1.4.2 How the feedback obtained is being analysed and utilized for overall development of the institution?

Collected curriculum feedback is represented through the Board of Studies Members (BOS) and syllabus framing committee members. Based on the Institutional Hierarchical Framework, Feedback can be broadly classified in to two levels

- The department level feedback that are discussed in the department meeting and necessary initiatives and measures that are taken with the consent of the principal.
- The college level feedback analyzed by the Academic Council Members (ACM) headed by the principal. On a regular basis our Institute connects with all its stake holders to collect feedback to utilize them for overall development of the institution.

Different types of Feedback taken throughout the Academic Year with Stakeholders given as follows: Feedback is collected from the following groups identified as stakeholders

1. Current students
2. Alumni
3. Faculty
4. Parents
5. Employers

Based on the inputs taken from the Stake holders, the data is processed. Below is the action taken on the feedback for the Academic year **2017-18**

S.no	Stakeholder	Feedback	Action taken	Page no
1	**Student**	Requested to add a theory course and lab course on prime movers to get the knowledge on different Turbines	Primer movers and pumps ,primer movers and pumps lab are included in R-16 scheme	5
2	**Alumni**	Suggested to introduce a course to solve Non-linear equations which are in Power Systems	A course named Statistical and Numerical methods is introduced in sem-V of R-16 regulation	6
3	**Alumni**	Suggested to separate the HVDC and FACT's,	HVDC transmission systems course is introduced in sem VI as an elective in R-16 regulation	7-8

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4	**Alumni**	Requested to add Electronics subjects like Digital Signal Processing , Embedded systems	With the inputs taken from the alumni, DSP and Embedded Systems theory course and corresponding lab is introduced in semester VII of R-16 regulation.	9
5	**Alumni**	Suggested to introduce Static Relays, Protection of the Power Systems components like Transformer, Transmission line etc. As these topics gives a basic idea of Protection and can be helpful while doing Masters in Power systems.	Advanced power systems protection course is introduced in semester VIII as a program elective of R-16 regulation to get the knowledge on static relays, protection of busbars, transformer and transmission lines	10
6	**Alumni**	Suggested to remove some topics from Electrical Circuits -I and Electrical Circuits-II which are repeating in other courses.	Electrical Circuit Analysis- 50 % of the syllabus modified(merged Electrical Circuits-1 & 2) resonance, network synthesis , fourier series concepts are removed and concepts of polyphase circuits	11-15
7	**Alumni**	As FACT's devices are useful to the mitigate the power quality issues. A detailed dedicated course for FACT's is needed	FACTs course is introduced in sem VIII as an elective in R-16 regulation	16
8	**Teacher**	Elements of Electrical Engineering in R-16 should be modified .electromagnetism, batteries, fuel cell should be removed as these topics are included in Physics, Chemistry respectively and DC,AC machines, transformers should be added	As the modifications insisted by CEG members are incorporated in Basic Electrical Engineering (R-18) with the approval of BoS members.	17-19
9	**Teacher**	Suggested to do incorporate minor changes of adding Transient Stability concept in Electrical Machines-III course	Suggestions of teachers in electrical machines-III- transient stability concept is included in VI sem of R-16 scheme	20
10	**Teacher**	Needed minor modifications in control systems by the inclusion of Steady State Errors for standard test signals.	All the suggestions given by teachers in concerned CEG, problems on conversion from block diagram to signal flow graph, steady state errors for standard test signals(linear control systems) are included in V sem of R-16 scheme	21-22

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11	**Teacher**	Suggested to include advanced topics in Advanced Control Systems	Advanced control systems: e- smaple data control systems concept, concept of describing function	23
12	**Teacher**	Suggested to add contents related to detailed analysis of Wind and Solar energy conversion systems, to address the integration issues of the same with the Grid.	Wind & Solar energy systems – title changed from Non-Conventional Energy sources. Wind and Solar energy conversion systems have completely elaborated. Network integration issues are added.	24-25
13	**Teacher**	Suggested to add metaheuristic techniques in techniques in electrcial engineering	With the feedback taken from the teachers and employers, metaheuristic techniques are added AI techniques in Electrical Engineering course of R-16 syllabus.	26
	Employer	Insisted to add different optimization techniques in AI techniques in Electrical Engineering		
14	**Teacher**	Suggested to make the electrical machines-ii and Electrical Machines-III course as one course by removal of some topics.	With the approval from the course experts, Electrical Machines –II & Electrical Machines –III theory course lab course are combined in R-18 scheme.	27-29,31
15	**Teacher**	Suggested to remove characteristics of DC compound motor and separation of core losses	With the suggestions from the respective teachers handled and course experts approval, in Electrical Machines-I of R-18 syllabus, two experiments were removed-performance characteristics of DC compound motor and separation of core losses in a transformer.	30
17	**Employer**	Suggested to introduce a course on studying the Electrical Materials, Magnetic materials, Insulating material.	With the suggestions form the employers a course named Electrical Engineering materials is introduced as an elective in VI semester of R-16 scheme	32
18	**Employer**	Suggested to introduce a course on simulation of Electrical Circuits using MATlab	A course named Simulation Techniques for Electrical Engineering is introduced as an elective in semester VI of R-16 scheme	33-34
19	**Employer**	Suggested to have exclusive hardware experiments and remove simulation experiments in Linear Control Systems Lab	Exclusive hardware are included in Linear Control Systems lab of R-16 syllabus	35-36

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20	**Teacher**	Suggested to add sample data control systems data concepts and concept of Describing Function in Advanced Control systems course	Sample data control systems data concepts, concept of Describing Function in Advanced Control Systems theory course in semester VI of R-16 syllabus	37-40
	Employer	Suggested to add concepts of describing function in advanced control systems course		

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Choice Based Credit System

B.E (Electrical and Electronics Engineering)

SEMESTER – III

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16MT C05	Engineering Mathematics-III	3	-	3	30	70	3
2	16EE C02	Electrical Circuits-I	3	-	3	30	70	3
3	16EE C03	Electrical Measurements and Instruments	3	-	3	30	70	3
4	16EC C16	Electronics Engineering	4	-	3	30	70	4
5	16ME C11	Prime Movers and Pumps	3	-	3	30	70	3
6	16MB C01	Engineering Economics and Accountancy	3	-	3	30	70	3
PRACTICALS								
6	16EE C04	Circuits and Measurements Lab	0/1	2	3	25	50	2
7	16EC C17	Electronics Engineering Lab	-	3	3	25	50	2
8	16ME C12	Prime Movers and Pumps Lab	0/1	2	3	35	50	2
Total			**21**	**7**	**-**	**255**	**570**	**25**

L: Lecture T: Tutorial P: Practical D: Drawing

CIE - Continuous Internal Evaluation SEE - Semester End Examination

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Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-V

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC15**	Power Systems – II	3/1	-	3	30	70	4
2.	**16EEC16**	Electrical Machinery – II	3/1	-	3	30	70	4
3.	**16EEC17**	Power Electronics	4	-	3	30	70	4
4.	**16EEC18**	Linear Control Systems	3/1	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective-1	3	-	3	30	70	3
PRACTICALS								
6.	**16EEC19**	Electrical Machinery – II Lab	0/1	2	3	25	50	2
7.	**16EEC20**	Power Electronics Lab	0/1	2	3	25	50	2
8.	**16EEC21**	Linear Control Systems Lab	0/1	2	3	25	50	2
			22	**06**	**-**	**225**	**500**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-1
16EE E01	Non Conventional Energy Sources (NCES)
16EE E02	Electrical Engineering Materials (EEM)
16EE E03	Electronic Instrumentation (EI)
16MT E01	Statistical and Numerical Methods (SNM)
	Courses offered to other Departments
16EE E04	Electrical Technology (for BE3/4, ECE, V-SEM) (Elective)
16EEC22	Electrical Machines and Microcontroller Applications Lab (Core) (for BE3/4, Mech & Prod, V-SEM)

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B.E (Electrical and Electronics Engineering)

SEMESTER-VI

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC23**	Electrical Machinery – III	3/1	-	3	30	70	4
2.	**16EEC24**	Switchgear and Protection	3	-	3	30	70	3
3.	**16EEC25**	Power Semiconductor Drives	3	-	3	30	70	3
4.	**16EEC26**	Microprocessor and Microcontrollers	4	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective- 2	3	-	3	30	70	3
6.	**16EEEXX**	Program Specific Elective - 3	3	-	3	30	70	3
PRACTICALS								
7.	**16EEC27**	Microprocessor and Microcontrollers Lab	0/1	2	3	25	50	2
8.	**16EEC28**	Power Systems Lab	0/1	2	3	25	50	2
9.	**16EEC29**	Mini Project	-	2	-	50	-	1
10.	**16EEC30**	Industrial Visit	Satisfactory / Unsatisfactory					
			22	**06**	**-**	**280**	**520**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-2
16EEE05	High Voltage Engineering (HVE)
16EEE06	Artificial Intelligence Techniques in Electrical Engineering (AITEE)
16EEE07	Switch Mode Power Converters (SMPC)
16EEE08	Optimization Techniques (OT)

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Course Code	Program Specific Elective-3
16EEE09	Advanced Control System (ACS)
16EEE10	Electrical Distribution Systems & Automation (EDSA)
16EEE11	High Voltage DC Transmission (HVDC)
16EEE12	Simulation Techniques for Electrical Engineering(STEE)
Elective Courses offered to other Departments	
16EE E13	Industrial Electronics (BE ¾ ECE, VIth Sem)

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SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E/B.Tech under CBCS
B.E.(EEE)

SEMESTER-VII

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EE C31**	Power System Operation and Control	4	-	3	30	70	4
2.	**16EE C32**	Utilization of Electrical Energy	3	-	3	30	70	3
3.	**16EE C33**	DSP and Embedded Systems	4	-	3	30	70	4
4.	**16EE EXX**	Program Specific Elective- 4	3	-	3	30	70	3
5.	**16XX OYY**	Open Elective-I	3	-	3	30	70	3
PRACTICALS								
6.	**16EE C34**	Power Systems Simulation Lab	0/1	2	3	25	50	2
7.	**16EE C35**	Digital Signal Processor and Embedded Systems Lab`	0/1	2	3	25	50	2
8.	**16EE C36**	Project Seminar	0	3	-	50	-	2
			19	**07**	**-**	**250**	**450**	**23**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-4
16EEE14	Basic VLSI Design
16EEE15	Computer Methods in Power Systems(CMPS)
16EEE16	Power Quality Engineering(PQE)
16EEE17	Special Electrical Machines(SEM)

Course Code	Open Elective-I
16PY O01	History of Science and Technology
16EG O02	Gender Sensitization
16CE O02	Disaster Mitigation and Management (DMM)
16CS O10	Machine Learning Using Phyton
16ME O01	Entrepreneurship

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16EE C31

POWER SYSTEM OPERATION AND CONTROL

Instruction	4 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To understand the formulation of Load-Flow problems applying different methods and economic operation of power systems
2. To understand the importance of Load Frequency Control and stability of power systems.
3. To study the reactive power control and basic FACTS controllers

Course Outcomes: After completion of this course, students will be able to:

1. Acquire knowledge in assessing the importance of load flow studies in power system operation. Carryout Load-Flow studies with different methods compare and interpret the results.
2. Acquire knowledge in conducting Economic operation of power system without and with losses
3. Acquire knowledge in conducting Load Frequency Control for single and two area systems and also distinguish between different control methods.
4. Acquire knowledge in analyzing the Stability aspects of power system.
5. Acquire knowledge in assessing the system improvement through reactive power control and FACTS controllers.

UNIT-I

Load Flow Studies: Formulation of Y bus for a system, modeling of tap changing and phase shifting transformer, Formulation of load flow problem, Solution of load flow by Gauss Seidel, Newton- Raphson, Decoupled and Fast Decoupled methods, comparison of different load flow methods.

UNIT-II

Economic Operation of Power System: Input-Output curves, Heat rates and incremental cost curves, Equal Incremental cost criterion Neglecting transmission losses with and without generator limits, B_{mn} Coefficients, Economic operation including transmission losses.

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VIII-Semester of B.E/B.Tech under CBCS
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SEMESTER-VIII

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEEXX**	Program Specific Elective - 5	3	-	3	30	70	3
2.	**16EEEXX**	Program Specific Elective -6	3	-	3	30	70	3
3.	**16XXXXX**	Open Elective -II	3	-	3	30	70	3
PRACTICALS								
4.	**16EE C37**	Seminar	-	3	-	50	-	2
5.	**16EE C38**	Project	-	6	Viva voce	50	100	6
			09	**09**	**-**	**190**	**310**	**17**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-5	Equivalent NPTEL Courses
16EE E18	Electrical Machine Design(EMD)	
16EE E19	Flexible AC Transmission Systems(FACTS)	FACTS Devices
16EE E20	Power System Reliability (PSR)	
16EE E21	Smart Grid(SG)	Introduction to Smart Grids

Course Code	Program Specific Elective-6	Equivalent NPTEL Courses
16EE E22	Embedded System Design (ESD)	Embedded System Design with ARM
16EE E23	Advanced Power System Protection (APSP)	
16EE E24	Power System Operation and Deregulation(PSOD)	
16EE E25	Electrical Estimation and Costing(EEC)	

Course Code	Open Elective-II	Equivalent NPTEL Courses
16EG O01	Technical Writing Skills	
16ME O04	Intellectual Property Rights (IPR)	Intellectual Property Rights
16 ME O08	Industrial Administration and Financial Management (IAFM)	
16CS O03	IOT and Applications	Introduction to IoT
16CS O04	Basics of Data Science Using R	Machine Learning

Note: Student undergoing internship is permitted to take-up Equivalent NPTEL courses with the prior permission from BoS.

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16EE C37

SEMINAR

Instruction	3Hours per week
CIE	50 Marks
Credits	2

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summaryand Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

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B.E (Electrical and Electronics Engineering)

SEMESTER – III

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16MT C05	Engineering Mathematics-III	3	-	3	30	70	3
2	16EE C02	Electrical Circuits-I	3	-	3	30	70	3
3	16EE C03	Electrical Measurements and Instruments	3	-	3	30	70	3
4	16EC C16	Electronics Engineering	4	-	3	30	70	4
5	16ME C11	Prime Movers and Pumps	3	-	3	30	70	3
6	16MB C01	Engineering Economics and Accountancy	3	-	3	30	70	3
PRACTICALS								
6	16EE C04	Circuits and Measurements Lab	0/1	2	3	25	50	2
7	16EC C17	Electronics Engineering Lab	-	3	3	25	50	2
8	16ME C12	Prime Movers and Pumps Lab	0/1	2	3	35	50	2
Total			**21**	**7**	**-**	**255**	**570**	**25**

L: Lecture T: Tutorial P: Practical D: Drawing

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Choice Based Credit System
B.E (Electrical and Electronics Engineering)

SEMESTER - IV

S.No.	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			Credits
			Hours per week		Duration of SEE in Hours	Maximum Marks		
			L/T	P/D		CIE	SEE	
THEORY								
1	16EEC06	Electrical Circuits -II	3	-	3	30	70	3
2	16EE C07	Electrical Machinery - I	3	-	3	30	70	3
3	16EE C08	Power Systems - I	3	-	3	30	70	3
4	16EE C09	Electromagnetic Theory	3/1	-	3	30	70	4
5	16EE C10	Digital Elctronics and Logic Design	3	-	3	30	70	3
6	16EE C11	Linear Integrated Circuits	3	-	3	30	70	3
PRACTICALS								
6	16EE C12	Electrical Machinery - I Lab	0/1	2	3	25	50	2
7	16EE C13	Linear Integrated Circuits Lab	0/1	2	3	25	50	2
8	16EG C03	Soft Skills and Employability Enhancement Lab	-	2	2	15	35	1
Total			**21**	**6**	**-**	**245**	**555**	**24**

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B.E. (EEE)

SEMESTER-III

Sl. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration In Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
1.	18MT C07	Applied mathematics	3	1	-	3	30	70	4
2.	18EE C03	Analog Electronic Circuits	3	1	-	3	30	70	4
3.	18EE C04	Electrical Measurements and Instrumentation	3	-	-	3	30	70	3
4.	18EE C05	Electromagnetic Fields	3	1	-	3	30	70	4
5.	18EE C06	Electrical Circuit Analysis	3	1	-	3	30	70	4
6.	18EG M 01	Indian constitution	2	-	-	2	-	50	-
7.	18EE M01	Indian Traditional Knowledge	2	-	-	2	-	50	-
PRACTICALS									
8.	18EE C07	Analog Electronic Circuits Lab	-	-	2	2	15	35	1
9.	18EE C08	Electrical Measurements and Instrumentation Lab	-	-	2	2	15	35	1
		Total	19	4	4	-	180	520	21

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Core Courses offered to other Departments:

SEMESTER-III

Sl. No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration In Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
1	18EE C01	Basic Electrical and Electronics Engineering	3	1	-	3	30	70	4
PRACTICALS									
2	18EE C02	Basic Electrical and Electronics Engineering Lab	-	-	2	2	15	35	1

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18MT C07

APPLIED MATHEMATICS
(For ECE/EEE)

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To form PDE and solve Linear and Non-Linear equations.
2. To learn the Laplace, Inverse Laplace Transform and Z-Transforms.
3. To find roots of equations, interpolation and Numerical differentiation.
4. To learn Numerical solution of ODE and Engineering problems.
5. To learn fitting of distribution and predicting the future values.

Course outcomes: After completion of this course, students will be able to:

1. Understand the methods to find solution of linear and non-linear PDE and solution of wave equation.
2. Find Laplace, Inverse Laplace and Z-Transforms and solution of engineering problems.
3. Solve Non-Linear algebraic and transcendental equations to find interpolations when tabular values are given.
4. Find solution of initial value problems of ODE.
5. Understand the Methods for analysing the random fluctuations using probability distribution and also identify the importance of principle of Least squares approximations for predictions.

UNIT-I

Partial Differential Equations: Formation of Partial Differential Equations, Solution of Linear (Lagrange's) and Non-linear PDE of First order standard forms and Charpit's Method, Solutions of PDE by method of separation of variables, solution of one dimensional wave equation and its applications.

UNIT-II

Transform Theory: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by partial fractions and residue method, solving ODEs by Laplace Transform method.Z-transforms and its basic properties, inverse Z-transform and solutions of difference equation by Z-transform.

time, boundary conditions, Poisson's and Laplace's equations, Uniqueness theorem.

UNIT-III

Magneto Static Fields: Biot-Savart's law, Ampere's law, Displacement current, Magnetic scalar and Vector Potentials, boundary conditions, Forces in Magnetic fields, Lorentz force equation, Force between parallel conductors, Inductance Calculations (Solenoid, Toroid), Mutual Inductance.

UNIT-IV

Time Varying Electromagnetic Fields: Faraday's laws of electromagnetic induction, Final forms of Maxwell's Equations, Power and Poynting theorem, Time-Harmonic Electromagnetic fields, Wave equations (One dimension), Plane Wave, Propagation in perfect and lossy-dielectrics.

UNIT-V

Electromagnetic Interference and Compatibility (Theoretical Aspects only): Introduction to Electromagnetic Interference and Electromagnetic Compatibility (EMI & EMC)- Sources and Characteristics of EMI, Control Techniques of EMI, Grounding, Shielding, Filtering. Introduction to numerical electromagnetic.

Text Books:

1. Hayt, W.H and J.A Buck, Engineering Electromagnetics, Tata McGraw Hill, 8th Edition, 2014.
2. Sadiku, M.N.O,S.V. Kulkarni, Principles of Electromagnetics, Oxford University press, 6th Edition, 2015.

Suggested Readings:

1. S. P. Seth, Elements of Electromagnetic Fields, Danpat Rai& Co, 2011.
2. David K. Cheng, Field and Wave Electromagnetics, Pearson Education. 2nd Edition 2014.
3. Ashutosh Pramanik, Electromagnetism Theory and Applications, PHI Pvt. Ltd., 3rd Edition, 2014.

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18EE C06

ELECTRICAL CIRCUIT ANALYSIS

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives:

1. To understand the nature of different circuit elements, laws and network theorems.
2. To study transient response of circuits with initial conditions & forcing functions and also basics of network topology.
3. To understand the Laplace transforms and two-port networks.

Course Outcomes: After completion of this course, students will be able to:

1. Apply network theorems for the analysis of electrical circuits.
2. Understand the circuit analysis using graph theory &Coupled circuits.
3. Obtain the transient and steady-state response of electrical circuits.
4. Analyze circuits using Laplace transformations.
5. Analyze behavior of two port networks.

UNITI

Sinusoidal steady state analysis: Review of AC fundamentals, effective or RMS values, Steady state response of RLC networks with sinusoidal excitations, average power and complex power, series and parallel resonance, Three phase circuits with balanced & unbalanced loads, Displacement neutral, Mutual coupled circuits, Dot Convention in coupled circuits, Ideal Transformer.

UNITII

Network Theorems: Node and Mesh Analysis, Analysis with dependent current and voltage sources, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Compensation and Milliman's theorems.

UNITIII

Graph Theory: Formation of Incident, fundamental Tie-set and Cut-set matrices, Concept of duality and dual networks.

Solution of First and Second order networks: Review of solution of first and second order differential equations for Series and parallel RL, RC, RLC circuits,

initial and final conditions in network elements, forced and force-free responses, time constant, steady state and transient state responses.

UNITIV

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros. Frequency response (magnitude and phase plots),

UNITV

Two Port Networks: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interconnections of two port networks.

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", 3rd Edition, Prentice Hall, 2015.
2. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits",6th Edition, McGraw Hill Education, 2019.
3. W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education2013.

Suggested Reading:

1. D. Roy Choudhury, "Networks and Systems", 2nd Edition, New Age International, 2010.
2. K. V. V. Murthy and M. S. Kamath, "Basic Circuit Analysis", Jaico Publishers, 2002.

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18EG M 01

INDIAN CONSTITUTION

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks

Course Objectives: The course will introduce the students to :

1. The history of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes : After successful completion of the course the students will be able to :

1. Understand the making of the Indian Constitution and its features.
2. Have an insight into various Organs of Governance - composition and functions.
3. Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
4. Be aware of the Emergency Provisions in India.
5. Understand the Right To equality, the Right To freedom and the Right To Liberty.

Unit-I

Constitution of India - Introduction and salient features . Constitutional history. Directive Principles of State Policy - Its importance and implementation.

UnitII

Union Government and its Administration - Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States.
Parliamentary form of government in India. President: role, power and position.

UnitIII

Emergency Provisions in India - National emergency, President rule, Financial emergency

CHAITANYABHARATHIINSTITUTEOFTECHNOLOGY(A)
SCHEMEOFINSTRUCTIONANDEXAMINATION
VIII-Semester of B.E/B.Tech under CBCS
B.E. (EEE)

SEMESTER-VIII

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEEXX**	Program Specific Elective - 5	3	-	3	30	70	3
2.	**16EEEXX**	Program Specific Elective -6	3	-	3	30	70	3
3.	**16XXXXX**	Open Elective -II	3	-	3	30	70	3
PRACTICALS								
4.	**16EE C37**	Seminar	-	3	-	50	-	2
5.	**16EE C38**	Project	-	6	Viva voce	50	100	6
			09	**09**	-	**190**	**310**	**17**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-5	Equivalent NPTEL Courses
16EE E18	Electrical Machine Design(EMD)	
16EE E19	Flexible AC Transmission Systems(FACTS)	FACTS Devices
16EE E20	Power System Reliability (PSR)	
16EE E21	Smart Grid(SG)	Introduction to Smart Grids

Course Code	Program Specific Elective-6	Equivalent NPTEL Courses
16EE E22	Embedded System Design (ESD)	Embedded System Design with ARM
16EE E23	Advanced Power System Protection (APSP)	
16EE E24	Power System Operation and Deregulation(PSOD)	
16EE E25	Electrical Estimation and Costing(EEC)	

Course Code	Open Elective-II	Equivalent NPTEL Courses
16EG O01	Technical Writing Skills	
16ME O04	Intellectual Property Rights (IPR)	Intellectual Property Rights
16 ME O08	Industrial Administration and Financial Management (IAFM)	
16CS O03	IOT and Applications	Introduction to IoT
16CS O04	Basics of Data Science Using R	Machine Learning

Note: Student undergoing internship is permitted to take-up Equivalent NPTEL courses with the prior permission from BoS.

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16EE C37

SEMINAR

Instruction	3Hours per week
CIE	50 Marks
Credits	2

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summaryand Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

B.E. (EEE)

SEMESTER – II

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
	THEORY								
1	18MT C03	Mathematics -II	3	1	-	3	30	70	4
2	18CY C01	Chemistry	3	1	-	3	30	70	4
3	18CE C01	Engineering Mechanics	3	1	-	3	30	70	4
4	18ME C01	Engineering Graphics and Design	1	-	4	3	30	70	3
5	18EE C01	Basic Electrical Engineering	3	1	-	3	30	70	4
	PRACTICALS								
6	18EE C02	Basic Electrical Engineering Lab	-	-	2	2	15	35	1
7	18CY C02	Chemistry Lab	-	-	3	3	25	50	1.5
		Total	**13**	**04**	**09**	**-**	**190**	**435**	**21.5**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

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18EE C01

BASIC ELECTRICAL ENGINEERING

Instruction:	3L+1T Hours per Week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	70 Marks
Continuous Internal Evaluation:	30 Marks
Credits:	4

Course Objectives:

1. To understand the behavior of different circuit elements R,L & C, and the basic concepts of electrical circuit analysis.
2. To know the concepts of AC circuits, RMS value, Average value, Phasor analysis etc.
3. To understand the basic principle of operation of Transformer and DC machines.
4. To understand the basic principle of operation of DC machines and AC machines.
5. To know about different types of electrical wires and cables, domestic and industrial wiring.
6. To understand safety rules and methods of earthing.

Course Outcomes: At the end of the course, the student will be able to

1. Acquire the concepts of Kirchhoff's laws and network theorems and able to get the solution of simple dc circuits.
2. Obtain the steady state response of RLC circuits and also determine the different powers in AC circuits.
3. Acquire the concepts of principle of operation of Transformers and DC machines.
4. Acquire the concepts of principle of operation of DC machines and AC machines.
5. Acquire the knowledge of electrical wiring and cables and electrical safety precautions.
6. Recognize importance of earthing and methods of earthing and electrical installations.

UNIT-I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of firstorder RL and RC circuits.

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18EE C02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation:	15 Marks
Credits	1

Course Objectives:

1. To acquire the knowledge of different types of electrical elements.
2. To verify the basic electrical circuit laws and theorems.
3. To determine the parameters and power factor of a coil.
4. To calculate the time and frequency responses of RLC circuits
5. To determine the characteristics of Transformers.
6. To determine the characteristics of dc and ac machines.

Course Outcomes: At the end of the course, the students are expected to

1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the circuit analysis techniques.
4. Determine the parameters of the given coil.
5. Understand the basic characteristics of transformer.
6. Understand the basic characteristics of dc and ac machines.

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components
2. Verification of KCL and KVL.
3. Time response of RL and RC circuits.
4. Calculation of permittivity of a choke or coil by Wattmeter Method.
5. Verification of Thevenin's and Norton's theorems.
6. Turns ratio /voltage ratio verification of 1-Ph Transformers.
7. OC and SC tests on a given 1-Ph Transformer.
8. Observation of Excitation Phenomenon in Transformer.
9. Measurement of 3-Ph power in a balanced system (By 2- Wattmeter method).
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle).
11. Load test of DC Shunt motor.
12. Speed control of DC Shunt motor.
13. Load test of 3-Ph Induction motor.
14. Demonstration of LT Switchgear Equipment/Components.
15. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: At least **TEN** experiments should be conducted in the semester.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-VI

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC23**	Electrical Machinery – III	3/1	-	3	30	70	4
2.	**16EEC24**	Switchgear and Protection	3	-	3	30	70	3
3.	**16EEC25**	Power Semiconductor Drives	3	-	3	30	70	3
4.	**16EEC26**	Microprocessor and Microcontrollers	4	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective- 2	3	-	3	30	70	3
6.	**16EEEXX**	Program Specific Elective - 3	3	-	3	30	70	3
PRACTICALS								
7.	**16EEC27**	Microprocessor and Microcontrollers Lab	0/1	2	3	25	50	2
8.	**16EEC28**	Power Systems Lab	0/1	2	3	25	50	2
9.	**16EEC29**	Mini Project	-	2	-	50	-	1
10.	**16EEC30**	Industrial Visit	Satisfactory / Unsatisfactory					
			22	**06**	**-**	**280**	**520**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-2
16EEE05	High Voltage Engineering (HVE)
16EEE06	Artificial Intelligence Techniques in Electrical Engineering (AITEE)
16EEE07	Switch Mode Power Converters (SMPC)
16EEE08	Optimization Techniques (OT)

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UNIT-III

Time Response Analysis: Standard test signals, Time response of first and second order systems for unit step input, Time domain specifications , Type of system - Steady state error, static error coefficients,

Stability Analysis-Concept of stability, Routh-Hurwitz criterion, Root locus technique, effect of addition of poles and zeros to open loop transfer function on Root locus, Introduction to PID Controller.

UNIT-IV

Stability Analysis-Frequency Domain: Frequency Domain specifications for a standard second order system, Correlation between time and frequency domain specifications, Stability analysis from Bode plots, Polar plots and Nyquist plots, Introduction to compensators.

UNIT-V

State Space Representation: Concept of State, State Variable, State Models of linear time invariant systems, Derivation for state models from transfer functions and differential equations, Solution of State equation by Laplace method, State Transition matrix and properties, Concept of Observability and Controllability.

Text Books:

1. I.J.Nagrath, M.Gopal, "Control System Engineering", New Age International (P) Limited Publishers, 5th Edition, 2008.
2. B.C. Kuo, "Automatic Control Systems", John wiley and son's Publishers, 9th Edition, 2009
3. K.Ogata, "Modern Control Systems", 5th Edition.PHI publication, 2010.

Suggested Reading:

1. M.Gopal, "Control Systems Principles and Design",- Tata McGraw Hill, 2nd Edition, 2003.
2. N.C Jagan, "Control Systems", BS Publications, 2nd Edition, 2008
3. N. Nise, "Control Systems Engineering",6th Edition, Willey Publications, 2011.

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16EEC19

ELECTRICAL MACHINES - II LAB

Instruction	1T+2Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: The objective of the course is to

1. Understand and apply Scott connection for three phase to two phase conversion.
2. Comprehend the principles of voltage regulation of Alternators and compute the values by different methods .
3. Predict the performance of Three Phase Induction Motor by conducting No-load test and Blocked rotor test
4. Operate the induction motor with various speed control methods and compare the different methods.
5. Analyze the performance of three phase induction motor under different loading conditions and assess the performance.
6. Estimate the improvement in power factor of Induction Motor using capacitors.

Course Outcomes: After completion of the course, the student will be able to

1. Apply phase conversion method to obtain balanced two phase supply from three phase supply.
2. Appraise the voltage regulation of Synchronous generator using various methods.
3. Assess the performance of three phase induction motor by conducting no-load test and blocked rotor tests.
4. Discuss practical aspects of AC machine analysis.
5. Assess the proper AC machine and its usage for a given load application
6. Use capacitors for power factor improvement.

List of Experiments:

1. Three phase to Two-phase conversion (Scott connection).
2. Heat run test on Three-phase transformer.
3. No-load test, blocked rotor test and load test on 3-phase Induction motor.
4. Speed control of Three-phase Induction motor by
   a). Rotor impedance control
   b). V/f control.
5. Synchronization of an alternator with infinite bus-bars by dark lamp method.
6. Performance characteristics of Single-phase Induction motor.

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UNIT-III

State-space Analysis and Design: State space representation of discrete time systems, phase variable and canonical form of state model, solution of discrete time state equation using z-transform, concept of Controllability and Observability, Controllable and Observable phase variable form of state model, control system design through pole placement by state feedback.

UNIT-IV

Nonlinear Systems: Introduction, common physical nonlinearities, phase plane-method, Singular points, stability of non linear system, Construction of phase trajectories- Isoclines method, ä-method, The Describing Function-basic concepts, Derivation of describing functions- dead zone and saturation, relay with dead zone and hysteresis.

UNIT-V

Liapunov's Stability Analysis: Introduction, Liapunov's stability criterion, direct method of Liapunov and the linear system, Methods of constructing Liapunov function for non linear systems- Krasovskii's method, Variable gradient method.

Text Books:

1. I. J Nagrath, M. Gopal, "Control Systems Engineering", New Age International (P) Limited, 2017.
2. Ogata .K, "Discrete Time control Systems", PHI Publications, 2nd Edition 1995.

Suggested Reading:

1. M. Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill, 2/e, 2003.
2. K. Ogata, "Modern Control Engineering", Pearson Publications, 5th Edition, 2015.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-V

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC15**	Power Systems – II	3/1	-	3	30	70	4
2.	**16EEC16**	Electrical Machinery – II	3/1	-	3	30	70	4
3.	**16EEC17**	Power Electronics	4	-	3	30	70	4
4.	**16EEC18**	Linear Control Systems	3/1	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective-1	3	-	3	30	70	3
PRACTICALS								
6.	**16EEC19**	Electrical Machinery – II Lab	0/1	2	3	25	50	2
7.	**16EEC20**	Power Electronics Lab	0/1	2	3	25	50	2
8.	**16EEC21**	Linear Control Systems Lab	0/1	2	3	25	50	2
			22	**06**	**-**	**225**	**500**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-1
16EE E01	Non Conventional Energy Sources (NCES)
16EE E02	Electrical Engineering Materials (EEM)
16EE E03	Electronic Instrumentation (EI)
16MT E01	Statistical and Numerical Methods (SNM)
	Courses offered to other Departments
16EE E04	Electrical Technology (for BE3/4, ECE, V-SEM) (Elective)
16EEC22	Electrical Machines and Microcontroller Applications Lab (Core) (for BE3/4, Mech & Prod, V-SEM)

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With effect from the academic year 2020-21

18EEE01 WIND AND SOLAR ENERGY SYSTEMS (Core Elective - 1)

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course objectives:

1. To familiarize Non-Conventional energy sources for sustainable energy conversion.
2. To understand working of wind power generation and wind energy conversion systems.
3. To understand the working of solar energy systems and Explore the issues with integration of renewable energy sources.

Course Outcomes: After the completion of this course, students will be able to:

1. Understanding the significance of non-conventional energy sources
2. Apply the knowledge of physical requirement of wind power energy systems
3. Analyze the required parameters for generator, turbine and converter suitable for a specific wind-generation topology.
4. Understand solar thermal systems
5. Analyze the network integration issues

UNIT-I:

Fundamentals of Energy: Introduction, Classification of energy resources, importance of Non Conventional Energy Sources, Common forms of energy, Merits and Demerits of non-conventional energy sources over conventional energy sources.

UNIT-II

Physics of Wind Power: History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions. Review of modern wind turbine technologies, Fixed and Variable speed wind turbines.

UNIT-III

Wind generator topologies: Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters, Generator-Converter configurations, Converter Control, Wind farm behavior during grid disturbances, Power quality issues, Power system interconnection experiences in the world, Hybrid and isolated operations of wind systems.

UNIT-IV

The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability. Peak Sun Hours (PSH) at a location

Solar photovoltaic: Technologies-Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Maximum Power Point Tracking (MPPT) algorithms, Balance of System Components, Solar PV Systems, Solar PV Applications

Solar Thermal Systems: Introduction, Solar Collectors, Solar Water Heater, Solar Passive Space Heating and Cooling Systems, Solar Industrial Heating Systems, Solar Refrigeration and Air Conditioning Systems, Solar Cookers

UNIT-V

Network Integration Issues: Overview of grid code technical requirements, Fault ride-through for wind farms -real and reactive power regulation, voltage and frequency operating limits.

Text Books:

1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005
2. G. M. Masters, "Renewable and Efficient Electric Power Systems", John Wiley and Sons, 2004.
3. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.

Suggested Reading:

1. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006
2. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004
3. J. A. Duffie & W.A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Son

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UNIT- III

Metaheuristic Techniques-1: Introduction, Particle Swarm Optimization- swarm intelligence, PSO algorithms,Accelerated PSO, Implementation- Multimodal Functions, Validation, Simulated Annealing-Annealing and Probability, Choice of Parameters, SA Algorithm, Implementation, Ant Algorithms- Behaviour of Ants, Ant Colony Optimization, Double Bridge Problem, Virtual Ant Algorithm.

UNIT-IV

Metaheuristic Techniques-2: Bee Algorithms- Behavior of Honey Bees, Bee Algorithms- Honey Bee Algorithm, Virtual Bee Algorithm, Artificial Bee Colony Optimization, Applications, Harmony Search algorithm, Music-Based Algorithms, Harmony Search, Implementation.

UNIT-V

Applications of AI Techniques: Economic load dispatch, Load frequency control, Single area system and two area system, Reactive power control, speed control of DC and AC Motors.

Text Books:

1. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms",PHI, New Delhi, 2010.
2. Xin-SheYang, "Engineering Optimization: An Introduction with Metaheuristic Applications",Wiley publication, 2010.

Suggested Reading:

1. P.D.Wasserman,VanNostrandReinhold, "Neural Computing Theory & Practice", New York,1989.
2. Bart Kosko, "Neural Network & Fuzzy System" Prentice Hall, 1992.

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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-V

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC15**	Power Systems – II	3/1	-	3	30	70	4
2.	**16EEC16**	Electrical Machinery – II	3/1	-	3	30	70	4
3.	**16EEC17**	Power Electronics	4	-	3	30	70	4
4.	**16EEC18**	Linear Control Systems	3/1	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective-1	3	-	3	30	70	3
PRACTICALS								
6.	**16EEC19**	Electrical Machinery – II Lab	0/1	2	3	25	50	2
7.	**16EEC20**	Power Electronics Lab	0/1	2	3	25	50	2
8.	**16EEC21**	Linear Control Systems Lab	0/1	2	3	25	50	2
			22	**06**	**-**	**225**	**500**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-1
16EE E01	Non Conventional Energy Sources (NCES)
16EE E02	Electrical Engineering Materials (EEM)
16EE E03	Electronic Instrumentation (EI)
16MT E01	Statistical and Numerical Methods (SNM)
	Courses offered to other Departments
16EE E04	Electrical Technology (for BE3/4, ECE, V-SEM) (Elective)
16EEC22	Electrical Machines and Microcontroller Applications Lab (Core) (for BE3/4, Mech & Prod, V-SEM)

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With effect from the academic year 2020-21

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)

AICTE MODEL CURRICULUM

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-V

Sl. No.	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			
			Hours per week			Duration in Hours	Maximum Marks		Credits
			L	T	P		CIE	SEE	
THEORY									
1	**18EEC14**	Electrical Machines-II	3	-	-	3	30	70	3
2	**18EEC15**	Power Systems-II	3	-	-	3	30	70	3
3	**18EEC16**	Power Electronics	3	-	-	3	30	70	3
4	**18EEEXX**	Core Elective -1	3	-	-	3	30	70	3
5	**18EEEXX**	Core Elective -2	3	-	-	3	30	70	3
6	**18MBC01**	Engineering Economics and Accountant	3	-	-	3	30	70	3
PRACTICALS									
7	**18EEC17**	Electrical Machines-II Lab	-	-	2	2	15	35	1
8	**18EEC18**	Power Systems-I Lab	-	-	2	2	15	35	1
9	**18EEC19**	Power Electronics Lab	-	-	2	2	15	35	1
		Total	**18**	**-**	**6**	**-**	**225**	**525**	**21**

L: Lecture **T: Tutorial** **P: Practical**

CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

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Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-VI

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC23**	Electrical Machinery – III	3/1	-	3	30	70	4
2.	**16EEC24**	Switchgear and Protection	3	-	3	30	70	3
3.	**16EEC25**	Power Semiconductor Drives	3	-	3	30	70	3
4.	**16EEC26**	Microprocessor and Microcontrollers	4	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective- 2	3	-	3	30	70	3
6.	**16EEEXX**	Program Specific Elective - 3	3	-	3	30	70	3
PRACTICALS								
7.	**16EEC27**	Microprocessor and Microcontrollers Lab	0/1	2	3	25	50	2
8.	**16EEC28**	Power Systems Lab	0/1	2	3	25	50	2
9.	**16EEC29**	Mini Project	-	2	-	50	-	1
10.	**16EEC30**	Industrial Visit	Satisfactory / Unsatisfactory					
			22	**06**	**-**	**280**	**520**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-2
16EEE05	High Voltage Engineering (HVE)
16EEE06	Artificial Intelligence Techniques in Electrical Engineering (AITEE)
16EEE07	Switch Mode Power Converters (SMPC)
16EEE08	Optimization Techniques (OT)

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4. Performance characteristics of DC series motor.
5. Swinburne's test & determination of performance characteristics of D.C. shunt motor.
6. Performance characteristics of DC Compound motor.
7. Separation of iron and friction losses and estimation of parameters in D.C. machines.
8. Speed control of D.C. shunt motor by shunt field control and armature resistance control.
9. Separation of core losses in a single phase transformer .
10. Open circuit and short circuit tests on a single phase transformer.
11. Sumpner's test on two identical transformers.
12. Estimation of efficiency of DC Machine by Hopkinson test.
13. Retardation test, dynamic braking of DC shunt motors.
14. Load test on single phase transformers.

Note: At least **TEN** experiments should be conducted in the semester.

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18EE C13

ELECTRICAL MACHINES-I LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course objectives:

1. To understand the practical connections of the machines.
2. To draw the characteristics of different types of generators.
3. To test the DC machines and single phase transformer under different loading conditions for their performance.

Course Outcomes: After completion of this course, students will be able to:

1. Make the connections for DC machines and single phase transformer for their applications.
2. Design the meter ratings for various applications of DC machines and single phase transformer.
3. Control the speed of the DC motor by different methods.
4. Determine the efficiency of the given DC machine and single phase transformer.
5. Test the DC machine and single phase transformer for their performance.

LIST OF EXPERIMENTS

1. OCC and Load characteristics of separately excited DC generator.
2. OCC and load characteristics of DC shunt generator.
3. Load characteristics of DC compound generator.
4. Speed control of DC shunt motor by field control and armature control
5. Swinburne's test on DC shunt machine to predetermine the efficiency of DC shunt machine at any given load
6. Load test on DC shunt motor.
7. Load test on DC series motor.
8. Hopkinson's test on DC shunt machines.
9. Separation of stray losses of DC shunt machine.
10. OC and SC test on single phase transformer.
11. Load test on single phase transformers.
12. Sumpners test on two identical transformers.

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Note: At least **TEN** experiments should be conducted in the semester.

18 EG C03

SOFT SKILLS LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The course will introduce the students to:

1. Imbibe an impressive personality, etiquette, professional ethics & values, effective time management & goal setting.
2. Understand the elements of professional update & upgrade through industry exposure in a mini-live project. Understand confidence building strategies and thereby to make effective presentations through PPTs.
3. Learn what constitutes proper grooming and etiquette in a professional environment. Acquire the necessary skills to make a smooth transition from campus to corporate.

Course Outcomes: After successful completion of the course the students will be able to :

1. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
2. Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
3. Write effective resumes. Plan, prepare and face interviews confidently.
4. Adapt to corporate culture by being sensitive - personally and sensible - professionally. Draft an SOP.
5. Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.

Exercise 1

Main Topics: Thinking Skills, Personality Development – Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.

Flipped Sessions: Personal Sensitivity & Professional Sensibility (Reading & Discussion)

Writing Input: Writing to Express - Drafting & Delivering a Speech (Free Writing Exercise)

Exercise 2

Main Topics: Advanced Group Discussion with Case studies : Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.

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Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-V

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC15**	Power Systems – II	3/1	-	3	30	70	4
2.	**16EEC16**	Electrical Machinery – II	3/1	-	3	30	70	4
3.	**16EEC17**	Power Electronics	4	-	3	30	70	4
4.	**16EEC18**	Linear Control Systems	3/1	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective-1	3	-	3	30	70	3
PRACTICALS								
6.	**16EEC19**	Electrical Machinery – II Lab	0/1	2	3	25	50	2
7.	**16EEC20**	Power Electronics Lab	0/1	2	3	25	50	2
8.	**16EEC21**	Linear Control Systems Lab	0/1	2	3	25	50	2
			22	**06**	**-**	**225**	**500**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-1
16EE E01	Non Conventional Energy Sources (NCES)
16EE E02	Electrical Engineering Materials (EEM)
16EE E03	Electronic Instrumentation (EI)
16MT E01	Statistical and Numerical Methods (SNM)
	Courses offered to other Departments
16EE E04	Electrical Technology (for BE3/4, ECE, V-SEM) (Elective)
16EEC22	Electrical Machines and Microcontroller Applications Lab (Core) (for BE3/4, Mech & Prod, V-SEM)

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Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-VI

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC23**	Electrical Machinery – III	3/1	-	3	30	70	4
2.	**16EEC24**	Switchgear and Protection	3	-	3	30	70	3
3.	**16EEC25**	Power Semiconductor Drives	3	-	3	30	70	3
4.	**16EEC26**	Microprocessor and Microcontrollers	4	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective- 2	3	-	3	30	70	3
6.	**16EEEXX**	Program Specific Elective - 3	3	-	3	30	70	3
PRACTICALS								
7.	**16EEC27**	Microprocessor and Microcontrollers Lab	0/1	2	3	25	50	2
8.	**16EEC28**	Power Systems Lab	0/1	2	3	25	50	2
9.	**16EEC29**	Mini Project	-	2	-	50	-	1
10.	**16EEC30**	Industrial Visit	Satisfactory / Unsatisfactory					
			22	**06**	**-**	**280**	**520**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-2
16EEE05	High Voltage Engineering (HVE)
16EEE06	Artificial Intelligence Techniques in Electrical Engineering (AITEE)
16EEE07	Switch Mode Power Converters (SMPC)
16EEE08	Optimization Techniques (OT)

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Course Code	Program Specific Elective-3
16EEE09	Advanced Control System (ACS)
16EEE10	Electrical Distribution Systems & Automation (EDSA)
16EEE11	High Voltage DC Transmission (HVDC)
16EEE12	Simulation Techniques for Electrical Engineering(STEE)

Elective Courses offered to other Departments	
16EE E13	Industrial Electronics (BE ¾ ECE, VIth Sem)

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Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-V

S.No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC15**	Power Systems – II	3/1	-	3	30	70	4
2.	**16EEC16**	Electrical Machinery – II	3/1	-	3	30	70	4
3.	**16EEC17**	Power Electronics	4	-	3	30	70	4
4.	**16EEC18**	Linear Control Systems	3/1	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective-1	3	-	3	30	70	3
PRACTICALS								
6.	**16EEC19**	Electrical Machinery – II Lab	0/1	2	3	25	50	2
7.	**16EEC20**	Power Electronics Lab	0/1	2	3	25	50	2
8.	**16EEC21**	Linear Control Systems Lab	0/1	2	3	25	50	2
			22	**06**	**-**	**225**	**500**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-1
16EE E01	Non Conventional Energy Sources (NCES)
16EE E02	Electrical Engineering Materials (EEM)
16EE E03	Electronic Instrumentation (EI)
16MT E01	Statistical and Numerical Methods (SNM)
	Courses offered to other Departments
16EE E04	Electrical Technology (for BE3/4, ECE, V-SEM) (Elective)
16EEC22	Electrical Machines and Microcontroller Applications Lab (Core) (for BE3/4, Mech & Prod, V-SEM)

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16EEC21

LINEAR CONTROL SYSTEMS LAB

Instruction	1T + 2 Periods per week
Duration of Semester End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	2

Course Objectives: The objective of the course is to

1. Understand the characteristics of DC Servo Motor.
2. Understand the characteristics of AC Servo Motor.
3. Understand Synchro pair operation.
4. Understand the time domain specifications in time domain.
5. Understand the frequency response of compensating networks.
6. Study the closed loop performance for given plant using
   i) P, PI and PID controllers ii) ON/OFF controller.

Course Outcomes: After completion of the course, the student will be able to

1. Define DC, AC Servo Motors Characteristics.
2. Describe and analyze Synchro pair Characteristics.
3. Design and Analyze the performance of a given second order plant in time domain.
4. Design and Analyze the performance of a given second order plant in frequency domain.
5. Select and state the design function of position and level control systems.
6. Acquire knowledge in analyzing the performance of P, PI, PID and ON/OFF controller.

List of Experiments

1. Characteristics of D.C. Servo motor.
2. Characteristics of A.C. Servo motor.
3. Characteristics of Synchro Pair.
4. Step response of second order system.
5. Frequency response of compensating networks.
6. Closed loop P, PI and PID Controller for temperature of a given plant.
7. Step response and Frequency response of a given plant.
8. Level Control System.
9. Temperature control system-ON/OFF Control.
10. Characteristics of magnetic amplifier.
11. Linear System simulator.
12. DC Position Control System.
13. AC Position Control System.

Note: **At least TEN experiments should be conducted in the Semester.**

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Choice Based Credit System (with effect from 2018-19)

B.E (Electrical and Electronics Engineering)

SEMESTER-VI

S. No	Course Code	Title of the Course	Scheme of Instruction		Scheme of Examination			
			Hours per week		Duration in Hours	Maximum Marks		Credits
			L/T	P/D		CIE	SEE	
THEORY								
1.	**16EEC23**	Electrical Machinery – III	3/1	-	3	30	70	4
2.	**16EEC24**	Switchgear and Protection	3	-	3	30	70	3
3.	**16EEC25**	Power Semiconductor Drives	3	-	3	30	70	3
4.	**16EEC26**	Microprocessor and Microcontrollers	4	-	3	30	70	4
5.	**16EEEXX**	Program Specific Elective- 2	3	-	3	30	70	3
6.	**16EEEXX**	Program Specific Elective - 3	3	-	3	30	70	3
PRACTICALS								
7.	**16EEC27**	Microprocessor and Microcontrollers Lab	0/1	2	3	25	50	2
8.	**16EEC28**	Power Systems Lab	0/1	2	3	25	50	2
9.	**16EEC29**	Mini Project	-	2	-	50	-	1
10.	**16EEC30**	Industrial Visit	Satisfactory / Unsatisfactory					
			22	**06**	**-**	**280**	**520**	**25**

L: Lecture T: Tutorial D: Drawing P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

Course Code	Program Specific Elective-2
16EEE05	High Voltage Engineering (HVE)
16EEE06	Artificial Intelligence Techniques in Electrical Engineering (AITEE)
16EEE07	Switch Mode Power Converters (SMPC)
16EEE08	Optimization Techniques (OT)

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Course Code	Program Specific Elective-3
16EEE09	Advanced Control System (ACS)
16EEE10	Electrical Distribution Systems & Automation (EDSA)
16EEE11	High Voltage DC Transmission (HVDC)
16EEE12	Simulation Techniques for Electrical Engineering(STEE)

Elective Courses offered to other Departments	
16EE E13	Industrial Electronics (BE ¾ ECE, VIth Sem)

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16EE E09

ADVANCED CONTROL SYSTEMS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objective of the course is to

1. Understand the classical approach in designing compensators.
2. Gain the mathematical knowledge of z-transforms in representing sampled data control systems.
3. Understand the concepts of stability analysis in sampled data control system.
4. Uunderstand the concepts of controllability and observability tests for Discrete - time and time invariant systems.
5. Understand the importance of response of non-linear systems and construction of phase plane trajectories.
6. Understand the procedures to perform stability study using Liapunov's criteria and construction of Liapunov function.

Course Outcomes: After the completion of the course the students will be able to

1. Design different types of compensators.
2. Represent discrete time systems and obtain solution.
3. Calculate and analyze sample data control system stability.
4. Apply the concepts of controllability and observability - tests for discrete-time systems.
5. Analyze the response of non-linear systems and construction of phase plane trajectories.
6. Justify the stability study through Liapunov's criteria and construction of Lyapunov function.

UNIT-I

Introduction to Compensator Designs: Preliminary considerations of classical design, Realization of basic compensators, cascade compensation in time domain, cascade compensation in frequency domain using bode plots.

UNIT-II

Sampled Data Control Systems: Introduction, Spectrum analysis of sampling process, signal reconstruction, difference equations, Z-transform, Pulse transfer function, Inverse Z transform, Analysis of sampled data control systems, Z and S domain relationships, Stability analysis-Jury's stability test, bilinear transformation.

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UNIT-III

State-space Analysis and Design: State space representation of discrete time systems, phase variable and canonical form of state model, solution of discrete time state equation using z-transform, concept of Controllability and Observability, Controllable and Observable phase variable form of state model, control system design through pole placement by state feedback.

UNIT-IV

Nonlinear Systems: Introduction, common physical nonlinearities, phase plane-method, Singular points, stability of non linear system, Construction of phase trajectories- Isoclines method, ä-method, The Describing Function-basic concepts, Derivation of describing functions- dead zone and saturation, relay with dead zone and hysteresis.

UNIT-V

Liapunov's Stability Analysis: Introduction, Liapunov's stability criterion, direct method of Liapunov and the linear system, Methods of constructing Liapunov function for non linear systems- Krasovskii's method, Variable gradient method.

Text Books:

1. I. J Nagrath, M. Gopal, "Control Systems Engineering", New Age International (P) Limited, 2017.
2. Ogata .K, "Discrete Time control Systems", PHI Publications, 2nd Edition 1995.

Suggested Reading:

1. M. Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill, 2/e, 2003.
2. K. Ogata, "Modern Control Engineering", Pearson Publications, 5th Edition, 2015.

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