R.V.COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belagavi)

R.V. Vidyaniketan Post, Mysore Road

Bengaluru – 560 059

Bachelor of Engineering (B.E)

Scheme and Syllabus

(2016 Scheme)

III & IV Semester

(Electrical & Electronics Engineering)

Department Vision

Attain technical excellence in Electrical and Electronics Engineering through graduate programs and interdisciplinary research related to sustainability in power, energy and allied fields.

Department Mission

- To provide technical education that combines rigorous academic study and the excitement of innovation enabling the students to engage in lifelong learning
- To establish Centre of Excellence in sustainable electrical energy, smart grids and systems
- To establish tie-ups with industries and institutions of repute and to foster building up of a wide knowledge base to keep in tune with upcoming technologies.
- To motivate commitment of faculty and students to collate, generate, disseminate, persevere, knowledge and to work for the benefit of society.
- To develop simple, appropriate and cost effective inclusive technologies which are instrumental in the up-liftment of the rural society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: To provide a strong foundation in Mathematics, Science and Electrical & Electronics Engineering to comprehend, analyze, design, innovate and develop products for real world applications.

PEO2: To inculcate ethical attitude, effective communication skills, leadership qualities and team spirit for a successful professional career with concern for society.

PEO3: To provide a holistic academic environment to foster excellence, entrepreneurship and multidisciplinary approach to inculcate an aptitude for research and lifelong learning.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO	Description
PSO1	The B.E. EEE Program must demonstrate knowledge and competence in the application of circuit analysis, control systems, field theory, analog and digital electronics, Power Electronics, microcontrollers , microprocessors, Signal processing and conditioning, computer hardware and software to the design, building , testing, protection and operation of electrical machines, power systems, electrical and electronic systems.
PSO2	The B.E. EEE Program must demonstrate knowledge and competence in the application of basic sciences, rigorous mathematics and project management techniques in the design of complex electrical and electronic systems.
PSO3	The B.E. EEE Program must demonstrate the ability to effectively work in a team, communicate correctly and develop an ethical attitude and concern for society and environment.

Lead Society: Institute of Electrical & Electronics Engineers (IEEE)

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Scheme and Syllabus for III & IV Semesters

2016 SCHEME

ELECTRICAL & ELECTRONICS ENGINEERING

Abbreviations (Change accordingly)

Sl. No.	Abbreviation	Meaning
1.	**VTU**	Visvesvaraya Technological University
2.	**BS**	Basic Sciences
3.	**CIE**	Continuous Internal Evaluation
4.	**CS**	Computer Science and Engineering
5.	**CV**	Civil Engineering
6.	**CHY**	Chemistry
7.	**EC**	Electronics and Communication Engineering
8.	**EE**	Electrical and Electronics Engineering
9.	**ES**	Engineering Science
10.	**HSS**	Humanities and Social Sciences
11.	**ME**	Mechanical Engineering
12.	**PHY**	Engineering Physics
13.	**SEE**	Semester End Examination
14.	**MAT**	Engineering Mathematics

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Department of Electrical & Electronics Engineering

THIRD SEMESTER CREDIT SCHEME								
Sl. No.	**Course Code**	**Course Title**	**BOS**	**Credit Allocation**				**Total Credits**
				L	**T**	**P**	**SS**	
1	16MA31	Discrete And Integral Transforms	MAT	3	1	0	0	4
2	16ET32	Environmental Technology	BT	2	0	0	0	2
3	16EE33	Analog Electronics Systems	EEE	3	0	1	1	5
4	16EE34	Digital Logic Design with VERILOG	EEE	3	0	1	1	5
5	16EE35	Network Analysis	EEE	4	0	0	1	5
6	16EE36	Signals & Systems	EEE	3	1	0	0	4
7	16DCS37	Bridge Course C Programming *	CSE	2	0	0	0	0
Total number of Credits								**25**
Total Number of Hours / Week				**18+2***	**4**	**4**	**12****	

FOURTH SEMESTER CREDIT SCHEME								
Sl. No.	**Course Code**	**Course Title**	**BOS**	**Credit Allocation**				**Total Credits**
				L	**T**	**P**	**SS**	
1	16EE41	Measuring Instruments And Transducers	EEE	3	1	0	0	4
2	16EM42	Engineering Materials	EC	2	0	0	0	2
3	16EE43	Microprocessor & Micro Controller.	EEE	3	0	1	1	5
4	16EE44	Fields & Waves	EEE	3	0	0	1	4
5	16EE45	Electrical Machine Analysis-I	EEE	3	0	1	1	5
6	16EE46	Control Systems	EEE	3	1	0	0	4
7	16HS47	Professional Practice-II (Team Work & Professional Ethics)	HSS	0	0	1	0	1
8	16DMA48	Bridge Course Mathematics *	MAT	2	0	0	0	0
Total number of Credits								**25**
Total Number of Hours / Week				**17+2***	**4**	**4**	**12****	

*Mandatory Audit course for lateral entry diploma students ** Non-contact hours

Semester: III		
DISCRETE AND INTEGRAL TRANSFORMS (Theory) (COMMON TO EC, EE, EI, TC)		
Course Code:16MA31B		**CIE Marks:** 100
Credits: L:T:P:S: 3:1:0:0		**SEE Marks:** 100
Hours: 36L+12T		**SEE Duration:** 03Hrs

Course Learning Objectives: The students will be able to	
1	Comprehend the existence and the role of transforms, inverse transforms and Fourier series in engineering problems.
2	Learn to find transform and inverse transform of continuous, discontinuous and discrete functions.
3	Develop the knowledge of periodic functions as a Fourier series subject to Dirichlet's conditions and derive the Fourier series using Euler's formulae.
4	Identify and solve initial and boundary value problems, interpret the physical significance of solutions using transform methods.

UNIT-I	
Laplace transform: Existence and uniqueness of Laplace Transform (LT), Transform of elementary functions, RoC. Properties of LT - Linearity, change of scale and first shifting. Transform of function - multiplied by t^n, division by t, derivatives and integral. LT of periodic function, Heaviside unit step function, Unit impulse function. Heaviside shift (second shift) theorem.	**07 Hrs**
UNIT-II	
Inverse Laplace Transform: Definition, properties of inverse Laplace transform, evaluation using different methods. Convolution theorem, problems. Application to solve ordinary linear differential equations and simultaneous differential equations.	**07 Hrs**
UNIT-III	
Fourier Series: Introduction, periodic function, even and odd functions, properties. Special waveforms - square wave, half wave rectifier, saw-tooth wave and triangular wave. Dirichlet's conditions, Euler's formula for Fourier series, Fourier series for functions of period 2L (particular cases) - problems. Half Range Fourier series- Construction of Half range cosine and sine series. Parseval's theorem for Root mean square value of a function(without proof). Complex form of Fourier series.	**08 Hrs**
UNIT-IV	
Fourier Transform: Fourier Integral theorem, Complex Fourier transform, Fourier sine transform, Fourier cosine transform, Properties of FT, Convolution theorem, Parseval's identity, Applications of FT.	**07 Hrs**
UNIT-V	
Z – Transform: Introduction, Z transform of standard functions, Linearity property, damping rule, shifting theorem, initial and final value theorems, convergence of Z transform, RoC, inverse Z transform using power series and partial fraction methods, convolution theorem, application to difference equations.	**07 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1 :	Understand - the significance of fundamental concepts of transforms and inverse transforms, even & odd functions, periodic phenomena.
CO2 :	Demonstrate - the properties of transforms and inverse transforms, graphical representation of various wave forms.
CO3 :	Evaluate - transforms of periodic, discontinuous and discrete functions, develop Fourier series of various type of functions.
CO4 :	Apply - transform techniques to solve Differential equations and Difference equations in engineering problems.

Reference Books	
1.	Higher Engineering Mathematics, B.S. Grewal, 40th Edition, Khanna Publishers, 2007, ISBN: 81-7409-195-5.
2.	A Text Book of Engineering Mathematics, N.P Bali & Manish Goyal, 7th Edition, Lakshmi Publications, 2010, ISBN: 978-81-7008-992-6.
3.	Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2007, ISBN: 978-81-265-3135-6.
4.	Higher Engineering Mathematics, B. V. Ramana, Tata McGraw-Hill, 2008, ISBN: 13-978-07-063419-0.

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total marks of CIE are 100.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	-	-	-	-	-	-	-	1	-	1
CO2	3	2	2	1	-	-	-	-	-	1	-	1
CO3	3	3	2	2	2	-	-	-	-	1	-	1
CO4	3	3	3	3	2	-	-	-	-	1	-	1

Low-1 Medium-2 High-3

Semester: III

ENVIRONMENTAL TECHNOLOGY (Theory)		
Course Code:16ET32/16ET42		**CIE Marks: 50**
Credits: L:T:P:S: 2:0:0:0		**SEE Marks: 50**
Hours: 25L		**SEE Duration: 02Hrs**

Course Learning Objectives: The students will be able to	
1	Understand the various components of environment and the significance of the sustainability of healthy environment.
2	Recognize the implications of different types of the wastes produced by natural and anthropogenic activity.
3	Learn the strategies to recover the energy from the waste.
4	Design the models that help mitigate or prevent the negative impact of proposed activity on the environment

UNIT-I	
Introduction: Ecosystem – Types and structure of ecosystem. Components of environment, Environmental education, Environmental act & regulations. Global environmental issues, ISO 14000, Environmental Impact Assessment and Challenges.	**05 Hrs**
UNIT II	
Environmental pollution: Causes, effects and control measures of Air, noise and land pollution. Air Pollution. Clean air act, Pollution standard index. Indoor air quality. Global atmospheric change - Global warming, Acid rain &Ozone depletion and their controlling measures.	**05 Hrs**
UNIT III	
Water pollution and management: Pollutants in surface & ground water, water borne diseases. Water purification systems: physical & chemical treatment - aeration, solids separation, settling operations, coagulation, softening, filtration, disinfection, The common technologies for purification of drinking water - Ultraviolet radiation treatment, Reverse Osmosis. Rain water harvesting, water recycling, STP plant.	**05 Hrs**
UNIT IV	
Renewable energy sources and technology for generation of energy: Different types of energy, conventional sources & non conventional sources of energy, solar energy, wind energy, hydro electric energy, Geothermal Energy, Nuclear energy, Fossil Fuels & Biomass energy.	**05 Hrs**
UNIT V	
Solid waste management: Types, causes, control and processing. Typical generation rates, estimation of solid waste quantities, factors that affect generation rates. Management - On site handling, collection, storage and processing techniques, ultimate disposal, landfills. Reduction and recycling of waste – waste to composite, energy.	**05 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1	Identify the components of environment and exemplify the detrimental impact of anthropogenic activities on the environment.
CO2	Differentiate the various types of wastes and suggest appropriate safe technological methods to manage the waste.
CO3	Aware of different renewable energy resources and can analyse the nature of waste and propose methods to extract clean energy.
CO4	Adopt the appropriate recovering methods to recover the essential resources from the wastes for reuse or recycling.

Reference Books	
1.	Introduction to environmental engineering and science, Gilbert, M.M., Pearson Education. 2nd Edition, 2004, ISBN: 8129072770.
2.	Environmental Engineering, Howard S. Peavy, Donald R. Rowe and George Tchobanoglous, 2000, McGraw Hill Series in water resources and Environmental Engg., ISBN: 0070491348
3.	Environmental Science – 15th edition, G. Tyler Miller, Scott Spoolman, 2012,Publisher: Brooks Cole, ISBN-13: 978-1305090446 ISBN-10: 130509044
4.	Environment Management, Vijay Kulkarni and T. V. Ramachandra, 2009, TERI Press, ISBN: 8179931846, 9788179931844

Continuous Internal Evaluation (CIE); Theory (50 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Assignment. A minimum of three quizzes are conducted and each quiz is evaluated for 05 marks adding up to 15 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 25 marks each and the sum of the marks scored from three tests is reduced to 30. The marks component for Assignment is 05. The total marks of CIE are 50.

Semester End Evaluation (SEE); Theory (50 Marks)

SEE for 50 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 10 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 8 marks adding up to 40 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	3	-	2	-		-
CO2	2	3	3	2	1	-	3	3	2	-	2	1
CO3	-	3	1	3	-	2	3	3	2	-	1	2
CO4	1	-	2	1	3	-	2	-	2	-	-	2

High-3 : Medium-2 : Low-1

Semester: III		
ANALOG ELECTRONICS CIRCUITS (Theory & Practice)		
Course Code: 16EE33		**CIE Marks:** 100+50
Credits: L:T:P:S: 3:0:1:1		**SEE Marks:** 100+50
Hours: 36L+24T		**SEE Duration:** 03Hrs+03Hrs

Course Learning Objectives: The students will be able to	
1	Analyse a transistor circuit by developing dc and ac models
2	Study different parameters and application circuits of op-amps
3	Realize voltage regulators using IC`s
4	Design multivibrators and timer circuits using IC 555 and IC565
5	Realize basic ADC and DAC circuits.

UNIT-I	
Transistors Biasing: DC Load line and bias point, biasing methods and its design approach for BJT and JFET (voltage divider bias and base bias), Thermal stability, Design of biasing for JFET. AC Analysis of BJT circuit: AC load line, Hybrid equivalent model **Power amplifiers**: Class A, B, AB, C and D amplifiers	**08 Hrs**
UNIT-II	
Over view of operational amplifier: Introduction to Op-amps, Analysis of ideal Op-Amp circuits, non-inverting amplifier, inverting amplifier, Integrator and differentiator. **Operational amplifier**: Internal Structure of Op-Amps, Parameters and Characteristics of Practical Op-Amps.	**07 Hrs**
UNIT-III	
OP-AMPS Applications: Basic applications, Instrumentation amplifier, AC amplifier, V to I & I to V converters, Opamp circuits using diode, Sample & Hold, integrator, differentiator, and Power amplifiers. Schmitt trigger - regenerative comparator, Astable & mono - stable multi- vibrators. **Wave from generator:** Square wave generator, Triangular wave generator and saw tooth-wave generator.	**07 Hrs**
UNIT-IV	
Active Filters Comparison of Active and Passive filters. Butterworth filters(Butterworth function for n=2 and n=3) ,First order low and high pass filter, Second order Low and high pass filters, Butterworth second order low pass filters. Band pass filter (wide-band and narrow band), Band reject filters (wide-band and narrow band) and All-pass filter. **Oscillators:** Principles of oscillators, Phase shift oscillator, Quadrature Oscillator, Three phase oscillator, Wein Bridge Oscillator	**07 Hrs**
UNIT-V	
Other Analog IC's And Applications: Voltage controlled oscillators-NE/SE-566, 555 Timer-functional block diagram, monostable and astable multivibrators and its applications, Phase lock loops-phase detectors, integrated circuit PLL and applications of 565 PLL, Sample and Hold circuits, Digital to analog converters-R-2R ladder, weighted resistor D/A converters, IC D/A converters, Analog to digital converters-successive approximation A/D converter and A/D converter.	**07 Hrs**

LABORATORY EXPERIMENTS
1. a. Verification of maximum power transfer theorem b. Verification of the venin's theorem **2.** a. Design of inverting amplifier, non-inverting amplifier, integrator using IC 741 b. Basics of PSPICE **3.** RC coupled amplifier. **4.** Study the working of half wave and full wave Precision Rectifiers using operational amplifier IC741 **5.** Design and implementation of peak detector and clamming circuit **6.** Design and implement a Schmitt trigger circuit for given UTP & LTP using op-amp. **7.** Design and implementation square and ramp wave generators for given frequency using operational amplifier IC 741 **8.** Design and simulation First order High pass filter, Low pass filter, wide Band Pass filter and wide Band reject filter for the given pass band gain and cut-off frequency and plot the frequency response. **9.** a. Design and implement a Astable multivibrator for a given frequency and duty cycle using NE555 Timer. b. Design a Monostable multivibrator for a given frequency using NE555 timer **10.** Realize 2 bit flash ADC using LM 324 comparator and priority encoder IC 74148 **11.** Realize a 4 bit DAC using R-2R ladder network and asynchronous decade Counter IC 7490. **12.** a. Design of VCO using IC NE/SE 566 b. Design of PLL using IC NE/SE 565 c. Study the working of voltage regulator using IC 723 **Design of analog circuits using PSPICE** **13.** Schmitt trigger circuit for given UTP & LTP **14.** First order High pass filter, Low pass filter, wind Band Pass filter and wide Band reject filter for the given pass band gain and cut-off **15.** To plot the frequency response. **16.** Generation of ramp wave for a given frequency using NE555 timer. **17.** Implement FSK modulator using IC 555.

Course Outcomes: After completing the course, the students will be able to	
CO 1	Understand the basic fundamentals of transistor biasing and operational amplifiers
CO 2	Analyze the performance of Op-amp and build simple circuits using op-amps
CO 3	Apply the concepts to design various applications of op-amps
CO 4	Design a complete analog electronic system using various analog IC's for a specific application.

Reference Books	
1.	Electronic Devices and Circuits ,David A. Bell, , 5th Edition, 2010, Oxford Higher Education Press,.ISBN:9780195693409
2.	Microelectronics circuits Analysis and Design, M.H Rashid Thomson, ISBN:0534951740
3.	Microelectronics circuits, Sedra & Smith Oxford, 5th Edition,ISBN 13: 9780195338836
4	Microelectronics, Millman & Grabel: 2nd Edition, TMH,ISBN 13:9780074637364.

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Continuous Internal Evaluation (CIE): Total marks: 100+50=150

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total CIE for theory is 100.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 40 marks. At the end of the semester a test is conducted for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO/PO	PO1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2
CO1	3	1	1	-	1	-	1	1	-	1	1	1
CO2	2	1	2	1	1	1	-	2	1	2	-	2
CO3	1	1	1	2	2	-	-	-	1	2	-	1
CO4	2	2	3	2	3	1	2	-	2	3	2	1

High-3: Medium-2: Low-1

Semester: III		
DIGITAL LOGIC DESIGN WITH VERILOG (Theory & Practice)		
Course Code: 16EE34		**CIE Marks:** 100+50
Credits: L:T:P:S: 3:0:1:1		**SEE Marks:** 100+50
Hours: 36+24T		**SEE Duration:** 03Hrs+03Hrs
Course Learning Objectives: The students will be able to		
1	Optimize logic expressions using Karnaugh map, Tabular method and VEM method.	
2	Simplify Boolean equations and design combinational circuits with optimal gates.	
3	Analyze the working principles of Flip-Flops and design asynchronous sequential circuits.	
4	Design simple synchronous digital circuits based on finite state machine algorithm.	
5	Design, simulate and implement digital systems using HDL.	

UNIT-I	
DIGITAL LOGIC: Overview of Basic Gates and Universal Logic Gates, Logic families, TTL and CMOS logic gates, Interfacing of IC'S of different logic family. Simplification of logical equations using Boolean algebra. **OPTIMIZED IMPLEMENTATION OF LOGIC FUNCTIONS:** Terms and Definitions: minterm, maxterm, Standard form and canonical forms (SOP and POS). Simplification of logical equations using Karanaugh map, Quine - McClusky and VEM method: Strategy for minimization, minimization in SOP, POS.Incompletely specified functions minimization. Realization of logic circuits using AOI logic and universal gates.	**07 Hrs**
UNIT-II	
COMBINATIONAL CIRCUIT BUILDING BLOCK : Half/Full adder, Half/Full subtractor, ripple carry adder, fast adder, BCD adder, Multiplexers, demultiplexers, decoder, encoders, code converters, Magnitude comparators. Programmable Logic Devices (PLD), Programmable Read-only memories, Programmable Logic Arrays, Programmable Array Logic.Design of combinational circuits using PLD's. **INTRODUCTION TO Verilog PROGRAMMING:** Introduction, general structure of Verilog program for describing digital circuit, operators, architectural models and simple examples. Verilog code for combinational circuits.	**08 Hrs**
UNIT-III	
FLIPFLOPS - Basic latch, gated SR latch, gated D latch, master slave & edge triggered SR flip flop, D flip flops, T flip flop, JK flip flop. **REGISTERS**: Shift registers, types, parallel access shift registers. Universal shift registers. Verilog code for flip flops and registers.	**07 Hrs**
UNIT-IV	
COUNTERS: Design of asynchronous & synchronous counters, binary counters, BCD counters, IC counters, ring & Johnson counters. Verilog code for counters. **SYNCHRONOUS SEQUENTIAL NETWORKS**: Design techniques, concept of states, state diagram, state table & state assignment. Mealy & Moore state	**07 Hrs**

models.	
UNIT-V	
Clocked Synchronous Sequential Network: Structure and operation of Clocked synchronous Sequential Networks, Analysis of Clocked Synchronous Sequential Networks, Modeling clocked synchronous sequential network behavior, State Table Deduction, The State Assignment, Completing the design of clocked synchronous sequential networks.	**07 Hrs**

LABORATORY EXPERIMENTS

1. Simplification, realization of Boolean expressions, full adder & full subtractor using logic gates/Universal gates.
2. Realization of parallel adder/ Subtractors using 7483 IC, BCD to Excess-3 code conversion and vice versa
3. MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.
4. Realization of One/Two bit comparator and study of 7485 magnitude comparator.
5. Use of a) Decoder IC to drive LED display and b) Priority encoder.
6. Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).
7. Shift left; Shift right, SIPO, SISO, PISO, PIPO operations, ring / Johnson counter, using 74S95.
8. Realization of full adder by simulation & testing the code by a test bench by simulation.
9. Realization of 4 –bit adder / 2's complement subtractor by structural modeling by simulation
10. Realization of 4 to 1 multiplexers and 2 to 4 decoders by simulation
11. Realization of edge triggered D flip- flops and a 4 –bit shift register by simulation
12. Realization of ring / twisted ring counters by simulation.

All simulation experiments can be carried out using Model Sim by Verilog code.

Course Outcomes: After completing the course, the students will be able to	
CO 1	Understand and remember the basic concepts of logic families, Boolean algebra, combinational and sequential circuits.
CO 2	Apply the concepts to realize the digital circuits.
CO 3	Analyze and evaluate different techniques to realize the digital circuits
CO 4	Design and develop digital circuits for real time applications

Reference Books	
1.	Digital principles, Givone, 2002 Edition ,PHI ,ISBN-10: 0072551321
2.	Digital Design, Morris Mano,3rd Edition, Pearson education,ISBN-13: 978-0132348485
3.	Fundamental of Digital Logic Design with Verilog, Stephan Brown & Zvonko Vranesic, 3rd Edition, Tata McGraw Hill, ISBN 978–0–07–338054
4.	Digital Principles and Applications, Donald P Leach, Albert Paul Malvino & Goutam Saha, 8th Edition, 2006, TMH, ISBN: 978933920340.

Continuous Internal Evaluation (CIE): Total marks: 100+50=150
Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total CIE for theory is 100.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 40 marks. At the end of the semester a test is conducted for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	1	1	2	1	1	--	1	1	1	1
CO2	2	3	2	2	1	--	--	--	1	1	--	2
CO3	3	3	2	2	1	1	1	--	1	1	--	2
CO4	3	3	2	2	--	1	1	1	1	1	2	2

High-3: Medium-2: Low-1

SEMESTER – III		
NETWORK ANALYSIS (Theory)		
Course Code:16EE35		**CIE Marks:** 100
Credits: L:T:P:S: 4:0:0:1		**SEE Marks:** 100
Hours: 45L		**SEE Duration:** 3Hrs
Course Learning Objectives: The students will be able to		
1.	Apply knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits.	
2.	Analyze complex networks using network theorems.	
3.	Understand the concept of dot convention used in coupled circuits.	
4.	Find the time constants, initial and final values of voltages, currents and complete responses for RLC circuits under ac and dc excitations.	
5.	Use Laplace transforms to evaluate complete response of electrical networks.	
6.	Understand the concept of poles and zeros in the analysis and synthesis of networks.	

UNIT-I	
Basic Concepts: Practical sources, source transformation, source shifting, Loop and Node analysis with linear dependent and independent sources for DC and AC networks. Principle of duality.	**09 Hrs**
UNIT-II	
Network Theorems: Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power transfer and Millman's theorems. **Coupled circuits:** Dot convention, Analysis of coupled circuits. Coupled coils in series and parallel.	**09 Hrs**
UNIT-III	
Polyphase Circuits: Analysis of unbalanced loads connected to balanced three-phase supply, neutral shift. **Resonance in Networks:** Series and parallel resonance, Q-factor, Bandwidth. Response by varying f, L, C. **Locus diagrams:** current locus diagram of series RL, RC, and RLC circuit. Locus diagram of parallel circuits with variation of various parameters	**09 Hrs**
UNIT-IV	

Two port networks: Z, Y, ABCD and Hybrid parameters, their inter relationship and numerical problems **Transient Behavior and Initial Conditions :** Behavior of circuit elements under switching conditions and their representation. Evaluation of initial and final conditions in R-L, R-C and R-L-C Circuits for DC and AC excitations.	**09 Hrs**
UNIT-V	
LaLaplace Transformation and Applications: Definition, Laplace and inverse Laplace transforms of standard functions, shifting theorem. Waveform synthesis, initial and final value theorems. Impulse function, Convolution theorem, Network functions of single port & two port networks-Driving point & transfer functions (immetence function). Concepts of poles and zeros. Restrictions on location of poles & zeros of Driving point & transfer functions.	**09 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1 :	Understand the basic concepts of circuits, theorems, and three phase unbalanced circuits and waveform synthesis
CO2 :	Apply the basic concepts and solve circuits with DC or AC excitation and coupled circuits using theorems and transformations
CO3 :	Compare the steady state and transient response of a circuit through application of inverse transformation and shifting theorems
CO4 :	Design and implement a circuit as per the given specifications and constraints

Reference Books	
1.	Network Analysis, M.E Van Valkenberg, , PHI, 3rd Edition, Reprint 2002, ISBN81-7808-729-4
2.	Engineering Circuit Analysis, Hayt, Kemmerly and Durbin, 6th Edition, 2002,TMH, ISBN-10: 0071122273
3.	Electrical Network, Ravish R Singh, Edition 2009 , Tata McGrawHill ,.ISBN 13: 978-0-07-026096-2
4.	Networks and Systems, D.Roy Choudhary, , 2nd Edition, New Age international Publishing, ISBN 978-81-224-2769-7

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total marks of CIE are 100.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marks is executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub

questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	1	0	2	0	0	0	1	2	0	2
CO2	3	3	2	0	2	0	0	0	1	2	0	2
CO3	3	2	1	1	2	0	0	0	1	2	0	1
CO4	3	2	2	1	2	0	0	0	1	2	0	2

High-3: Medium-2: Low-1

SEMESTER – III		
SIGNALS AND SYSTEMS (Theory)		
Course Code:16EE36		**CIE Marks:** 100
Credits: L:T:P:S: 3:1:0:0		**SEE Marks:** 100
Hours: 36L+24T		**SEE Duration:** 3Hrs
Course Learning Objectives: The students will be able to		
1	Recognize basics of naturally existing signals, systems and their mathematical representations.	
2	Analyze Linear Time Invariant systems and their properties	
3	Represent signals and a systems in frequency domain and z-domain and develop a mathematical process to migrate between the two representations of the same entity	
4	Understand the concept of sampling theorem	

UNIT-I	
Signals: Definition of Signals, Classification of Signals, Basic Operations on Signals: Operations Performed on the independent and dependent variable, Precedence rule, Elementary Signals. **Systems:** Definition of systems, system viewed as interconnection of operations, properties of systems.	**07 Hrs**
UNIT-II	
Linear Time Invariant Systems: **Discrete Time Systems:** Convolution sum, Convolution sum evaluation procedure. **Continuous Time Systems:** Convolution integrals, convolution integrals evaluation procedure, interconnections of LTI system, relations between LTI system properties and impulse response representation, difference equation representation of LTI system and solving difference equation (excluding differential equation), block diagram representation of systems.	**08 Hrs**
UNIT-III	
Fourier Representation of Discrete Signals: Discrete Time Fourier series(DTFS): Representation, Properties of DTFS **Discrete Time Fourier Transform:** Fourier Transform representation. Properties of DTFT, Inverse Fourier Transform by using Partial Fraction Expansion, Fourier Transform of Periodic Signals, Frequency response of Systems characterized by LCC difference equation.	**07 Hrs**

UNIT-IV	
Application of Fourier Representation: Sampling and Reconstruction: Introduction, representation of continuous time signals by samples: sampling theorem, impulse train sampling, sampling with zero order hold, reconstruction using interpolation, effect of under sampling, discrete time processing of continuous time signals, sampling of discrete time signals: impulse train sampling, discrete time decimation and interpolation.	**07 Hrs**
UNIT-V	
Z-Transforms: Introduction, Z Transforms, Properties of ROC, Poles and Zeros, Properties of Z- Transforms, Inverse of Z Transforms: Partial-Fraction Expansions, Power Series Expansion, Transfer Function, Causality, Stability and Inverse Systems. Unilateral Z transform and its application to solve difference equation. Relation between Z Transform and Fourier Transform.	**07 Hrs**

Z

Course Outcomes: After completing the course, the students will be able to	
CO1:	Understand representation of basic signals, LTI system and its response in time and frequency domains
CO2:	Apply various mathematical operations on signals
CO3:	Analyze both continuous and discrete time systems in time, frequency and z-domains
CO4:	Design simple signal conditioning systems

Reference Books	
1.	Signals and Systems , Simon Haykin and Barry Van Veen, 2nd Edition, 2008, John Wiley & Sons, ISBN: 978-0-471-16474-6
2.	Signals and Systems, V Oppenheim, Alan Willsky and A Hamid Nawab, Alan, 2nd Edition, 2006,Pearson Education Asia/ PHI, ISBN 10: 0138147574
3.	Signals and Systems, H.P Hsu, R. Ranjan, Schaum's outline series, TMH, 2006, ISBN 13: 9780070669185

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Assignment. A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 60. The marks component for assignment is 10. The total marks of CIE are 100.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have

internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	2	1	1	1	1	1	-	2	2	-	1
CO2	2	2	2	2	1	1	1	-	2	1	-	1
CO3	3	3	2	2	2	1	1	-	2	2	-	1
CO4	3	3	2	1	1	1	1	-	2	1	-	1

High-3: Medium-2: Low-1

III/IV Semester		
C PROGRAMMING (BRIDGE COURSE) (Theory)		
Course Code: 16DCS37		**CIE Marks: 100**
Credits: L:T:P:S : 2:0:0:0 (Audit Course)		**SEE Marks: 100**
Hours: 24L		**SEE : 03 Hrs**
Course Learning Objectives: The students will be able to		
1	Develop arithmetic reasoning and analytical skills to apply knowledge of basic concepts of programming in C.	
2	Learn basic principles of problem solving through programming.	
3	Write C programs using appropriate programming constructs adopted in programming.	
4	Solve complex problems using C programming.	

UNIT-I	
Introduction to Reasoning, Algorithms and Flowcharts Skill development – Examples related to Arithmetical Reasoning and Analytical Reasoning. Fundamentals of algorithms and flowcharts.	**02 Hrs**
Introduction to C programming Basic structure of C program, Features of C language, Character set, C tokens, Keywords and Identifiers, Constants, Variables, Data types.	**01 Hrs**
Handling Input and Output operations Reading a character, Writing a character, Formatted input/output functions, Unformatted input/output functions.	**02 Hrs**
UNIT-II	
Operators and Expressions Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and decrement operators, Conditional operators, Bit-wise operators, Arithmetic expressions, evaluation of expressions, Precedence of arithmetic operators, Type conversion in expressions, Operator precedence and associativity.	**02 Hrs**
Programming Constructs **Decision Making and Branching** Decision making with 'if' statement, Simple 'if' statement, the 'if…else'	**03 Hrs**

statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, The '*?:*' operator, The '*goto*' statement. **Decision making and looping** The while statement, the do statement, The 'for' statement, Jumps in loops**.**	
UNIT-III	
Arrays One dimensional arrays, Declaration of one dimensional arrays. Initialization of one dimensional arrays, Two dimensional arrays, Initializing two dimensional arrays.	**02 Hrs**
Character Arrays and Strings Declaring and Initializing String Variables, Reading Strings from Terminal, Writing strings to screen, Arithmetic Operations on characters, String operations using with and without String handling functions.	**02 Hrs**
UNIT-IV	
User-defined functions Need for User Defined Functions, Definition of functions, Return values and their types, Function calls, Function declaration, Category of functions, Nesting of functions, Functions with arrays, Storage classes.	**03 Hrs**
Structures and Unions Introduction, Structure definition, Declaring structure variables, Accessing structure members, Structure initialization, Copying and comparing structure variables, Arrays of structure, Arrays within structures, Structures and functions, Unions.	**03 Hrs**
UNIT – V	
Pointers : Introduction , Accessing the address of a variable, Declaring and initializing of pointer variables, Accessing a variable using pointers, Chain of pointers, Pointer expressions, Pointer increments and scale factor, Pointers and arrays, Pointers and character strings.	**03 Hrs**
File Managements in C Basic concepts of files, Defining and opening a file, closing of a file, Input/Output operations on files.	**01 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1.	Understand and explore the fundamental computer concepts and basic programming principles like data types, input/output functions, operators, programming constructs and user defined functions.
CO2.	Analyze and Develop algorithmic solutions to problems.
CO3.	Implement and Demonstrate capabilities of writing 'C' programs in optimized, robust and reusable code.
CO4.	Apply appropriate concepts of data structures like arrays, structures, and files to implement programs for various applications.

Reference Books:	
1.	Programming in C, P. Dey, M. Ghosh, 1st Edition, 2007, Oxford University press, ISBN -13: 9780195687910.
2.	The C Programming Language, Kernighan B.W and Dennis M. Ritchie, 2nd Edition, 2005, Prentice Hall, ISBN -13: 9780131101630.
3.	Turbo C: The Complete Reference, H. Schildt, 4th Edition, 2000, Mcgraw Hill Education, ISBN-13: 9780070411838.
4	Understanding Pointers in C, Yashavant P. Kanetkar, 4th Edition, 2003, BPB

.	publications, ISBN-13: 978-8176563581.

Scheme of Continuous Internal Evaluation:

CIE is executed by way of quizzes (Q), tests (T) and Assignment. A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. Faculty may adopt innovative methods for conducting quizzes effectively. The two tests are conducted and each test is evaluated for 30 marks adding up to 60 marks The marks component for assignment is 10. The total marks of CIE are 100.

Scheme of Semester End Examination:

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**2**	**-**	**1**
CO2	**3**	**2**	**2**	**2**	**2**	**-**	**-**	**-**	**2**	**1**	**-**	**1**
CO3	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**-**	**2**	**2**	**1**	**2**
CO4	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**-**	**2**	**2**	**1**	**2**

Low-1 Medium-2 High-3

SEMESTER – IV		
MEASURING INSTRUMENTS AND TRANSDUCERS (Theory)		
Course Code:16EE41		**CIE Marks:** 100
Credits: L:T:P:S: 3:1:0:0		**SEE Marks:** 100
Hours: 36L+24T		**SEE Duration:** 3Hrs

Course Learning Objectives: The students will be able to	
1	Understand the errors encountered in measuring instruments..
2	Derive the balance conditions in AC and DC bridges for the measurement L, C, R and dissipation factor etc.
3	To analyze the working of analog and digital measuring instruments, and determine the necessary conditions for working of instrument transformers.
4	To analyze the working principles of signal generators used in the laboratories.
5	To distinguish and describe various transducers and display devices used in instrumentation.

UNIT-I	
Measurement Errors: Definition of error, Gross errors and systematic errors, Absolute and relative errors, Accuracy, Precision, Resolution and Significant figures. Illustrative examples **Digital Instruments:** Introduction, Digital voltmeters (DVM) of ramp type, successive approximation principles, Resolution and sensitivity, General specifications, Digital Multi-meters. DC and DAC. Digital frequency meters.	**07 Hrs**
UNIT-II	
Measurement Errors: Whetstone's bridge, Kelvin Bridge; AC bridges - Capacitance Comparison Bridge, Maxwell's bridge, Wein's bridge, Schering bridge , D'sautys bridge, Wagner's earth connection, examples	**07 Hrs**
UNIT-III	
Measuring Instruments (AC and DC): Introduction, ammeter, voltmeter, wattmeter (dynamometers type), energy's meter (induction type).Multi-range voltmeter, extending voltmeter range. AC voltmeter using Rectifiers – Half wave and full wave, Peak responding and True RMS voltmeters, ammeters, multimeters.	**07 Hrs**

Instrument Transformers: Construction and theory of instrument transformers, ratio and phase angle errors of C.T. and P.T. including derivation and Numerical problems.	
UNIT-IV	
Signal Generators and Analyzers: Introduction, Fixed and variable AF oscillator, Standard signal generator, Laboratory type signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator, Sweep frequency generator, Analog and Digital storage oscilloscope. **Display Devices:** Digital display system, classification of display, Display devices, LEDs, LCD	**07 Hrs**
UNIT-V	
TrTransducers: Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, Differential output transducers and LVDT, capacitive transducer, Photoelectric transducer, Photovoltaic transducer, Semiconductor photo devices, Temperature transducers-RTD, Thermocouple, Piezo electric transducer. Measurements of noise and vibrations.	**08 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1:	Define the different measuring network parameters and understand the measuring techniques in analog and digital systems.
CO2:	Analyze the different methods of implementation in the working of measuring instruments and compare the end results.
CO3:	Asses the performance of different measuring instruments.
CO4:	Plan and design various measuring instruments for their innovation.

Reference Books	
1.	Electronic Instrumentation and Measurements , David A Bell, PHI,2nd Edition, 2006,ISBN 10: 0132499541
2.	Modern electronic instrumentation and measuring techniques , Cooper D & A D Helfrick, 1998,PHI,. ISBN-8120307526
3.	Electronics & electrical measurements , A K Sawhney , 9th edition,2010, Dhanpat Rai & sons,.ISBN-10: 8177001000
4.	Electronic Instrumentation ,H. S. Kalsi, 2nd Edition,2004,TMH, ISBN-9780074621868

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Assignment. A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 60. The marks component for assignment is 10. The total marks of CIE are 100.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub

questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	1	1	2	1	-	2	2	1	-	2	-	
CO2	2	2		2	2	3	1		1	1		2
CO3	3	1	1	3	2	2	2	3	1	1	2	1
CO4	1	2	3	3	1	2	2		3	2	2	3

High-3: Medium-2: Low-1

Semester: IV		
ENGINEERING MATERIALS (Theory) (COMMON TO EC, EE, EI & TE)		
Course Code:16EM42B		**CIE Marks:** 50
Credits: L:T:P:S 2:0:0:0		**SEE Marks:** 50
Hours: 24L		**SEE Duration:** 2 Hrs
Course Learning Objectives: The students will be able to		
1.	Understand electrical conduction (transport) in solids based on quantum mechanics and modern band theory	
2.	Understand lattice vibration and thermal conduction (transport) in solids	
3.	Understand major properties of bulk and nanostructured semiconductors & effects of dopant impurities and defects in semiconductors	
4.	Understand the principles of light-solid interactions.	

UNIT-I	
Introduction: Classification and Properties of Materials, Materials Used in Electrical and Electronic Industries, Requirements and Future Developments of Electronic Materials	**04 Hrs**
UNIT-II	
Classical Theory of Electrical Conduction and Conducting Materials: Resistivity, TCR (Temperature Coefficient of Resistivity) and Matthiessen's Rule, Traditional Classification of Metals, Insulators and Semiconductors, Drude's Free Electron Theory, Hall Effect, Wiedemann–Franz Law, Resistivity of Alloys, Nordheim's Rule, Resistivity of Alloys and Multiphase Solids, Materials for Electricity Transmission	**05 Hrs**
UNIT-III	
Thin Film Electronic Materials: Techniques for Preparation of Thin Films, Thin Film Conducting Materials, Thin Film Resistors, Transparent and Conductive Thin Films, Thin Film Magnetic Materials	**05 Hrs**
UNIT-IV	
Organic Electronic Materials: Conducting Polymers, Semiconducting Organic Materials, Organic Superconductors, Organic Piezoelectric Materials.	**05 Hrs**
UNIT-V	
Nanomaterials for Electronic Device Applications: Techniques for Preparation of Nanomaterials, Micro-/nano-devices Using Nanostructured Materials,	**05 Hrs**

graphene, carbon nano tubes	

Course Outcomes: After completing the course, the students will be able to	
CO1 :	Define different electronics materials properties, devices and its preparation techniques
CO2 :	Classify & summarize different materials based on its function properties and its preparation for real time devices
CO3 :	Identify electronics materials based on functional properties and preparation techniques
CO4 :	Analyze the significance of emerging materials from appraising the existing materials properties and preparation techniques for devices and applications

Reference Books	
1.	Introduction to Electronic Materials for Engineers, Wei Gao & Zhengwei Li, Nigel Sammes, 2nd Edition, World Scientific Publishing Co. Pvt. Ltd, ISBN:9789814293693
2.	Flexible Electronics: Materials and Applications: William S, Wong and Alberto Salleo. ISBN 978-0-387-74362-2,2009

Continuous Internal Evaluation (CIE); Theory (50 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Assignment. A minimum of three quizzes are conducted and each quiz is evaluated for 05 marks adding up to 15 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 25 marks each and the sum of the marks scored from three tests is reduced to 30. The marks component for Assignment is 05. The total marks of CIE are 50.

Semester End Evaluation (SEE); Theory (50 Marks)

SEE for 50 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 10 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 8 marks adding up to 40 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO-PO Mapping												
CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**2**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**-**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**3**	**2**	**-**	**-**	**1**	**2**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**3**	**2**	**2**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**2**

Low-1 Medium-2 High-3

Semester: IV		
MICRO PROCESSOR AND MICRO CONTROLLERS (Theory & Practice)		
Course Code: 16EE43		**CIE Marks:** 100+50
Credits: L:T:P:S: 3:0:1:1		**SEE Marks:** 100+50
Hours: 36L		**SEE Duration:** 03Hrs+03Hrs
Course Learning Objectives: The students will be able to		
1	Specify, design, implement, and debug simple microprocessor-based applications using the Intel 8086 architecture	
2	Demonstrate the differences between microprocessor and microcontroller	
3	Analyze the architecture of 8051 microcontroller	
4	Use software development tools to assemble, test and debug the programs by using breakpoints, single-stepping, monitoring the changes in register/memory contents, on a hardware platform or on an emulator	
5	Analyze the architectural support of MCUs to interface with external world	

UNIT-I	
8086 PROCESSORS: Historical background, The microprocessor based personal computer system, Van Neumann and Harvard Architecture, RISC & CISC processor architecture, 8086 CPU Architecture, Machine language instruction formats, Addressing modes, Instruction execution timing. Assembler Directives and operators INSTRUCTION SET OF 8086: Data transfer and arithmetic instructions. Illustration of these instructions with example programs. , Maximum Mode, Minimum Mode of 8086	**08 Hrs**
UNIT-II	
BYTE AND STRING MANIPULATION: Branch type, loop, NOP & HALT, logical and shift and rotate instructions String instructions, Branching Instructions, Processor Control Instructions , Macros, Modular Programs, Procedures REP Prefix, Procedures, Illustration of these instructions with example programs	**07 Hrs**
UNIT-III	
8086 INTERRUPTS: Introduction to stack, stack structure of 8086, 8086 Interrupts and ISR, NMI, INTR, and Interrupt programming, Passing parameters to procedures, Interrupt examples, Macros, Timing and Delays. Basic Peripherals and their Interfacing with 8086: Semiconductor Memory Interfacing-Static RAM Interfacing of 8086. Modes of operation. **Advanced** processor**:** Typical characteristics of RISC Architecture, ARM advanced RISC machine	**07 Hrs**
UNIT-IV	
Hardware of 8051 Microcontrollers : Introduction of Intel MCS 51 family, Comparison of Microprocessor and Microcontroller, Architecture and Pin Functions of 8051 Microcontroller, CPU Organization, Program Counter, Timing and Machine Cycles, Internal Memory Organization, Registers, Stack, Input/ Output Ports, Counters and Timers, Serial Data Input and Output, Interrupts, Power Saving Modes	**07 Hrs**
UNIT-V	
8051 Microcontroller Based System Design: Input/output Port Programming, Programming timers, Asynchronous Serial Data Communication, Interrupt Service Routines. Programming in C, Inline Assembly, Interfacing Matrix Keyboard and Seven Segment Displays, Interfacing ADC and DAC, Interfacing of LCD Display	**07 Hrs**

LABORATORY EXPERIMENTS

8086 Microprocessor programming using MASM

1. Data Transfer Programs: Block Moves (With & Without Overlap) with & without
   String Instructions,
2. Arithmetic Operations: Addition, Subtraction, Multiplication &
3. Code Conversions: Use XLAT Instruction to Convert Binary to BCD,
4. Binary to ASCII, Binary to gray
5. (a) Linear Search (b)Binary Search
   (c)Bubble Sort (d) Selection Sort
6. ASCII Operations: Addition, Subtraction, Multiplication & Division on

Interfacing programs using 8051 Microcontroller.

7. UP/down counters
8. Stepper motor
9. DAC interface
10. Hex keypad 7 segment display interface
11. Elevator interface
12. LCD interface
13. ADC interface
14. Program on timer.

Course Outcomes: After completing the course, the students will be able to	
CO 1	Discuss the basic design principles of processor/controller based system design
CO 2	Identify the different operational &non-operational attributes to be satisfied while designing processor/controller based application
CO 3	Analyze the execution of instructions/program knowing the basic principles of microprocessor, microcontroller architecture and assembly language
CO 4	Evaluate the performance of different architectures to meet data processing needs of real world applications

Reference Books	
1.	Micro-Processors and Interfacing-Programming & Hardware , Douglas Hall, , 2nd Edition, 2002., TMH, ISBN: 0070097674
2.	Advanced Microprocessors and Peripherals , A.K Ray KM Bhurchandi , TMH Publications ,ISBN-0-07-463841
3.	The Intel Micro-processors, Architecture, Programming and Interfacing , Barry B. Brey, 6th Edition, 2008, Pearson Education,. ISBN: 9788131726228
4.	The 8051 Microcontroller Architecture, Programming &Applications , Kenneth J. Ayala, Thomson Learning; 2nd Edition, 2004. ISBN: 9780314201881

Continuous Internal Evaluation (CIE): Total marks: 100+50=150

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total CIE for theory is 100.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 40 marks. At the end of the semester a test is conducted for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	2	2	3	3	2	-	-	-	1	1	2	2
CO2	3	3	3	3	2	-	-	-	1	1	2	2
CO3	3	3	3	2	1	-	-	-	1	1	2	2
CO4	3	3	3	3	2	-	-	-	1	1	2	2

High-3: Medium-2: Low-1

SEMESTER – IV

FIELDS AND WAVES (Theory)		
Course Code:16EE44		**CIE Marks:** 100
Credits: L:T:P:S: 3:0:0:1		**SEE Marks:** 100
Hours: 36L		**SEE Duration:** 3Hrs

Course Learning Objectives: The students will be able to	
1.	Calculate electric field and potential due to different charge configurations.
2.	Apply Poisson's equation to derive capacitance of different configurations.
3.	Derive magnetic field intensity for various current configurations.
4.	Understand the concept of EM waves and compare wave propagation through different media.
5.	Derive the transmission and reflection coefficients for an EM wave.

UNIT-I	
Electrostatics 1 : Coulomb's law, illustrative examples, Electric Field Intensity, Field intensity due to point charge, Line charge distribution, Surface charge distribution, sheet of charge, Circular ring and disk;. Flux, flux density Gauss' Law, Divergence Theorem(qualitative treatment), Application of Gauss's Law to Continuous Volume Charge, Line Charge, Sheet Charge, Metal sphere, spherical shell; Illustrative examples in all topics; Maxwell's equations for electrostatics	**07 Hrs**
UNIT-II	
Electrostatics 2 : Work done to move a point charge, Electric potential, Relation between E and V, Potential due to Line charge distribution, Surface charge distribution, sheet of charge, Circular ring and disc; Energy Density in an Electric Field ;Properties of conductors and field inside a conductor; Boundary Conditions (dielectric-dielectric, dielectric-conductor), Poisson's and Laplace's Equations, Uniqueness Theorem, Applications of Laplace's and Poisson's Equations to a parallel plate , coaxial and spherical capacitors; Illustrative examples in all topics	**07Hrs**
UNIT-III	
Magnetostatics1 : Current, Current density, Biot -Savart Law , Ampere's Circuital Law and its applications; Magnetic Flux Density; Magnetic field intensity H; Magnetic Scalar and Vector Potentials; Magnetic Force and torque; Forces due to Magnetic Fields, A Magnetic Dipole , Magnetization in Materials, Classification of Magnetic Materials	**07 Hrs**
UNIT-IV	
Magnetostatics2: Magnetic Boundary Conditions Inductance; Inductance of a solenoid and toroid. ; Faraday's Law ,Transformer and Motional EMFs; ,Displacement Current ; Maxwell's Equations in Final Forms for Time-Varying fields; Time-Harmonic Fields , Illustrative examples	**07 Hrs**
UNIT-V	
Electromagnetic waves : Introduction, Waves in General ,Wave Propagation in Lossy Dielectrics , Plane Waves in Lossless Dielectrics , Plane Waves in Free Space , Plane Waves in Good Conductors , Power and the Pointing Vector ,Reflection of a Plane Wave at Normal Incidence , Illustrative examples	**08 Hrs**

Course Outcomes: After completing the course, the students will be able to

CO1:	Understand the basic concepts of electric fields, magnetic fields, material properties and electromagnetic waves
CO2:	Apply the basic laws of Physics and Engineering Mathematics to solve complex problems in electric fields, magnetic fields and electromagnetic waves
CO3:	Analyze different charge and current configurations to derive their fields, potential and energy
CO4:	Evaluate, analyze and design simple components from their field specifications, propagation in different medium and boundary conditions

Reference Books	
1.	Elements of Electromagnetics , Matthew N O Sadiku , 4th Edition,2007,Oxford University Press; ISBN- 978-0199321384
2.	Engineering Electromagnetics , William H. Hayt Jr. and John A. Buck , 6th Edition, 2001; Tata McGraw Hill, ISBN 9780071244497
3.	Introduction to Electromagnetics , David J Griffiths, , 3rd Edition , PHI, ISBN 978-8120316010
4.	Field and Wave Electromagnetics, David K. Cheng II Edition.-1989, Indian Reprint 2001, , Pearson Education Asia ,ISBN - 9787302152125

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total marks of CIE are 100.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	1	1	-	-	-	1	2	-	1
CO2	3	3	2	1	1	-	-	-	1	2	-	1
CO3	3	3	2	1	1	-	-	-	1	2	-	1
CO4	3	3	2	1	1	-	-	-	1	2	-	1

High-3: Medium-2: Low-1

Semester:IV

ELECTRICAL MACHINE ANALYSIS– I (Theory & Practice)		
Course Code: 16EE45		**CIE Marks:** 100+50
Credits: L:T:P:S: 3:0:1:1		**SEE Marks:** 100+50
Hours: 36L		**SEE Duration:** 03Hrs+03Hrs

Course Learning Objectives: The students will be able to	
1	Apply the theory of electromagnetism in analyzing electrical machines
2	Describe the construction, characteristics and operation of the transformers and induction machines
3	Analyze the performance of transformers and induction machines at different loading conditions
4	Develop the equivalent circuit model of induction motors to evaluate their performance characteristics
5	Design and estimate the physical dimensions of the machine in relation to the output.

UNIT-I	
Theory Of Transformer: Principle, equivalent circuit. Losses, Predetermination of efficiency & Percentage regulation, tap changing of transformer ON load, all day efficiency Auto Transformers: Uses, advantages & disadvantages. Causes of failure of transformers	**07Hrs**
UNIT-II	
Industrial Tests: H.V.Flash test, Sumner's test. **Parallel Operation**: Polarity test, load sharing of transformers in parallel. **3-Phase Transformers: Y: Y, Y: Δ**, Δ: Y, andΔ:Δ, open delta connection, Scott connection, phasor diagrams. Harmonics in transformers	**07 Hrs**
UNIT-III	
Induction Machine: Production of rotating magnetic field, operation on no-load and load, phasor diagram, Power flow diagram- calculation of HP, torque, efficiency and power factor. Torque – slip characteristics, Maximum torque, **Performance Of Induction Motors:** No load and blocked rotor tests, equivalent circuit, circle diagram, Cogging and crawling	**07 Hrs**
UNIT-IV	
Method of starting induction motors. Speed control of induction motor by pole changing method, stator voltage control and Rotor resistance control. **Single Phase Induction Motors:** Double field revolving theory, Starting methods and type of motors, Single phase series motors, repulsion motors. Induction Generator :principle of working ,isolated induction generator, Advantages ,Limitations and applications of Induction Generator	**07 Hrs**
UNIT-V	
Transformer Design on main dimensions, Design of windings, Design of insulations, Design of core sections(single phase, Three phase), problems **Induction motor :** Design on specifications, Stator design, Rotor Design(Single phase , Three phase),problems	**08 Hrs**

LABORATORY EXPERIMENTS
1. SC, OC test on 1 - phase transformer, predetermination of efficiency & regulation and verification by Load test at UPF.

2. Sumpner's test 3. Parallel operation of two dissimilar 1phase transformers. 4. Connection of 3 single phase transformers in star – star, star-delta etc. and determination of efficiency & voltage relationship for balanced direct loading. 5. Scott connection-for balanced and unbalanced loads. 6. Load test on 3phase Induction motor – performance evaluation. 7. A) Equivalent circuit of 3 – phase induction motor / predetermination of performance. B) Circle Diagram of 3 phase Induction Motor-performance evaluation. 8. Speed control of 3 - phase induction motor – stator voltage & rotor resistance control. 9. Load test on 1-phase Induction motor. 10. Load test on Induction generator.

Course Outcomes: After completing the course, the students will be able to	
CO1	Understand the operation of transformers and induction motors
CO2	Analyze the performance characteristics of Transformer and Induction motors
CO3	Evaluate, assess and compare the operation of machines
CO4	Design the various parts of the machine by changing different parameters in steps to obtain maximum output.

Reference Books	
1.	Theory of Alternating Current Machines , Alexander Langsdorf, , 4th Edition ,T.M.H publications ISBN 10: 1331129087 ISBN13: 9781331129080
2.	Performance and Design of A.C. Machines , M. G. Say.3rd Edition, , C.B.S. Publishers ,ISBN-10: 8123910274
3.	Electrical Machines , Ashfaq Hussain,. 3rd Edition, Dhanpatrai and Co. ISBN-9788177001662
4.	A Course in Electrical Machine Design , A.K. Sawhney, 2001, DanpatRai and Co, ISBN 007-709610

Continuous Internal Evaluation (CIE): Total marks: 100+50=150

Theory – 100 Marks

CIE is executed by way of quizzes (Q), tests (T) and Self-Study(S). A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 50. The marks component for Self-study is 20. The total CIE for theory is 100.

Laboratory- 50 Marks

The Laboratory session is held every week as per the time table and the performance of the student is evaluated in every session. The average of marks over number of weeks is considered for 40 marks. At the end of the semester a test is conducted for 10 marks. Total marks for the laboratory is 50.

Semester End Evaluation (SEE): Total marks: 100+50=150

Theory – 100 Marks

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions

for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

Laboratory- 50 Marks

Experiment Conduction with proper results is evaluated for 40 marks and Viva is for 10 marks. Total SEE for laboratory is 50 marks.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	2	1	2	3	2	2	1	1
CO2	3	-	2	2	-	2	1	-	3	2	2	2
CO3	-	2	1	3	2	2	-	1	1	2	2	2
CO4	2	2	2	1	-	2	2	1	2	2	-	2

High-3: Medium-2: Low-1

SEMESTER – IV		
CONTROL SYSTEMS (Theory)		
Course Code:16EE46		**CIE Marks:** 100
Credits: L:T:P:S: 3:1:0:0		**SEE Marks:** 100
Hours: 36L+24T		**SEE Duration:** 3Hrs

Course Learning Objectives: The students will be able to	
1.	Develop model and simulate single-input single-output linear systems
2.	Design a system, component or process to meet desired needs
3.	Write equivalent differential equation and transfer function models for a give system
4.	Acquire the knowledge of classical control system analysis techniques, system response and performance characteristics
5.	Analyze and evaluate stability of feedback control systems using both time and frequency domain methods
6.	Express the effects of PID controllers and compensators on the system performance

UNIT-I	
Introduction: Definitions, Classification of control systems open loop and closed loop, linear and nonlinear, time variant and time invariant, continuous and discrete time systems. Block diagram of a typical closed loop control system showing the basic structure and different terminologies **Modeling and Representation of Control System:** The transfer function concept, transfer function of simple electrical networks, different forms of transfer functions, transfer function of a closed loop system, block diagrams and signal flow graphs. Masons gain formula. Modeling of mechanical translational and rotational systems and their electrical analog, gear trains, modeling of a.c &d.c servomotors	**07 Hrs**
UNIT-II	
Time Response of Feedback Control Systems: Standard test signals, step response of first and second order systems, time domain specifications. Type and order of the system, Steady state error and static error constants. Effect of feedback on sensitivity	**07 Hrs**
UNIT-III	
Stability Analysis: Concept of stability, types of stability, Routh Hurwitz criterion, relative stability analysis **Root Locus:** Introduction, concept of magnitude and angle criterion, construction of root loci, root contours. Effect of adding a pole/zero to the system.	**07 Hrs**
UNIT-IV	
Frequency Domain Analysis: Introduction to frequency domain plots. Polar plots, frequency domain specifications, concept of phase margin and gain margin, correlation between time and frequency response. Principle of argument, Nyquist plots and Nyquist stability criterion. Bode plots, stability analysis using Bode diagrams.	**07 Hrs**
UNIT-V	
Controllers and Compensators: Basic control actions P, PI, PD and PID controllers and their effects on the dynamic and static behavior of the system. Lag, lead and lead-lag compensators, realization using RC networks. Design of controllers and compensators.	**08 Hrs**

Reference Books	
1.	Control System Engineering , J Nagarath and I.J.Nagarath and M Gopal, 5th edition, 2007, New age international publishers, ISBN: 81-224-1775-2
2.	Control systems - Principles and design , M.Gopal , 2nd edition,2006, TMH,ISBN:

	0071231277, 9780071231275
3.	Modern control engineering , K.Ogata, 2004, 4th edition., Pearson education , ISBN: 1-317-1887-2
4.	Modern Control Systems , R.C. Dorf and R.H.Bishop, Addison Wesley, 1995.ISBN 978-1-4612-0153-3

Continuous Internal Evaluation (CIE); Theory (100 Marks)

CIE is executed by way of quizzes (Q), tests (T) and Assignment. A minimum of three quizzes are conducted and each quiz is evaluated for 10 marks adding up to 30 marks. All quizzes are conducted online. Faculty may adopt innovative methods for conducting quizzes effectively. The number of quizzes may be more than three also. The three tests are conducted for 50 marks each and the sum of the marks scored from three tests is reduced to 60. The marks component for assignment is 10. The total marks of CIE are 100.

Semester End Evaluation (SEE); Theory (100 Marks)

SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from Units I, IV and V have no internal choice. Units II and III have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1	1	-	-	1	1	2	-	3
CO2	3	2	2	2	2	-	-	1	2	2	-	3
CO3	2	3	2	1	2	1	1	2	3	2	1	3
CO4	2	3	3	2	3	1	1	2	3	2	1	3

High-3: Medium-2: Low-1

III / IV Semester		
Professional Practice – II **COMMUNICATION SKILLS AND PROFESSIONAL ETHICS**		
Course Code:16HS47		**CIE Marks:** 50
Credits: L:T:P:S: 0:0:1:0		**SEE Marks:** NA
Hours: 18 Hrs		**CIE Duration:** 02 Hrs
Course Learning Objectives: The students will be able to		
1	Develop communication style, the essentials of good communication and confidence to communicate effectively.	
2	Manage stress by applying stress management skills.	
3	Ability to give contribution to the planning and coordinate Team work.	

4	Ability to make problem solving decisions related to ethics.

III Semester	
UNIT-I	
Communication Skills: Basics, Method, Means, Process and Purpose, Basics of Business Communication, Written & Oral Communication, Listening. **Communication with Confidence & Clarity**- Interaction with people, the need the uses and the methods, Getting phonetically correct, using politically correct language, Debate & Extempore.	**06 Hrs**
UNIT-II	
Assertive Communication- Concept of Assertive communication, Importance and applicability of Assertive communication, Assertive Words, being assertive. **Presentation Skills**- Discussing the basic concepts of presentation skills, Articulation Skills, IQ & GK, How to make effective presentations, body language & Dress code in presentation, media of presentation.	**06 Hrs**
UNIT-III.A	
Team Work- Team Work and its important elements Clarifying the advantages and challenges of team work Understanding bargains in team building Defining behaviour to sync with team work Stages of Team Building Features of successful teams.	**06 Hrs**
IV Semester	
UNIT-III.B	
Body Language & Proxemics - Rapport Building - Gestures, postures, facial expression and body movements in different situations, Importance of Proxemics, Right personal space to maintain with different people.	**06 Hrs**
UNIT-IV	
Motivation and Stress Management: Self-motivation, group motivation, leadership abilities, Stress clauses and stress busters to handle stress and de-stress; Understanding stress - Concept of sound body and mind, Dealing with anxiety, tension, and relaxation techniques. Individual Counselling & Guidance, Career Orientation. Balancing Personal & Professional Life-	**06 Hrs**
UNIT-V	
Professional Practice - Professional Dress Code, Time Sense, Respecting People & their Space, Relevant Behaviour at different Hierarchical Levels. Positive Attitude, Self Analysis and Self-Management. **Professional Ethics** - values to be practiced, standards and codes to be adopted as professional engineers in the society for various projects**.** Balancing Personal & Professional Life	**06 Hrs**

Course Outcomes: After completing the course, the students will be able to	
CO1:	Inculcate skills for life, such as problem solving, decision making, stress management.
CO2:	Develop leadership and interpersonal working skills and professional ethics.
CO3:	Apply verbal communication skills with appropriate body language.
CO4:	Develop their potential and become self-confident to acquire a high degree of self.
Reference Books	
1.	Stephen R Covey, The 7 Habits of Highly Effective People, Free Press, 2004 Edition, ISBN: 0743272455
2.	Dale Carnegie, How to win friends and influence people, General Press, 1st Edition, 2016, ISBN: 9789380914787
3.	Kerry Patterson, Joseph Grenny, Ron Mcmillan, Crucial Conversation: Tools for Talking

	When Stakes are High, 2012 Edition, McGraw-Hill Publication ISBN: 9780071772204
4.	Ethnus, Aptimithra: Best Aptitude Book ,2014 Edition, Tata McGraw Hill ISBN: 9781259058738

Scheme of Continuous Internal Examination (CIE)
Evaluation of CIE will be carried out in TWO Phases.

Phase	Activity	Weightage
I	Test 1 is conducted in III Sem for 50 marks (15 Marks Quiz and 35 Marks Descriptive answers) after completion of Unit-1, Unit-2 and Unit -3.A for 18 hours of training sessions.	50%
II	Test 2 is conducted in IV Sem for 50 marks ((15 Marks Quiz and 35 Marks Descriptive answers) after completion of Unit -3B, Unit - 4 and Unit-5 for 18 hours of training sessions.	50%
	At the end of the IV sem Marks of Test 1 and Test 2 is consolidated for 50 marks (Average of Test1 and Test 2 (T1+T2/2). The grading is provided by the Coe. The final CIE marks is scrutinized by the committee comprising of HSS- Chairman, Training Co-ordinator, respective department Staff Placement co-ordinator before submitting to CoE.	

SEE: NA

CO-PO Mapping												
CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	---	___	---	----	1	----	1	1	1	2	1
CO2	1	2	2	---	---	---	----	1	2	1	2	1
CO3	---	---	3	---	---	1	---	2	1	2	1	---
CO4	---	---	___	---	----	1	3	1	1	1	1	---

Low-1 Medium-2 High-3

Semester: IV		
BRIDGE COURSE MATHEMATICS III / IV		
Course Code:16DMA37/48		**CIE Marks:** 100
Credits: L:T:P:S: 2:0:0:0		**SEE Marks:** 100
Audit Course		**SEE Duration:** 03Hrs
Course Learning Objectives: The students will be able to		
1	Understand the existence of polar coordinates as possible 2 - D geometry, approximate a function of single variable in terms of infinite series.	
2	Gain knowledge of multivariate functions, types of derivatives involved with these functions and their applications.	
3	Recognize linear differential equations, apply analytical techniques to compute solutions.	
4	Acquire concepts of vector functions, vector fields and differential calculus of vector functions in Cartesian coordinates.	

5	Explore the possibility of finding approximate solutions using numerical methods in the absence of analytical solutions of various systems of equations.

Prerequisites :
Hyperbolic functions, Trigonometric formulas, methods of differentiation, methods of integration, reduction formulae, vector algebra.

UNIT-I	
Differential Calculus: Taylor and Maclaurin's series for function of single variable. Partial derivatives – Introduction, simple problems. Total derivative, Composite functions, Jacobian's-simple problems.	**05 Hrs**
UNIT-II	
Multiple Integrals: Evaluation of double and triple integrals – direct problems, change of order in double integral, change of variables to polar, cylindrical and spherical coordinate systems.	**05 Hrs**
UNIT-III	
Differential Equations: Higher order linear differential equations with constant coefficients, Complementary function and Particular integral, problems. Equations with variable coefficients – Cauchy and Legendre differential equations, problems.	**06 Hrs**
UNIT-IV	
Vector Differentiation: Introduction, simple problems in terms of velocity and acceleration. Concepts of Gradient, Divergence- solenoidal vector function, Curl- irrotational vector function and Laplacian, simple problems.	**05 Hrs**
UNIT-V	
Numerical Methods: Algebraic and transcendental equations – Regula-Falsi method, Newton-Raphson method. Ordinary Differential Equations – Taylor's, modified Euler's and 4^{th} order Runge-Kutta methods. Numerical Integration – Simpson's $1/3^{rd}$, $3/8^{th}$ and Weddle's rules.	**05 Hrs**

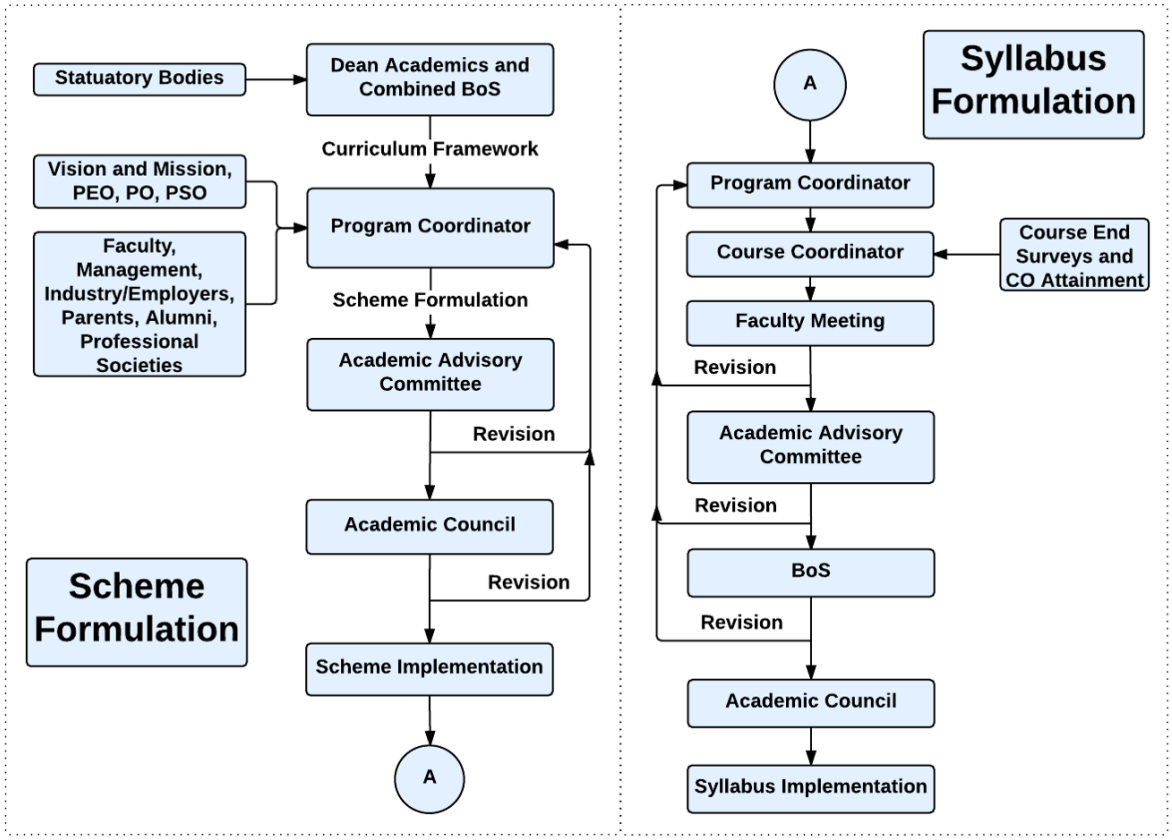
Course Outcomes: After completing the course, the students will be able to	
CO1 :	Demonstrate the understanding of the basics of polar coordinates, partial differentiation, multiple integrals, vector differentiation, classification and types of solutions of higher order linear differential equations, requirement of numerical methods and few basic definitions.
CO2 :	Solve problems on total derivatives of implicit functions, double integrals by changing order of integration, homogeneous linear differential equations, velocity and acceleration vectors.
CO3 :	Apply acquired knowledge to find infinite series form of functions, multiple integrals by changing order, solution of non-homogeneous linear differential equations, and numerical solution of equations.
CO4 :	Evaluate multiple integrals by changing variables, different operations using del operator and numerical solutions of differential equations and numerical integration.

Reference Books	
1.	Higher Engineering Mathematics, B.S. Grewal, 40th Edition, Khanna Publishers, 2007, ISBN: 81-7409-195-5.
2.	Advanced Engineering Mathematics, R. K. Jain & S.R.K. Iyengar, Narosa Publishing House, 2002, ISBN: 817-3-19-420-3. Chapters: 1, 2, 8, 15.
3.	Advanced Engineering Mathematics, Erwin Kreyszig, 9th Edition, John Wiley & Sons, 2007, ISBN: 978-81-265-3135-6. Chapters: 6, 10, 12.
4.	A Text Book of Engineering Mathematics, N.P Bali & Manish Goyal, 7th Edition, Lakshmi Publications, 2010, ISBN: 978-81-7008-992-6. Chapters: 6, 18, 16, 8, 26.

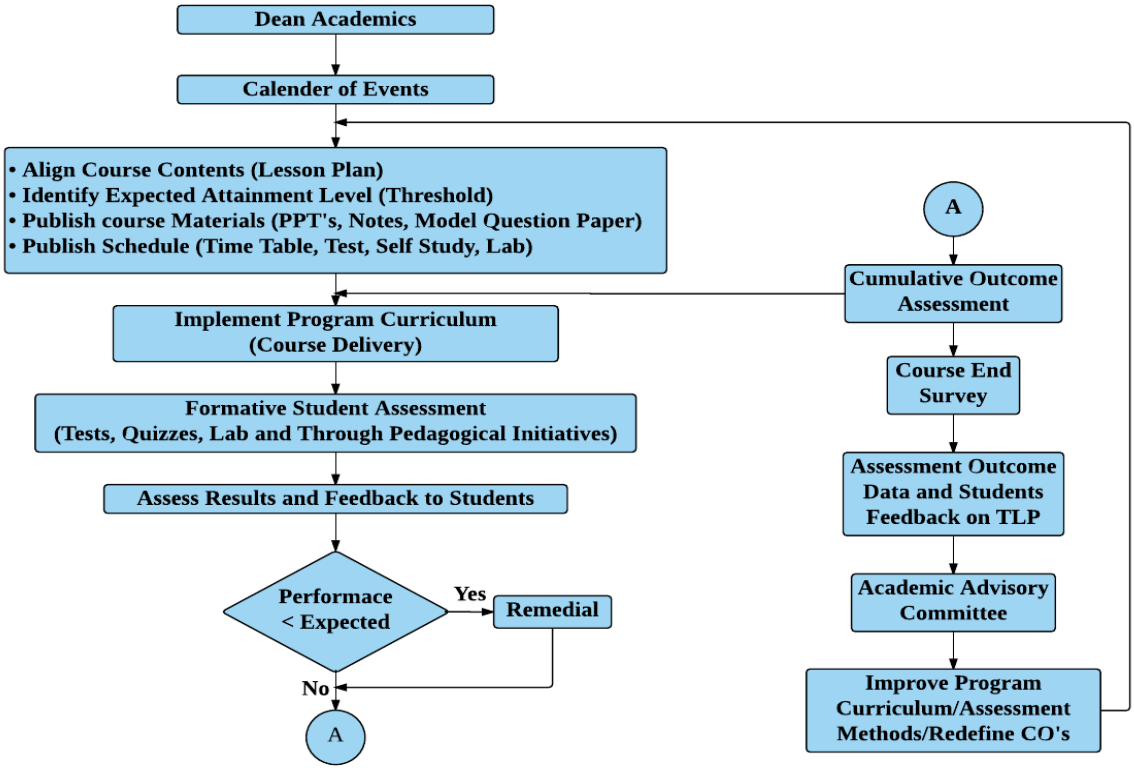
Continuous Internal Evaluation (CIE); Theory (100 Marks)
CIE consists of Two Tests each for 50 marks (20 marks for Quiz + 30 marks for descriptive questions)

Semester End Evaluation (SEE); Theory (100 Marks)
SEE for 100 marksis executed by means of an examination. The Question paper for each course contains two parts, Part – A and Part – B. Part – A consists of objective type questions for 20 marks covering the complete syllabus. Part – B consists of five main questions, one from each unit for 16 marks adding up to 80 marks. Each main question may have sub questions. The question from each unit have internal choice in which both questions cover entire unit having same complexity in terms of COs and Bloom's taxonomy level.

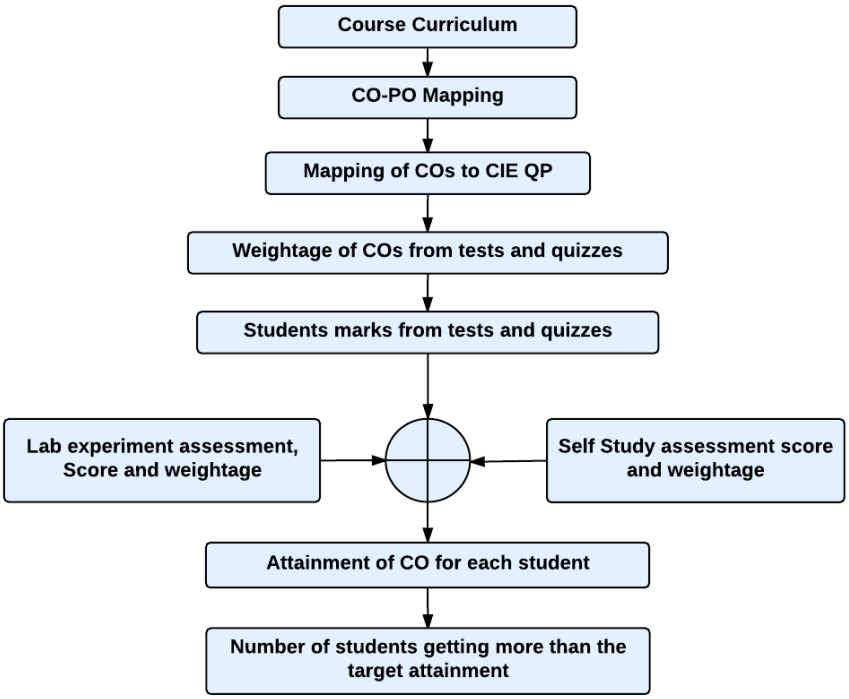
Curriculum Design Process



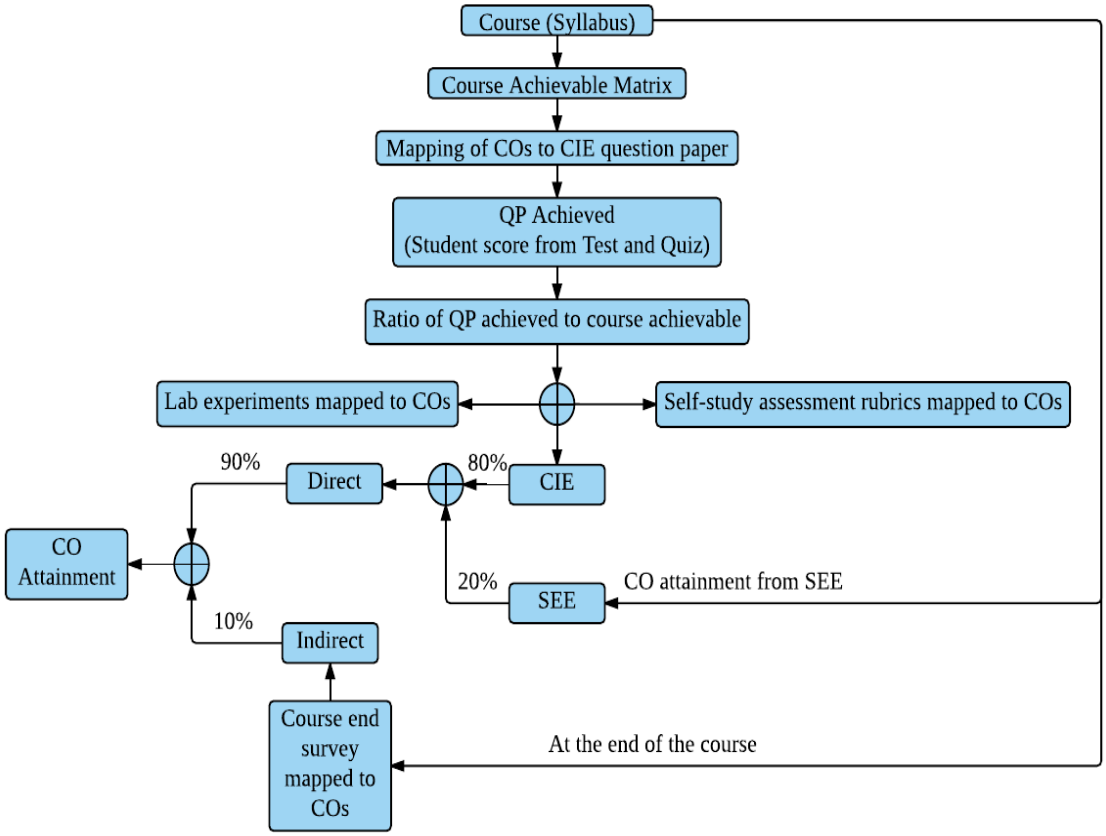
Academic Planning and Implementation



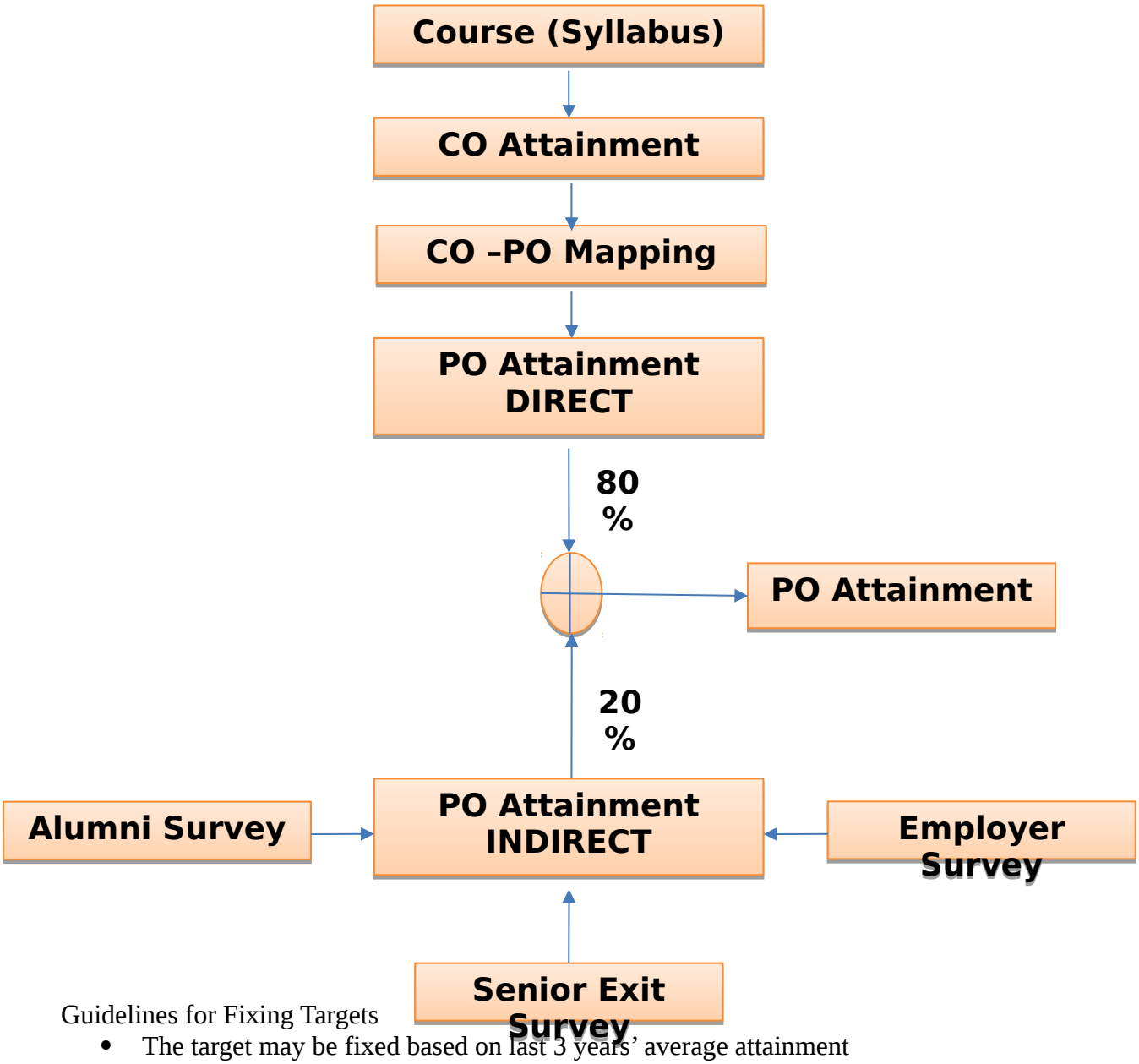
PROCESS FOR COURSE OUTCOME ATTAINMENT



Final CO Attainment Process



Program Outcome Attainment Process



Guidelines for Fixing Targets

- The target may be fixed based on last 3 years' average attainment

PROGRAM OUTCOMES (PO)

PO1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5:**Modern tool usage** : Create, select, and apply appropriate techniques, resources, and modern Engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6:**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7**: Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10:**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11**: Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.