SYLLABUS

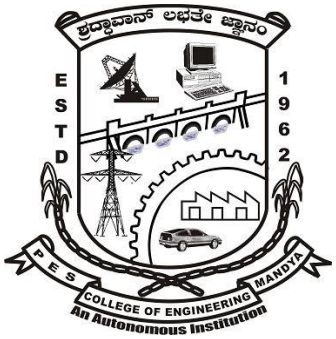
(With effect from 2018-19 Academic year)

ಪಠ್ಯಕ್ರಮ

(ಶೈಕ್ಷಣಿಕವರ್ಷ 2018–19)

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.

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

Dr. Nagarathna
Dean (Academic)
Professor
Dept. of CS &Engg

Department of Electrical & Electronics Engineering

Profile

Department of Electrical & Electronics Engineering Programme has been accredited by NBA for 6 Academic years (2017-18 to 2022-23)

The Department of Electrical and Electronics Engineering was established right from the inception of the institute in the year 1962. The various programs offered by the Department are B.E., M.Sc., (Engg.) by research and research leading Ph.D affiliated to Visvesvaraya Technological University (VTU), Belagavi. Also, Department is affiliated for Ph.D program with University of Mysore, Mysore and Kuvempu University, Shimoga. About 100 research papers have been published by the Department faculty members in various International & National journals and conferences.

The Department emphasizes towards imparting quality education, rigorous teaching-learning, hands-on expertise and helping students to shape their all-round personality. The Department with its strong pool of faculty, well-developed laboratories, latest software and hardware facilities, contributes to develop life-long learning skills to its students and producing worthy researchers by offering doctoral research program.

The academic programs are designed and updated keeping in view the constantly changing industrial needs, skills and challenges emerging out of new research. The academic programs are well received by the industry and academia. The department has always exerted the best of its effort to meet the objectives of achieving technical excellence in the areas of Electrical and Electronics Engineering such as High Voltage Engineering, Power Electronics & Drives, Control Systems, Power Systems, Energy Systems, Analog and Digital Electronics, Signal Processing, PLC & SCADA and Microcontrollers

The Department regularly organizes industrial visits, Technical lectures by experts from industries and institutes in contemporary areas to bridge the gap between syllabi and current developments.

VISION

The department of E & E would endeavour to create a pool of Engineers who would be technically competent, ethically strong also fulfil their obligation in terms of social responsibility.

MISSION

- Adopt the best pedagogical methods and provide the best facility, infrastructure and an ambience conducive to imbibe technical knowledge and practicing ethics.
- Group and individual exercises to inculcate habit of analytical and strategic thinking to help the students to develop creative thinking and in still team skills.
- MOUs and Sponsored projects with industry and R & D organizations for Collaborative learning
- Enabling and encouraging students for continuing Education and moulding them for life-long learning process

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

PEO2: Analyze real life problems and Design Electrical & Electronics Engineering system with appropriate solutions that are technically sound, economically feasible and socially acceptable

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

PROGRAMME OUTCOMES (POs)

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 problem.

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 plan, execute and complete projects

PO-12: Graduates will have the ability for self- education and lifelong learning

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO1: To understand the concept in Electrical and Electronics Engineering and apply them to develop modules analyze assess the performance of various power system equipment, generation, transmission, utilization and protection mechanisms.

PSO2: Design, develop, analyze and test electrical and electronics system: Deploy control strategies for electrical dives, power system networks, power electronics, high voltage and other related applications.

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

(An Autonomous Institution Under VTU, Belagavi)

Department of Electrical & Electronics Engineering

III Semester B.E. SCHEME OF TEACHING AND EXAMINATION (2019- 20)

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P18MA31	Transform calculus, fouries and numerical techniques	Maths	3:2:0:5	4	50	50	100
2.	P18EE32	Electrical circuit Analysis	E&EE	3:2:0:5	3	50	50	100
3.	P18EE33	Analog Electronic Circuits	E&EE	3:2:0:5	3	50	50	100
4.	P18EE34	Digital Electronic Circuits	E&EE	4:0:0:4	3	50	50	100
5.	P18EE35	Power Plant Engineering	E&EE	4:0:0:4	3	50	50	100
6.	P18EE36	Measurement & Instrumentation	E&EE	4:0:0:4	3	50	50	100
7.	P18EEL37	Analog Electronics & Digital Electronics Lab	E&EE	0:0:3:3	1.5	50	50	100
8.	P18EEL38	Circuit Simulation & Measurement Lab	E&EE	0:0:3:3	1.5	50	50	100
9	P18HU39	**Aptitude and Reasoning Development - BEGINNER (ARDB)	HS&M	2:0:0:2	0	(50)	---	---
10	P18HUDIP310	Comprehensive Communication Development(CCD)	HS&M	2:0:0:2	[2]	[50]	[50]	[100]
12	P18HUDIP311	* Indian Constitution, Human Rights & Professional Ethics	HS&M	2:0:0:2	0	(50)	---	---
13	P18MADIP31	*Additional Maths-I	Maths	4:0:0:4	0	(50)	---	---
Total					22[24]	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 course before completion of VI- Semester

Department of Electrical & Electronics Engineering

IV Semester B.E. SCHEME OF TEACHING AND EXAMINATION (2019- 20)

Sl. No.	Course Code	Course Title	Teaching Dept.	Hrs/ Week L:T:P:H	Total Credit	Examination Marks		
						CIE	SEE	Total
1.	P18MAAC41+/ P18MAES41++	Complex analysis, statistics, probability and numerical techniques	Maths	3:2:0:5	4	50	50	100
2.	P18EE42	Signals and Systems	E&EE	3:2:0:5	3	50	50	100
3.	P18EE43	Microcontrollers	E&EE	4:0:0:4	3	50	50	100
4.	P18EE44	Electrical Machines-I	E&EE	4:0:0:4	3	50	50	100
5.	P18EE45	Electro Magnetic Field Theory	E&EE	4:0:0:4	3	50	50	100
6.	P18EE46	Op-Amp & Linear ICs	E&EE	4:0:0:4	3	50	50	100
7.	P18EEL47	Electrical Machines Lab-I	E&EE	0:0:3:3	1.5	50	50	100
8.	P18EEL48	Microcontroller Lab	E&EE	0:0:3:3	1.5	50	50	100
9	P18HU49	Aptitude and Reasoning Development – Intermediate (ARDI)	HS&M	2:0:0:2	1	50	50	100
10	P18EVIP50	* Environmental	ENV	2:0:0:2	0	(50)	--	--
11	P18MADIP41	* Additional Maths-II	Maths	4:0:0:4	0	(50)	--	--
Total					23	450	450	900

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

+ Common to BE (AU, CV, ME and I&PE)	++ Common to BE (CS, EC, E&E and IS&E)

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

(Common to All Branches)

Course Content

Unit-1

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

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

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

10 Hours

Unit-2

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

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

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

10 Hours

Unit-3

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

Self-Study Component: Derivations of Euler's formulae **11 Hours**

Unit-4

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

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

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

10 Hours

Unit-5

Partial differential equations (PDE's):

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

Applications of PDE's:

One- dimensional wave and heat equations (No derivation), and various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two dimensional

Laplace's equation (No derivation)–various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems). Illustrative examples from engineering field.

Self-Study Component: Finding the solution of non-linear equations of first order: Char pit's Method -simple problem.

11 Hours

Text Books:

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

References:

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

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

Course Articulation Matrix

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

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

Course Title: Electrical Circuit Analysis			
Course Code: P18EE32	Semester: III	L-T-P-H: 3-2-0-5	Credits –3
Contact period : Lecture: 52 Hrs, Exam 3 Hrs		Weightage : CIE:50; SEE:50	

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 admittance 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.Enablethestudentstoeffectivelyutilizetheknowledgeobtainedinthis 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. **6 Hrs**

Network theorems: Superposition and Thevenin's theorems as applied to DC and AC circuits. **4 Hrs**

Self study: Maximum power transfer theorem, millman's theorem and reciprocity theorem

UNIT-II

Resonant circuits: Basic definition, Conditions for Series & Parallel resonance, frequency response, Quality factor, Bandwidth (All derivations and problems are excluded) **4 Hrs**

Harmonic Analysis: Trignometrical Fourier series of non sinusoidal periodic wave forms, Dirichlet condition, wave symmetry, Average value, Effective value of a periodic complex wave (Exponential Fourier series is excluded). **6 Hrs**

Self study: Power and Power factor in single phase circuit with Nonsinusoidal voltages and currents.

UNIT-III

Transient behaviour and Initial and Final Conditions In Networks: Integro-differential equations for networks, Transient behaviour of series R-L, R-C, R-L-C Circuits for DC excitation, Behavior of R, L and C at the instant of switching and at final conditions when the excitation is D.C. Meaning of initial and final conditions in networks. Importance and need for determination of initial conditions. **6 Hrs**

Laplace Transform and its applications: Definition of Laplace transforms and it's inverse. Laplace transform of standard signals - step, ramp, impulse and gate functions. Waveform synthesis of Recurring and Non Recurring signals. **4 Hrs**

Self study: Determination of Laplace transform of waveforms using gate function.

UNIT-IV

Three-Phase Circuits: Numbering and interconnection of three phases. Voltages, Currents and Power in balanced star and delta connected loads. **6Hrs**

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. **4Hrs**

Self study: Study of ABCD parameters for two port networks.

UNIT-V

Network Functions: Driving point Admittance functions, Properties, Poles & zeros significance and time domain response from pole and zero plot. **6Hrs**

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. **4Hrs**

Self study : Principle of duality, determination of dual circuits.

Text Books:

1) Roy Choudary, "Networks and system", New age Publication, 2nd edition, 2013

2) VanValkenburg, "Network Analysis", 3rd edition, PHI Learning Private Limited, 2012.

Reference Books:

1) Franklin F.Kuo, Network Analysis & Synthesis, Wiley International

2). Hayt, Kemmerly and Durbin, "Engineering circuit analysis", McGraw-Hill Education, 8th Edition, 2011.

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 Parameters and Assessment of stability of network from network function.

3. Inter relationship between these parameter sets.
4. Calculate these parameters for resistive networks..
5. Solve numerical Problems
6. Define driving point impedance functions, Admittance functions and transfer functions and its importance.
7. Plot Poles & zeros and importance of those for stability problems.
8. Know the significance and time domain response from pole zero plot.

Course Assessment Matrix(CAM)														
Course Outcome	Program Outcome													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
To solve problems on electrical network using different techniques and theorems resonance concepts	2	3	1	-	-	-	-	-	-	2	1			
To obtain graphical solution to electrical networks using Network Topology.	2	2	1	-	-	-	-	-	-	2	2			
Analyze the network under transient condition due to switching	3	2	1	-	-	-	-	-	-	1	2			
Analyze and obtain the time domain response of R, L, C circuits for all types of Excitations using Laplace transforms	2	3	2	-	-	-	-	-	-	1	1			
Represent the two port networks by Z,Y, ABCD and hParameters and Assessment of stability of network from network function.	2	3	2	-	-	-	-	-	-	1	2			
1 – Low, 2 – Moderate and 3 – High														

Course Title: Analog Electronic Circuits			
Course Code: P18EE33	**Semester: III**	**L-T-P-H: 4-0-0-**	**Credits –3**
Contact period : Lecture: 52Hrs, Exam 3 Hrs		**Weightage : CIE: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. Analyze the effect of negative feedback in transistor amplifier
4. Analyse and design various Power amplifier circuits and study the effect of distortion Power amplifier.
5. Analysis of J-FET and MOSFET Circuits.

Relevance of the Course:

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

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

Course content

Unit – I

Diode Circuits: Introduction, Clipping Circuits, Clampers, Voltage multiplier Circuits, Zener Regulator

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

Self Study: Clipping at two independent levels.

Unit – II

BJT Transistor Modelling: 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. **11Hrs**

Self Study: Piezo electric effect.

Unit – III

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

Self Study: General Characteristics of Negative Feedback Amplifier

Unit – IV

Power Amplifiers: Definitions of Power Amplifiers, Series fed Class A Amplifier, Transformer coupled Class A Amplifier, Transformer coupled Push pull Circuits, Amplifier Distortion, Second Harmonic Distortion. **11Hrs**

Self Study: Applications of Power Amplifier.

Unit –V

J-FET and MOSFET

Construction, working and characteristics of JFET and MOSFET. Biasing of JFET and MOSFET. Analysis and design of JFET (only common source configuration with Voltage Divider Bias) and MOSFET amplifiers& its applications. **10Hrs**

Self Study: common source configuration with Fixed Bias.

Text Book

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

References:

1. Albert Malvino& David J Bates, Electronic Principles, 7th Edition, TMH, 2007.David A Bell, "Electronics Device and Circuits" 5nd Edition, Oxford.
2. Sudhakar Samuel,U B Mahadeva Swamy "Electronic circuits", Sanguine publications, 2004

Course Outcomes

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

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

CO3: Analyse the effect of negative feedback in transistor amplifier

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

CO5: Analysis of J-FET and MOSFET Circuit

Course assessment matrix (CAM)													
Course Outcome	Program Outcome												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
Analyze and design Diode and Transistor circuit such as Clippers, Clampers, Voltage Multipliers and Amplifiers	2	3	1	-	-	-	-	-	-	2	1		
Analyse and design two port hybrid equivalent model for BJT amplifier and Various BJT Oscillator Circuits	2	2	1	-	-	-	-	-	-	2	2		
Analyse the effect of negative feedback in transistor amplifier	3	2	1	-	-	-	-	-	-	1	2		
Analyse and design various Power amplifier circuits and study the effect of distortions on Power amplifier	2	3	2	-	-	-	-	-	-	1	1		
Analysis of J-FET and MOSFET Circuits	2	3	2	-	-	-	-	-	-	1	2		
1 – Low, 2 – Moderate and 3 – High													

Course Title: Digital Electronic circuits			
Course Code: P18EE34	**Semester: III**	**L-T-P-H: 4-0-0-4**	**Credits - 3**
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 Circuits: Data and number systems, Binary representation, Codes: BCD, Octal, Hexadecimal, ASCII, EBDIC, Gray. Signed binary number representation with 1's and 2's complement methods. 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 **10 Hrs**

Self learning: Conversation of Basic gates into Universal

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, Parallel binary adder, Look ahead carry Adder.

Self learning: half & fullSubtractor. **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 **12 Hrs**

Self learning: Conversion of D to SR,T&JKF/Fs .

Unit –IV

Counters: Synchronous Counters, 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**

Self learning: Asynchronous Counters

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, MOS and CMOS circuits & their operation **10 Hrs**

Self learning: ECL circuit& their operation

Text books:

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

References:

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

Course Outcomes

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

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

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

CO3: Explain and analyze the bistable element and the different latches and flipflops.

CO4: Explain and analyze sequential circuits, like counters and shift registers

CO5: Explain and analyze the concepts of A/D & D/A converters

Course Assessment Matrix (CAM)														
CourseOutcomes:	**ProgramOutcomes:**													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
To analyse the different switching algebra theorems and apply them for logic functions	L2	3	2	2	1							3		
Explain and analyze the Karnaugh map for a few variables & combinational circuits: half adders/subtractors ,encoders/decoders.	L1	2	2	2	2							2		
Explain and analyze bistable element and the different latches and flipflops.	L2	3	1	2	1							2		
Explain and analyze sequential circuits, like counters and shift registers	L2	2	1	2	1							3		
Explain and analyze the concepts of A/D & D/A converters	L2	3	2	2	2							2		
1-Low, 2-Modertae, 3-High														

Course Title: Power Plant Engineering			
Course Code : P18EE35	**Semester : III**	**L-T-P-H: 4-0-0-4**	**Credits – 3**
Contact Period: Lecture: 52 Hr. Exam 3 Hr		**Weightage : CIE:50: SEE:50**	

Course Learning Objectives (CLOs)

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 and different tariff
5. Understand the concept grounding and power factor

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. **11Hrs**

Self study: Principle of working of a Hydro – Electric Turbines

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**

Self study: Nuclear materials

Unit – III

Generation Using Non-Conventional Energy Sources: Solar, Wind, Tidal, Geo-thermal

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

Self study: Gas turbine plants

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**

Self study: Load curve and load duration curve and its uses

Unit – V

Interconnected stations: necessity of phase angle control, load sharing and transfer of load between

stations, Power limit of interconnectors.

Grounding Systems: Introduction, Resistance grounding system, Neutral grounding, Ungrounded system, Resonant grounding, Solid grounding, Reactance grounding, Earthing transformer, Neutral grounding transformer. **11Hrs**

Self study: Parallel operation of interconnectors

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", DhanpatRai& 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 Out Comes

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

1. Understand the conceptual working principles of conventional source of electric power generation
2. Explain the detail descriptions 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, and different tariff
5. Understand the concept of ground and power factor

Course Assessment Matrix (CAM)

Course Outcomes:	Program Outcomes:													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Understand the conceptual working principles of conventional source of electric power generation		2	1	3			2								
Explain the detail descriptions of hydroelectric plants, nuclear power plants and gas power plants		2	1	3			2								
Analyze the power generation using non-		2	1	3			2								
Understand the concept of load curves and different tariff		2	1	3			2								
Understand the concept of grounding and power factor improvement		2	1	3			2								

1-Low, 2-Modertae, 3-High

Course Title :Measurement & Instrumentation			
Course Code : P18EE36	**Semester : III**	**L - T - P : 2- 1 - 0**	**Credits – 3**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50; SEE:50**	

Course Learning Objectives (CLOs)

This course aims to:

1. To Analyze the principle of operation & working of different Electrical &Electronic instruments (L2).
2. To study the principle of operation & working of different Bridges (L2).
3. To explore 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)Introduction to basic measuring concepts: Essential torques, Basic types of instruments, operating principle of Ammeters, voltmeters, wattmeter (LPF & UPF), Energy meter–errors& adjustments, illustrative examples. Construction and operation of single-phase and three-phase dynamometer type power factor meter.

Self study: Weston Frequency Meter **11 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, Illustrative Examples.

Self study: Wagner Earthing device **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 (P.T derivations excluded), Turns compensation, Illustrative examples (excluding problems on turns compensation)

Self study: Clamp on meter **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.

Self study : Transducers in Electronic circuits **10 Hrs**

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, LED display.

Self study : LCD Display **11 Hrs**

Text Books:

1. A.K.Sawhney, "**Electrical and Electronic Measurements and Instrumentation"**, DhanpatRai&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.

Course Assessment Matrix (CAM)

Course Outcome (CO)		Program Outcome													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Understand various units and dimensions associated with Electrical Quantities.	L2	**2**	**2**	**-**	**1**	**-**	**1**	**-**	**-**	**-**	**2**	**-**	**-**		
Apply fundamental knowledge of instruments/bridges characteristics for solving engineering problems.	L3	**3**	**2**	**-**	**2**	**-**	**1**	**1**	**-**	**-**	**-**	**-**	**-**		
Understand different types of standards; methods of calibration used in measurements and statistical and regression analysis.	L2	**2**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**1**	**-**	**-**		
Understand the principle of operation and working of different electronic instruments.	L2	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**		
Apply the knowledge of different oscilloscopes like CRO, DSO for various applications.	L3	**2**	**1**	**2**	**1**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**1**		
1 – Low, 2 – Moderate and 3 – High															

Course Title: Analog& Digital Electronics Lab			
Course Code: P18EEL37	**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.

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

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

Course Articulation Matrix (CAM)

Course Outcomes:	Program Outcomes:											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1. Designing and building circuits using diode and transistor.	**1**	**3**	**2**									
CO2. Explain the working of various logic gates, counters, Flip-flops, counters	**2**	**1**	**3**									
CO3. Designing own circuit using various analog and digital components.	**2**	**3**	**1**									
1 – Low, 2 – Moderate and 3 – High												

Course Title: Circuit Simulation & Measurement Lab			
Course Code: P18EEL38	**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 Assessment Matrix (CAM)														
Course Outcome (CO)	**Program Outcome**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Learn the measurement of resistance, inductance & capacitances using bridges	**1**	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**1**	**1**	**1**			
Conduct experiment on single phase energy meter	**1**	**3**	**1**	**-**	**1**	**2**	**2**	**1**	**2**	**1**	**1**			
Learn the measurement of active and reactive power in three phase circuits	**1**	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**2**	**-**	**1**			
Determine the resonance characteristics in series and parallel circuits	**1**	**3**	**-**	**-**	**1**	**1**	**1**	**1**	**1**	**-**	**-**			
To become familiar with theorems both in conventional and simulation method	**1**	**3**	**-**	**1**	**1**	**2**	**2**	**2**	**3**	**1**	**2**			
1 – Low, 2 – Moderate and 3 – High														

Course Title: Aptitude and Reasoning Development - BEGINNER. (ARDB)			
Course Code : P18HU39	**Semester : 3**	**L :T:P:H : 2:0:0:2**	**Credits: NA**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage :CIE:100% - [P/NP]**	

Course Content

Unit – 1

Sharpen your axe!!

Vedic mathematics:

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

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

Percentage calculations and ratio comparison:

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

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

Self-study Component- Thorough with fractions and decimal values. Applications of tabulated fractions. Product of means and extremes. **8 Hrs**

Unit – 2

Analytical Reasoning 1: series

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

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

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

Self-study Component- Basic knowledge of letter positions, Different number series for example – even, odd, prime, composite etc **6 Hrs**

Unit – 3

Number system:

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

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

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

Self-study Component-Basic arithmetic operations, knowledge about quotient and

remainders, multiples and factors. **6 Hrs**

Unit – 4

Simple equations, Ratio Proportions and Variations:

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

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

Self-study Component-Knowledge about factors, types of factors. Splitting the middle term rule, formula rule. **6 Hrs**

Unit – 5

Building the fundamentals of logical reasoning:

Arrangement:

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

Directions :

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

Blood relations :

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

Self-study Component-Basic knowledge of directions, Pythagoras theorem.Logical reasoning skills, Relations, Family tree. **6 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.
2. Give examples for AP, GP and HP and differentiate between them.
3. Apply divisibility rules , power cycle method and evaluate the significance of the number system module.
4. Point out the errors in the problems concerning inequalities and solve simple equations and problems based on ratio, proportion and variation.
5. Solve the problems based on blood relations, directions and arrangement.

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

Course Content

Unit -1

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

Vector Algebra: Scalar and vectors. Vectors addition and subtraction. Multiplication of vectors(Dot and Cross products). Scalar and vector triple products-simple problems. **12 Hrs**

UNIT -2

Differential Calculus: Review of successive differentiation. Formulae for n^{th} derivatives of standard functions- Liebnitz's theorem (without proof). Polar curves –angle between the radius vector and the tangent pedal equation- Problems. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem for homogeneous functions of two variables. Total derivatives-differentiation of composite and implicit function. Application to Jacobians, errors & approximations. **10 Hrs**

UNIT –3

Integral Calculus: Statement of reduction formulae for $sin^n x$, $cos^n x$, *and* $sin^m x cos^m x$ and evaluation of these with standard limits-Examples. Differentiation under integral sign(Integrals with constants limits)-Simple problems. Applications of integration to area, length of a given curve, volume and surface area of solids of revolution. **10 Hrs**

UNIT-4

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

10 Hrs

UNIT-5

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

10 Hrs

Text Book:

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

Reference Books :

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

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

(Common to all Branches)

Unit-1

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

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

10 Hours

Unit-2

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

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

10 Hours.

Unit-3

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

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

11 Hours

Unit-4

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

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

11 Hours

Unit-5

Probability Theory: Brief review of elementary probability theory. Random variables (discrete and continuous)-Introduction to probability distributions- probability mass/density

functions and cumulative probability density functions – Illustrative examples. Discrete probability distributions- Binomial and Poisson's distributions; Continuous probability distributions - exponential and normal distributions. (No derivation of mean and variance). Illustrative examples from engineering and industrial fields.

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

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

10 Hours

Text Books:

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

References:

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

Course Articulation Matrix

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

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

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

Course Title : Signals & Systems			
Course Code : P18EE42	Semester : IV	L - T - P H: 3- 2 - 0 - 5	Credits: 3
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, Systems viewed as interconnections of operations on signals, Properties of systems.

Self learning: Elementary signals **10 Hrs**

Unit – II

Time-domain representations for LTI systems: Impulse response, representation of signals using impulses, Convolution–impulse response representation for LTI systems. Properties of impulse response representation for LTI systems.

Self learning:Properties of convolution **10Hrs**

Unit – III

Time-domain representations for LTI systems – Differential and difference equation Representations, Block diagram representations. .

Fourier Representation of Signals: Introduction to Fourier representation of signals, Introduction to continuous time Fourier series

Self learning: discrete time Fourier series **10 Hrs**

Unit – IV

Fourier representation for signals: Introduction to Discrete time Fourier transform and continuous time Fourier transform. Properties of Discrete time Fourier transform .

Applications of Fourier representations: Introduction, Frequency response of LTI systems.

Self learning: Properties of continuous time Fourier transform **10 Hrs**

Unit – V

Z-Transforms: 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.

Self learning:Initial and final value theorem **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

Course Assessment Matrix (CAM)

Course Outcome (CO)		Program Outcome													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Analyse the classification of signals, relate between elementary signals and identify the properties of a system.	L2	**2**	**2**	-	-	-	-	**2**	-	-	-	**2**			
Perform convolution operation on continuous and discrete time signals. apply the properties of impulse response representation.	L3	**3**	**2**	-	-	-	-	**1**	-	-	-	**1**			
Solve difference and differential equations and represent them as block diagrams.	L3	**3**	**3**	-	-	-	-	**1**	-	-	-	-			
Apply the properties of DTFS and DTFT to Discrete and continuous time signals.	L3	**2**	**1**	-	-	-	-	**2**	-	-	-	-			
Solve difference equations using Z-transforms	L3	**3**	**2**	-	-	-	-	**2**	-	-	-	-			
1 – Low, 2 – Moderate and 3 – High															

Course Title: Microcontrollers			
Course Code: P18EE43	**Semester: IV**	**L-T-P-H: 4-0-0-4**	**Credits – 3**
Contact period : Lecture: 52Hrs, Exam 3Hrs		**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, Counter and Timers, Serial data input / output **10 Hrs**

Self study: External memory

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, Rotate and Swap operations. Incrementing and decrementing. **10 Hrs**

Self study: Stack operation

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. **12 Hrs**

Self study: Programs using subroutines

Unit- IV

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

Self study: Counter/Timer programming in C

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**

Self study: Serial port programming in C

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 access the 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.

Course Assessment Matrix (CAM)

Course Outcome – CO			Program Outcome													
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Explain the various types of micro controllers with their evolution and compare them based on the architecture.	L2	1	2	3	–	1	–	–	–		–	–	1		
2	Describe the different types of addressing modes used to access The data both from internal and External memory.	L3	1	2	3	–	3		–	–	–	–	–	1		
3	Describe and analyze the various types of instructions sets that are used to perform the data related operations	L3	2	2	3	–	1	–	–	–		–	–	2		
4	Explain and analyze the various conditional and unconditional JUMP and CALL Instructions and their relative range of jump.	L3	2	2	1	–	3	–	–	–		–	–	2		
5	Describe and analyze the timer/counter and interrupt access with their basic modes.	L3	2	2	3	–	3	–		–		–	–	2		
6	Explain and analyze the interfacing circuits in order to serially communicate with external world.	L3	2	2	1	-	3	-	-	-	-	-	-	2		
7	Able to write ALP for data operation, timer/counter, interrupt and interfacing with external world	L5	2	2	1	-	3	-	-	-	-	-	-	2		
1-Low, 2-Moderate, 3-High																

Course Title: Electrical Machines – I			
Course Code: P18EE44	**Semester: IV**	**L-T-P-H: 4-0-0-**	**Credits –3**
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. Able to carry out 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 evaluate the performance in terms of efficiency and regulation of single phase transformers along with Practical applications.

Course Content

Unit – I

Transformers: Principle of operation, constructional details of shell type and core type single phase 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**

Self Study: Instrument Transformers

Unit – II

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

Self Study: Polarity Test

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, Parallel operation. Three winding transformer & its equivalent circuit, determination of parameters of three winding transformer, voltage regulation of three winding transformers. **10 Hrs**

Self Study: Tap changing transformers

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**

Self Study: Schrage Motor

Unit –V

Performance of Three Phase Induction Machines: 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 rotating field double revolving field theory, determination of equivalent circuit parameters Types of single phase induction motors: split-phase, capacitor start, shaded pole motors, universal motors. **10Hrs**

Self Study: Induction generator

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: Analyze the basic operation and construction of different types of transformers

CO2: illustrate the various performance parameters of a single phase and three phase transformer

CO3: Evaluate and assess the various tests to be conducted on a transformer

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

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

Course Assessment Matrix (CAM)

Course Outcome (CO)		Program Outcome													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Analyze the basic operation and construction of different types of transformers	L2	**1**	**1**	**2**	-	-	-	**1**	-	-	-	**1**			
illustrate the various performance parameters of a single phase and three phase transformer	L4	**3**	**2**	**2**	-	-	-	**2**	-	-	-	-			
Evaluate and assess the various tests to be conducted on a transformer	L2	**1**	**2**	**1**	-	-	-	-	-	-	-	-			
Analyze the construction, operation and performance of various types of single phase induction motors	L4	**3**	**2**	**2**	-	-	-	**1**	-	-	-	-			
Analyze the construction, operation and performance of various types of three phase induction motors	L4	**3**	**2**	**2**	-	-	-	**1**	-	-	-	-			
1 – Low, 2 – Moderate and 3 – High															

Course Title: Electro Magnetic Field Theory			
Course Code: P18EE45	**Semester: IV**	**L-T-P-H: 3-2-0-**	**Credits –3**
Contact period : Lecture: 52 Hrs, 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 force, magnetic materials.
4. Understand the concept of static and time varying fields.

Course Content

Unit – I

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,.

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, max well's first equation in electrostatics, and the divergence theorem

Self Study: Field lines and sketches, vector operator (delta) **11Hrs**

Unit – II

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 gradient, the dipole, energy density in the electrostatic field.

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

Self Study: Properties of gradient of a scalar, potential field of system of charges- conservative property and Applications of Laplace's equation **11 Hrs**

Unit – III

Current and Conductors: Current and current density, continuity of current, metallic conductors, conductor properties and boundary conditions

Dielectric and Capacitance: The nature of dielectrics materials, boundary conditions for perfect dielectrics materials, capacitance, capacitance examples

Self Study: Equation for Relaxation, Steady current equation and boundary conditions between conductor and dielectrics, 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.

Self study : Properties of curl, physical significance of curl including types of fields **10 Hrs**

Unit – V

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), faraday's disc generator, displacement current density and displacement current.

Magnetic Forces, Materials and Uniform plane waves: Force on a moving charge, force on a differential current element, magnetic boundary conditions. General wave equations, poynting vector and poynting theorem.

Self Study: Force between differential current elements, Magnetic circuits, Inductance, mutual inductance, uniform plane wave in conductor and in dielectrics

10 Hrs

Text Books:

1) William H Hayt Jr. and John A Buck, Engineering Electromagnetic, Tata McGraw-Hill, 7TH Edition 2005
2) Stuart M. Wentworth,' Applied Electromagnetics: Early Transmission LineApproach',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, magnetic fields, 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.

Course Assessment Matrix (CAM)

Course Outcome (CO)		Program Outcome													
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
(1) Determine the electric and magnetic fields and energy stored due to specified charge and current distribution.	L4	-	**1**	-	-	**1**	-	-	-	**2**	**2**	-			
(2) Perform analysis of materials in the presence of fields for simple geometries.	L3	**1**	**1**	-	-	**1**	-	-	-	**2**	**2**	-			
(3) Apply the appropriate electric and magnetic field boundary conditions for a given problem involving their usage.	L3	**1**	**1**	**1**	-	**1**	-	-	-	**2**	**2**	-			
(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.	L3	**1**	**1**	**2**	-	**1**	-	-	-	**1**	**2**	-			
(5) Solve problems involving one dimensional Poisson's and Laplace's equations.	L3	**1**	**1**	**2**	-	**1**	-	-	-	**1**	**2**	-			
1 – Low, 2 – Moderate and 3 – High															

Course Title: Operational Amplifiers &Linear Integrated Circuits		
Course Code: P18EE46	**Semester :IV**	**L:T:P(Hrs)-4:0:0**
ContactPeriod:Lecture:52 Hrs,Exam:3Hrs	**Weightage:CIE:50;SEE:50**	

Course Learning Objectives (CLOs)

This course aims to:

1. Apply the knowledge of AC amplifier to describe the characteristics and operation of op-amps has AC amplifier.

2. Analyze the frequency response and stability of op-amps.

3.Design the op-amp has signal processing & waveform generator circuits for a given specifications

4.Design the op-amp has nonlinear circuits & filters for a given specifications.

5.Analyze the operation of specialised IC's and different types voltage regulators.

Course Content

UNIT - I

OP-AMPS AS AC AMPLIFIER: Capacitor coupled voltage follower, High Z_{in} capacitor coupled - voltage follower, non-inverting amplifier, inverting amplifier; Capacitor coupled inverting amplifier, setting upper cut off frequency, Capacitor coupled difference amplifie.

Self study: Use of single polarity supply. **11hrs**

UNIT - II

OP-AMPS FREQUENCY RESPONSE AND COMPENSATION : Op-amp circuit stability, Frequency and phase response, Frequency compensating methods , Manufacturer's recommended compensation, Op-amp circuit band width, Slew rate effects, Stray & load capacitance effects, Z_{in} mod compensation.

Self study: Circuit stability precautions. **11hrs**

UNIT - III

SIGNAL PROCESSING & GENERATOR CIRCUITS: Precision half wave & full wave rectifiers, Limiting circuits, Clamping circuits, Peak detectors, Sample & hold circuit. Triangular & rectangular wave generator, Waveform generator design, Phase shift oscillator, Oscillator amplitude stabilization, Wein bridge oscillator.

Self study: Signal generator output controllers. **10hrs**

UNIT - IV

OPAMPS-NONLINEAR CIRCUITS & ACTIVE FILTERS: Op-amps in switching circuits, Zero crossing detectors, Inverting & noninverting Schmitt trigger, Astable & monostable multivibrators. First and second order high pass and low pass filters, Band pass filter, Band stop filter.

Self study: Universal Active filter **10hrs**

UNIT - V

SPECIALIZED IC APPLICATIONS: Universal active filter, Switched capacitor filter, Phase locked loops & its applications, Power amplifiers.

DC VOLTAGE REGULATORS: Basics of Voltage regulators, Voltage follower regulator, Adjustable output regulator, Precision voltage regulators

Self study: Integrated circuit voltage regulators. **10hrs**

Text Books:

1. "Operational amplifiers and linear IC's"- David A Bell, -PHI, 4th edition, 2011
2. "Operational amplifiers and linear" - Ramakanth A Gayakwad,- IC's, Pearson Education, 4th edition, 2000.

Reference Books:

1. Operational amplifiers and linear IC's- Roy & Choudhry, New age International, 4th edition,2007
2. Operational amplifiers and linear IC's - Stanley William D, Pearson Education, 4th edition, 2007
3. Operational amplifier and linear integrated circuits - K. Lal kishore -Pearson education, 5th edition, 2008.

Course Title: Operational Amplifier & Linear IC's	
Course Code: P18EE46	**L: T: P 4:0:0** **Credits: 03**
CO #	**Course Outcome**
CO1	**Apply** the knowledge of AC amplifier to describe the characteristics and operation of op-amps has AC amplifier.
CO2	**Analyze** the frequency response and stability of op-amps.
CO3	**Design** the op-amp has signal processing & waveform generator circuits for a given specifications
CO4	**Design** the op-amp has nonlinear circuits & filters for a given specifications.
CO5	**Analyze** the operation of specialised IC's and different types voltage regulators.

Course Learning objectives (CLO)	**Program outcomes.....(General)**														
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Apply the knowledge of AC amplifier to describe the characteristics and operation of op-amps has AC amplifier.	L2	3	3	2		2		1		2					
Analyze the frequency response and stability of op-amps.	L4	3	1	2		3		2		2					
Design the op-amp has signal processing & waveform generator circuits for a given specifications	L2	3	1	2		1		3		2					
Design the op-amp has nonlinear circuits & filters for a given specifications.	L4	3	1	1		2		2		1					
Analyze the operation of specialised IC's and different types voltage regulators.	L2	3	2	1		2		1		2					

Course Title: Electrical Machines Lab-I			
Course Code:P18EEL47	**Semester: IV**	**L-T-P-H: 0-0-3-3**	**Credits – 1.5**
Contact period : Lecture: 36Hrs, Exam 3 Hrs		**Weightage : CIE:50%; SEE:50%**	

Course Learning Objectives (CLOs)

This course aims to

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

List of Experiments

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.

Self-Study Experiments

Course Articulation Matrix (CAM)

Course Outcomes:	**Program Outcomes:**													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1. Conduct different tests on single phase transformer.	**3**	**1**	**2**											
2. Determine the performance characteristics of single phase induction motor.		**2**	**1**											
3. Know how load can be shared between two transformers	**2**	**1**												
1 – Low, 2 – Moderate and 3 – High														

Course Title: Microcontroller Lab			
Course Code: P18EEL48	**Semester: IV**	**L-T-P-H: 0-0-3-3**	**Credits – 1.5**
Contact period : Lecture: 36Hrs, Exam 3 Hrs		**Weightage : CIE:50%; SEE:50%**	

Course Learning Objectives (CLOs)

This course aims to:

1. 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 and 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 without 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

Self-Study Experiments

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 Articulation Matrix (CAM)

Course Outcome – CO			Program Outcome											
			PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
1	Writing program for Addition, Subtraction, Multiplication & Division of 8-bit data & 16 bit number using assembly level language	L2	M	M	L	_	H	_	_	L	-	M	_	
2	Writing an assembly level program for data transfer	L2	L	H	M	_	M	-	_	_	_	_	_	
3	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.	L2	L	H	M	_	M	_	_	_	-	_	_	
4	Writing an assembly level program code conversion.	L3	M	M	L	_	H	_	_	_	-	_	_	
5	Writing a program for Hardware interfacing to Microcontroller kit.	L4	M	M	H	_	-	_	-	L	-	_	H	
Low, M-Moderate, H-High.														

Course Title : Aptitude and Reasoning Development - INTERMEDIATE (ARDI)			
Course Code : P18HU49	Semester : 4	L :T:P:H : 2:0:0:2	Credits: 1
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		Weightage: CIE:50%, SEE:50%	

Course Content

Unit – 1

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

Self-study Component- Basic relation between the 3 different quantities. Conversions between different units of measurement. Speed and velocity.

6 Hours

Unit-2

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

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

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

8 Hours

Unit-3

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

Syllogism: Meaning of syllogisms, Format of problems and standard qualifiers, Concept of distribution, Standard question pattern, Application of venn diagram to solve problems.

Logical Venn diagrams: Analysis of the given problem and solve it.

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

6 Hours

Unit-4

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

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

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

Unit-5

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

Self-study Component-LCM methods, basic arithmetic. Fractions and efficiency.

4 Hours

Reference Books:

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

Course Outcomes (CO)

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

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

Course Title : Additional Mathematics-II			
Course Code : P18MADIP41	**Semester : 4**	**L :T:P:H : 4:0:0:4**	**Credits: 0**
Contact Period: Lecture: 52 Hr, Exam: 3 Hr		**Weightage: CIE:50%, SEE:50%**	

Course Content

Unit-1

Linear Algebra: Introduction - Rank of matrix by elementary row operations - Echelon form of a matrix. Consistency of system of linear equations - Gauss elimination method. Gauss-Jordan and LU decomposition methods. Eigen values and eigen vectors of a square matrix. Application of Cayley-Hamilton theorem (without proof) to compute the inverse of a matrix-Examples. **10 Hours**

Unit-2

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators. Solutions of initial value problems. Method of undetermined coefficients and variation of parameters. Solution of Cauchy's homogeneous linear equation and Legendre's linear differential equation. **14 Hours**

Unit-3

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

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

Unit-4

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

Unit-5

Probability: Introduction. Sample space and events. Axioms of probability. Addition and multiplication theorems. Conditional probability – illustrative examples. Bayes's theorem-examples. **6 Hours**

Text Book:

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

Reference Books:

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

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