order to communicate with external world.
8. Write ALP for data operation, timer/counter, interrupt, serial communication and interfacing circuits with external world.

Relevance of the course:

This course deals with the evolution of Microcontrollers and their application with the architecture of 8051 they understand and the implementation of instruction sets to write programs for arithmetic, logic and sorting of the numbers. They can also interface microcontrollers with external world and operate them.

Course content

Unit-I

Microprocessors and Microcontroller. Introduction - Microprocessors and Micro controllers, A Microprocessors survey. RISC & CISC CPU Architectures, Harvard & Von Neumann CPU architecture.

8051 Architecture: Introduction, 8051 Micro controller Hardware, Input /output pins, Ports and circuits, External memory, Counter and Timers, Serial data input / output. **10hrs**

Unit-II

Addressing Modes: Introduction, Addressing modes. Data moves & Logical Operations: External data moves, Code Memory, Read only data moves / Data exchanges, Byte level logical operations, Bit level logical operations, PUSH and POP operation, Rotate and Swap operations. Incrementing and decrementing, **10hrs**

Unit-III

Arithmetic Operation: Addition, Subtraction, Multiplication and division, Decimal arithmetic, Programs.

Jump and Call Instruction: JUMP and CALL program range, Jumps, Calls and Subroutines programs. **12hrs**

Unit- IV

Timer / Counter programming in 8051: Programming 8051 Timers, Counter Programming, Programming timers 0 and 1 in assembly language **10hrs**

Unit- V

Interrupts Programming: More detail on Interrupts, 8051 interrupts, Programming Timer Interrupts, Programming external Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, interrupt programming in assembly language.

8051 Serial Communication : Basics of serial Communication, 8051 connecting to RS-232, 8051 Serial communication programming, Programming the second serial port, Serial port programming in assembly language. **10 Hrs**

Text Books :

1. Kenneth J. Ayala : "The 8051 Microcontroller Architecture, Programming & Applications" 2nd Edition, Penram International, 1996/ Thomason Learning 2005.
2. Muhammad Ali Mazidi and Janaice Gillespie Mazidi and Roollin D. Mckinlay" The 8051 Micro controller and Embedded Systems- using assembly and C " , Person Education, 2nd Edition 2006

Reference Book:

1. Predko "Programming and Customising the 8051 Micro controller" TMH 3rd Edition 2007
2. Ajaya V Deshmukh "Microcontrollers- Theory and applications", TMH 3rd Edition 2005
3. Rajkamal "Microcontrollers: Architecture, Programming, interfacing and system design", Person education, 4th Edition 2005

Course outcomes:

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

CO1: Explain the various types of microcontrollers with their evolution and compare them based on the architecture.

CO2: Describe the different types of addressing modes used to accessthe data both from internal and External memory.

CO3: Describe and analyze the various types of instructions sets that are used to perform the data related operations

CO4: Explain and analyze the various conditional and unconditional JUMP and CALL instructions and their relative range of jump.

CO5: Describe and analyze the timer/counter and interrupt access with their basic modes

CO6: Explain and analyze the interfacing circuits in order to serially communicate with external world.

CO7: Able to write ALP for data operation, timer/counter, interrupt and interfacing with external world.

Model Question Paper

UNIT-I				
Q.No.	**Questions**	**Marks**	**CO**	**Blooms level**
1. (a)	Give a brief summary about evolution of microcontrollers.	06	CO1	L1
(b)	Compare the following: Micro processors and Micro controllers	06	CO1	L3
(c)	Draw the block diagram and Write a note on 8 registesr of 8051 microcontroller	08	CO1	L3
OR				
2. (a)	Give the Comparison between the RISC and CISC architectures.	08	CO1	L1
(b)	Draw the block diagram of 8051 microcontroller and explain the special function registers.	06	CO1	L3
(c)	Explain the ROM & RAM internal memory organization	06	CO1	L2
UNIT-II				
3. (a)	State and explain the addressing modes used in each of the following instructions. i) MOV A, # 25h ii) MOV A, @ Ri iii) MOV R_2, 40H iv) MOVC A, @ A + PC	06	CO2	L2
(b)	Explain the following instructions i)MOVX ii)SWAP iii)XCHD	06	CO2	L2
(c)	Explain the various bit level logical operation.	08	CO2	L2
OR				
4. (a)	Explain the operation of stack and stack pointer with an example.	06	CO2	L2
(b)	What is the need of addressing modes? Explain any three addressing modes with an example.	06	CO2	L1
(c)	Explain the various byte level logical operation	08	CO2	L2
UNIT-III				
5.(a)	Write a note on jump instructions with their relative program range.	08	CO3	L1
(b)	Explain the following jump instructions with examples: i) AJMP ii) DJNZ iii) CJNE iv) JZ	06	CO3	L2
(C)	Write an ALP to find the sum of ten 8-bit numbers.	06	CO3	L5
OR				
6(a)	Write a note on CALL instructions with their relative jump program range.	06	CO3	L1
(b)	Write a program to find the largest of a number given in an array	08	CO3	L5
(c)	Explain the following jump instructions with	06	CO3	L2

	examples: i) RLC A ii) JNZ iii) RRC A iv) JC			
	UNIT-IV			
7(a)	Explain various modes of operation of timers/counters.	06	CO4	L2
(b)	Illustrate the contents of TMOD register	06	CO4	L3
(c)	Explain the steps involved in mode1 operation of Timer	08	CO4	L2
OR				
8(a)	What is the difference between timer and counter?Explain with an example.	06	CO4	L2
(b)	Explain the steps involved in mode 2 operation of Timer	08	CO4	L2
(C)	Write an ALP to generate a square wave of 100KHz on pin 2.3 using Timer 1 in mode 1. Clock frequency is 22 MHz.	04	CO4	L5
	UNIT-V			
9 (a)	What do you mean by simplex, half duplex and full duplex data transfers.	06	CO5	L1
(b)	What is Interrupt? Compare the interrupt and polling methods	08		L2
(c)	Explain the format SCON register in detail.	06	CO5	L2
OR				
10 (a)	What is serial communication? how is this achieved with 8051 using RS 232 standard	06	CO5	L1
(b)	Explain different bits in TCON register	06	CO5	L2
(c)	With the help of vector table explain the various interrupts in 8051.	08	CO5	L2

Course Title : Electro Magnetic Field Theory			
Course Code : P15EE46	**Semester :** IV	**L-T-P -H:** 3–2-0 -5	**Credits:** 4
Contact Period: Lecture: 50 Hr, Exam: 3 Hrs		**Weightage:** CIE:50; SEE:50	

Course Learning Objectives (CLOs)

This course aims to:

1. Understand the basic concepts of electric and magnetic fields.
2. Understand the concept of conductors, dielectrics, inductance and capacitance
3. Gain knowledge on the nature of magnetic materials.
4. Understand the concept of static and time varying fields.

Course Content

Unit – I

a) Time Invariant Electric Fields (Electrostatics): Brief introduction to vector analysis, Experimental law of coulomb, electric field intensity, field due to continuous volume charge distribution, field due to line charge and field of a sheet of charge, field lines and sketches.

b) Electric flux density, Gauss law and Divergence: Electric flux density, Gauss law, application of Gauss law for some symmetrical charge distributions, application of Gauss law for differential volume element, divergence, Maxwell's first equation in electrostatics, vector operator (delta) and the divergence theorem **10Hrs**

Unit – II

a) Energy and Potential: Energy expended in moving a point charge in an electric field, the line integral, potential difference and potential, potential field of a point charge, potential field of system of charges-conservative property, potential gradient, the dipole, energy density in the electrostatic field.

b) Poisson's and Laplace Equations: The derivation of Poisson's and Laplace's equation, uniqueness theorem, examples on the solution of Laplace's and Poisson's equation.

10 Hrs

Unit – III

a) Current and Conductors: Current and current density, continuity equation of current, metallic conductors, conductor properties and boundary conditions.

b) Dielectric and Capacitance: The nature of dielectrics materials, boundary conditions for perfect dielectrics materials, capacitance, capacitance examples, and current analogies.

10 Hrs

Unit – IV

Time Invariant Magnetic Fields (Magnetostatics): Magnetic field and its properties**,** Biot-Savart's law, Applications of Biot-Savart's law, Ampere's circuital law, Applications of Ampere's circuital law, Curl, Stroke's theorem, magnetic flux and magnetic flux density, scalar and vector magnetic potentials. **10 Hrs**

Unit – V

a) Time variant magnetic fields: Faraday's law, emf induced by changing field within a stationary path (transformer emf), emf induced in a moving conductor within a constant field (motional or generator emf).

b) Magnetic Forces, Materials and Inductance: Force on a moving charge, force on a differential current element, force between differential current elements,magnetic boundary conditions, Inductance and Mutual inductance. **10 Hrs**

Text Books:

1) William H Hayt Jr. and John A Buck, *Engineering Electromagnetic*, Tata McGraw-Hill, 7TH Edition 2001
2) Stuart M. Wentworth,' *Applied Electromagnetics: Early Transmission Line* Approach',JohnWiley,2007.

Reference Books:

1). John Krauss and Daniel A Fleisch, *Electromagnetics with Applications*, McGraw-Hill, 5th Edition 2006.

Course Outcomes

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

1.Determine the electric and magnetic fields and energy stored due to specified charge and current distribution.
2.Perform analysis of materials in the presence of fields for simple geometries.
3.Apply the appropriate electric and magnetic field boundary conditions for a given problem involving their usage.
4.Work with Maxwell's equation in differential and integral forms for the solution of appropriate problems involving static as well as time varying fields.
5.Solve problems involving one dimensional Poisson's and Laplace's equations.

Model Question Paper

SI.NO	Model Question Paper	Marks	CO's	Levels
UNIT-I				
1.a)	State and explain coulomb's law in vector form.	06	CO1	L1
b)	Point charges of 50nC each are located at A(1, 0, 0), B(-1, 0, 0), C(0, 1, 0) and D(0, -1, 0) meters. Find the total force on charge at A.	07	CO1	L2
c	Determine E at P(1, 1, 1) caused by 4 identical, 3nC point charges located at P1(1, 1, 0), P2(-!, 1, 0), P3(-1, -1, 0), and P4(1, -1, 0).	07	CO1	L3
2a	Explain the terms: (i) Electric Flux and (ii) Electric flux density	06		L1
b.	Starting from fundamental prove Gauss divergence theorem	07		L2
c.	Given, $D=x^2a_x+xya_y+yza_z$; C/m2. Verify divergence theorem over a cube of one unit for each side. The cube is situated in the first actant of the Cartesian coordinate system with one corner at the origin. Also verify by the gauss law.	07		L3
3a.	Bring out the relation between electric field intensity and electric potential	06	CO2	L1
b)	Determine the work done in carrying a charge of -2C from (2, 1,-1) to (8, 2, -1) in the electric field $E=ya_x + xa_y$; v/m, considering the path along the parabola $x=2y^2$	08	CO2	L3
c.	Derive an expression for energy density in an electrostatic field	06	CO2	L2
4a.	Starting from fundamental derive the expressions for Laplace and Poison's equations	07		LL1
b.	Determine whether or not the following field satisfies Laplace equation. (i) $V=x^2-y^2+z^2$ (ii) $V = \dot{\rho}*\cos\Phi+z$.	07		L4
c.	Discuss the application of Laplace equation to concentric spherical conductor system	06		L3
UNIT-III				
5a.	Derive the continuity equation of current in integral and point differential form.	06	CO3	L1
b.	Discuss the properties of a conductor subjected to electric field.	06	CO3	L4
c.	Discuss the nature of dielectric material		CO3	
6a.	Discuss the boundary conditions between two dielectric medium interface..	07		L1
b.	The region z<0 is composed of a uniform dielectric material with $\grave{\varepsilon}_r$=3.2 and the region z>0 is characterized by $\grave{\varepsilon}_r$=2. If $D_1=(-30a_x+50a_y+70\ a_z)$; nC/m2, determine (i) D2 (ii) Θ_1 and (iii) $\Theta_2$form	07		L3
c.	Derive the expression for capacitance of a coaxial cable	07		L2
7a.	State Biot-Savart's law. Derive the expression for magnetic flux density at a given point due to a current carrying element of finite length	06	CO4	L3

b.	Explain the concept of scalar and vector magnetic potential.	06	CO4	L1
c.	State and prove Stroke's theorem	08	CO4	L2
UNIT-IV				
8.a)	Find the value of the magnetic flux density at point p for the current circuit shown in Fig. 8a, using Biot-Savart's law	07	CO4	L3
b.	State and prove ampere's law.	07	CO4	L2
c)	Using Ampere's law find the magnetic field due to solid cylindrical conductor	06	CO4	L1
UNIT-V				
9.a)	Two homogeneous, linear, isotropic material have interface at x=0 in which there is a surface current $k=200u_z$; A/m. For x<0, $u_r=2$ and H1= $(150a_x+400a_y+250u_z)$; AT/m. In region 2, when x>0, find (i) H_2 (ii) $\|B_1\|$ and (iii) α_1	07	CO5	L3
b.	State and explain Faraday's law of electromagnetic induction. Write the point form of it.	07	CO5	L1
c.	Derive the Maxwell's equation based on ampere's circuital law for time varying fields.	06	CO5	L2
10a.	Two homogeneous, linear, isotropic material have interface at x=0 in which there is a surface current $k=200u_z$; A/m. For x<0, $u_r=2$ and H1= $(150a_x+400a_y+250u_z)$; AT/m. In region 2, when x>0, find (i) H_2 (ii) $\|B_1\|$ and (iii) α_1	07	CO5	L3
b.	Derive the expression for inductance of a solenoid	07	CO5	L2
c.	Derive the expression for force between two current carrying conductors	06	CO5	L1

Course Title: Electrical Machines-1Lab			
Course Code: P15EEL47	**Semester: IV**	**L-T-P-H: 0-0-1.5-3**	**Credits – 1.5**
Contact period : Lecture: 36Hrs, Exam 3 Hrs		**Weightage : CIE:50%; SEE:50%**	

Course Learning Objectives (CLOs)

This course aims to

1. Students should be able to study OC and SC tests on single phase Transformer.
2. Students should be able to determine the performance characteristics of single phase induction motor.
3. Students should be able to study how the load can be shared between two transformers.

Course Content

1. OC & SC tests on Single Phase transformer: Pre-determination of efficiency & regulation.
2. Sumpner's test on single phase transformers.
3. Parallel operation of single phase transformers.
4. Polarity test, connection of three single phase transformers in star-delta and determination of efficiency & regulation.
5. Scott connection for balanced & unbalanced load.

6. Load test on single phase Induction motor.
7. Load test on three phase induction motor.
8. Performance evaluation of three phase induction Motor using Circle diagram.
9. Speed control of three phase induction motor by Rotor resistance control.
10. Load test on three phase Induction generator.

Topic learning objective:

1. Define transformer
1. 2 explain the various types of transformer
2. 3 explain magnetizing current and working component of current with respect to transformer
4 Define slip of an induction motor
5 understand how you will reverse the direction of rotation of ac motor
6 explain the methods of speed control of ac motors
7 understand the different type's starters
8 Give the relation between line and phase values of i) star connected net-work ii) delta connected network.
9 understand the principle operation of motor and transformer
10 explain how the starting torque improved in slip ring induction motor
11 Define slip frequency
12 understand the difference between two winding transformer and auto transformer
13 explain transformers have highest efficiency than any other electrical machine
14 Define voltage regulation in transformer
15 Draw the torque-slip characteristics of 3 phase induction motor

CourseOutcomes:	**ProgramOutcomes:**										
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**
1. Conduct different tests on single phase transformer.	**S**	**L**	**M**									
2. Determine the performance characteristics of single phase induction motor.		**M**	**S**									
3. Know how load can be shared between two transformers	**M**	**S**										

Course Title: Microcontroller lab			
Course Code: P15EEL48	**Semester:** VI	**L:T:P:H**-0-0-1.5-3	**Credits –** 1.5
Contact Period: Lecture: 39 Hrs, Exam: 3Hrs		Weight age: CIE: 50 SEE: 50	

Course Learning Objectives (CLOs)

This course aims to:

1. To provide practical knowledge about writing program in assembly level language and executing programs using Microcontroller kit.
2. To provide practical knowledge about interfacing the hardware to Microcontroller kit

List of Experiments:

1. Addition, Subtraction, Multiplication & Division of 8-bit data.
2. Addition & Subtraction of 16 bit data
3. To find the largest and smallest of 8-bit number in a given array
4. Arranging numbers in Ascending & Descending order in a given array
5. Code conversions: Binary to gray, ASCII to BCD, Hexadecimal to decimal & vice versa
6. To find the number of 1's & 0's of a given 8 bit number.
7. To determine +ve and –ve number in an array
8. Addition of n-8 bit numbers stored in external memory
9. Data movement with and with out overlapping
10. Sorting of even and odd numbers separately
11. DC Motor interface with microcontroller
12. Stepper Motor interface with microcontroller
13. Elevator interface with microcontroller

Course outcome:

CO3: Writing program for Addition, Subtraction, Multiplication & Division of 8-bit data & 16 bit number using assembly level language

CO4: Writing an assembly level program for data transfer.

CO5: Writing an assembly level program to arrange the numbers even or odd ; to sort in ascending or descending order ; finding 0's & 1's and positive & negative number.

CO6: Writing an assembly level program code conversion.

CO7: Writing a program for Hardware interfacing to Microcontroller kit.

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 Hr	**Weightage**: CIE:50%;SEE:50%		

Prerequisites :ARDB

Course Learning Objectives (CLOs)

This course aims to

1. Explain proportionality rule, average speed, relative speed and concepts in circular track.
2. Explain the application of time, speed distance in solving problems related to races, trains, boats and streams, and clocks.
3. 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