CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Kokapet (Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.ac.in

ISO Certified 9001:2015

COMMITTED TO RESEARCH, INNOVATION AND EDUCATION 42 years

Name of the Department : **Electrical & Electronics Engineering**

Name of the Programme **: B.E. - Electrical & Electronics Engineering**

Board of Studies Meeting held on **: 17.04.2021**

CONTENTS

Minutes of the 10th Board of Studies (B.E. Electrical & Electronics Engineering) meeting held on 17-04-2021 through online mode from 11:00AM onwards:

Members Present:

1. Dr.Vaskar Sarkar,	Assoc. Prof., IIT, Hyderabad,
2. Dr V.T.Soma Sekhar,	Professor, NIT Warangal
3. Dr. P.Sathish,	Associate Professor, EE-OUCE
4. Sri Vipul Agarwaal,	General Manager (Electrical Machines), RC Puram, BHEL Hyderabad
5. Dr. Bhaskar Pariti –	Development Engineer AVL list GmBH, Austria
6. Dr P.Sudhir Agarwal	Senior General Manger-PGCIL
7. Sri T.Jagat Reddy,	Director – Transmission, TS Transco
8. Varunesh G.Kumar,	Chairman & MD -Veeral Controls
9. Dr R Nagaraja	M.D.-PRDC, Bengaluru
10. Dr. G.Suresh Babu	Professor & Head, Dept. of EEE
11. Dr. K. Krishnaveni,	Professor, Dept. of EEE
12. Dr. P.V.Prasad	Professor, Dept. of EEE
13. Dr. U.K.Choudhury	Professor, Dept. of EEE
14. Dr. M.Bala Subba Reddy,	Associate Professor, Dept. of EEE
15. Dr. B. Suresh Kumar ,	Associate Professor, Dept. of EEE
16. Dr. T.Murali Krishna,	Associate Professor, Dept. of EEE
17. Dr. P.Kowstubha,	Associate Professor, Dept. of EEE
18. Sri. Ch.V. Krishna Reddy,	Assistant Professor, Dept. of EEE
19. Dr. N Vasantha Gowri,	Assistant Professor, Dept. of EEE
20. Dr. N.V Phanendra Babu,	Assistant Professor, Dept. of EEE

AGENDA

- To approve minutes of 9th BoS meeting
- To Approve the Scheme of III to VIII Semesters under R-20 regulation
- To approve the syllabus of B.E 3rd & 4th Semesters (Electrical Electronics Engineering) under R-20 s regulation
- To approve the syllabus of all the other COURSES under this EEE board offered to the other departments [20 EE M 01 -Indian Traditional Knowledge]
- Any other item with the permission of the chair

Minutes of the Meeting: -

Dr. G.Suresh Babu, Chairperson, Board of Studies (EEE) welcomed the new members of the BoS and conducted the proceedings:

Item:1. Approval of minutes of 9th BoS meeting

Minutes of 9th BoS was approved.

Item:2. Approval of the Scheme for III to VIII Semesters of B.E. (EEE) Program as per R20 Regulation

Scheme of III rd to VIII th Semesters of R-20regulation were approved by all the BoS members

Item:3. Approval of the Syllabus for III & IV Semesters of B.E. (EEE) Program as per R20 Regulation

The proposed Syllabus for III & IV Semesters of B.E.(EEE) Program as per R20 Regulation is approved with the following recommendations:

- Inclusion of simulation experiments, Active filters to Analog electronics circuits lab
- Inclusion of topics impact of number of bits in ADC and state diagram and Moore and Mealy machines in the subject of Digital Electronics
- Inclusion of topics of data sheets of Transformer, motors, Standard electrical codes to Electrical Machines-1 syllabus.
- Removal topics of Thyristor based Inverters, series & Parallel Inverters, cyclo-converters from Power Electronics Course.
- Inclusion of topics of Voltage source converters, forward & fly back converters to Power electronics.
- Power Systems-I course, Unit-II name has to changed from Solar & Wind sources to Solar & Wind Generations.
  Action taken: Suggestions given by the BoS members are incorporated in the syllabus of above respective subjects.

- BoS suggested to have contact hours for evaluation of internships.
  Action taken: It is recommended to academic council

- BoS suggested that topics of HTLS conductor, polymer Insulator & its advantages, present day tariff system, New polices by regulated board, Graph meters, Net meters, Terms like ring main, radial in Distribution systems can be circulated in the form of handouts to keep the students updated to latest technologies of Power systems-I Syllabus.
  Action taken: Suggestions given by the BoS members are incorporated

- Inclusion of topics of Hall effect sensors, Digital meters and modern measurement devices to syllabus of Electrical measurement & Instrumentation
  Action taken: Suggestions given by the BoS members are incorporated in the syllabus of corresponding lab

Item:4. To approve the syllabus of all the other COURSES under this EEE board offered to the other departments [20 EE M 01 - Indian Traditional Knowledge]

Proposed syllabus of Indian Traditional Knowledge was approved.

Item:5. Any other item with the permission of the chair

- Scheme and syllabus of M.E. -PSPE 1st to 4th Semesters under R-20 regulation with the following modifications from R 18 syllabus was circulated through mail to honorable BoS members for the approval and the same was approved by members though mail.

List of Modifications

- Title of subject Artificial Intelligence Techniques is changed as Artificial Intelligence Techniques for Power Systems.
- COs of the subject Restructured Power Systems are modified
- COs of the subject Digital Protection of Power System were changed and content of unit - Vis modified
- COs of the subject Electric Power Distribution Systems were changed and content of Units I, II, and III are modified
- Title of the subject Power System Analysis is changed into Real Time Applications in Power Systems
- COs of the subject Power System Dynamics are changed and contents in unit-IV were rewritten
- In Power Electronics Simulation Lab, six new experiments are introduced in lieu of obsolete
- In Power Electronics Lab five new experiments are introduced in lieu of obsolete
- COs of the subject Power Semiconductor Devices and Modelling were changed

- The scheme and syllabus M.E. -PSPE 1st to 4th Semesters under R-20 regulation which were approved through mail were presented to members and same was confirmed by the BoS members.

- As there were no other points raised in the meeting, the meeting was concluded with vote of thanks by chair of BoS.

Dr. G. Suresh Babu
Chairperson, BoS (EEE)
Head, EEE, Dept., CBIT (A)

Copy to:
All the members of Board of Studies (EEE)
The chairman, Academic Council
Director, Academics
Joint Director, Academics-Informatics

With effect from the Academic Year 2020-21

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of I Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2020-21

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-I

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		CIE	SEE	
THEORY									
1.	20MT C05	Calculus	3	1	-	3	40	60	4
2.	20CY C01	Chemistry	3	-	-	3	40	60	3
3.	20CE C01	Engineering Mechanics-I	3	-	-	3	40	60	3
4.	20CS C01	Programming for Problem Solving	3	-	-	3	40	60	3
PRACTICALS									
5.	20CY C02	Chemistry Lab	-	-	4	3	50	50	2
6.	20CS C02	Programming for Problem Solving Lab	-	-	4	3	50	50	2
7.	20ME C02	Workshop/ Manufacturing Practice	-	-	5	3	50	50	2.5
8.	20ME C03	Engineering Exploration	90 Hours / 4P			-	50	-	1.5
		Total	**12**	**1**	**13**	**-**	**360**	**390**	**21**

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

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

With effect from the Academic Year 2020-21

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of II Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2020-21

B.E. – ELECTRICAL & ELECTRONICS ENGINEERING

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	20MT C06	Vector Calculus and Differential Equations	3	1	-	3	40	60	4
2	20EG C01	English	2	-	-	3	40	60	2
3	20PY C06	Electromagnetic Theory and Quantum Mechanics	3	-	-	3	40	60	3
4	20EE C01	Basic Electrical Engineering	3	-	-	3	40	60	3
PRACTICAL									
5	20EG C02	English lab	-	-	2	3	50	50	1
6	20PY C09	Electromagnetic Theory and Quantum Mechanics Lab	-	-	4	3	50	50	2
7	20EE C02	Basic Electrical Engineering Lab	-	-	2	3	50	50	1
8	20ME C01	CAD and Drafting	-	1	3	3	50	50	2.5
9	20MB C02	Community Engagement	30 field + 2P/W			-	50	-	1.5
TOTAL			**11**	**2**	**11**	**-**	**410**	**440**	**20**

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

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

With effect from the Academic Year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of III Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2021-22

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		CIE	SEE	
THEORY									
1	20MTC07	Applied Mathematics	3	1	0	3	40	60	4
2	20 CS C06	Basic Data Structures	2	0	0	3	40	60	2
3	20 EE C03	**Core- 1** Electrical Circuit Analysis	3	0	0	3	40	60	3
4	20 EE C04	**Core- 2** Analog Electronic Circuits	3	1	0	3	40	60	4
5	20 EE C05	**Core- 3** Electrical Measurements and Instrumentation	3	0	0	3	40	60	3
6	20 EE C06	**Core- 4** Signals & System	3	0	0	3	40	60	3
7	20 CE M01	Environmental Science	2	0	0	2	----	50	NC
8	20 EE I01	MOOCs/Training/ Internship	2-3 weeks/90 hours				**40**	**60**	2
PRACTICALS									
9	20 EE C 07	Analog Electronic Circuits Lab	0	0	2	3	50	50	1
10	20 EE C08	Electrical Circuits and Measurements Lab	0	0	2	3	50	50	1
11	20 CS C07	Basic Data Structures Lab	0	0	2	3	50	50	1
		Total	**19**	**2**	**6**	**-**	**430**	**620**	**24**

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

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

With effect from the Academic Year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of IV Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2021-22

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		CIE	SEE	
THEORY									
1	20 EE C09	**Core -5** Digital Electronics	3	0	0	3	40	60	3
2	20 EE C10	**Core -6** Electrical Machines-1	3	0	0	3	40	60	3
3	20 EE C11	**Core -7** Electromagnetic Fields	3	0	0	3	40	60	3
4	20 EE C12	**Core -8** Power Electronics	3	0	0	3	40	60	3
5	20 EE C13	**Core -9 Power systems I**	3	0	0	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	0	0	-	----	-	NC
7	20EGM03	Universal Human Values-II: Understanding Harmony	3	0	0	3	40	60	3
PRACTICALS									
8	20 EE C14	Digital Electronics Lab	0	0	2	3	50	50	1
9	20 EE C 15	Electrical Machines-1 Lab	0	0	2	3	50	50	1
10	20 EE C 16	Power Electronics Lab	0	0	2	3	50	50	1
		Total	**20**	**0**	**6**	**-**	**390**	**510**	**21**

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

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

With effect from the Academic Year 2022-23

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of V Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2022-23

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-V

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		CIE	SEE	
THEORY									
1	20 EE C17	**Core – 10** Electrical Machines-II	3	0	0	3	40	60	3
2	20 EE C18	**Core -11** Switchgear and Protection	3	0	0	3	40	60	3
3	20 EE C19	**Core -12** Power Systems -II	3	0	0	3	40	60	3
4	20 EE C20	**Core -13** Control Systems	3	0	0	3	40	60	3
5	20 EE Exx	**PE- I**	3	0	0	3	40	60	3
6	20 EE Exx	**PE-2**	3	0	0	3	40	60	3
7		OE-1	3	0	0	3	40	60	3
8	20 EE I02	Industrial / Rural Internship	3-4 weeks/ **(90)** hours						2
PRACTICALS									
9	20 EE C21	Control Systems Lab	0	0	2	3	50	50	1
10	20 EE C22	Electrical Machines- II Lab	0	0	2	3	50	50	1
11	20 EE C23	Power Systems Lab	0	0	2	3	50	50	1
12	20EGCO3	Employability Skills	0	0	2	3	50	50	1
		Total	**21**	**0**	**8**	**-**	**480**	**620**	**27**

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

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

Program Elective-1	
Course Code	**Title of the Course**
20 EE E11	Electrical Distribution Systems
20 EE E12	Advanced Power Converters
20 EE E13	Simulation Techniques in EE
20 EE E14	Industrial Instrumentation
20 EE E15	Electrical Machine Design
20EE E16	Digital Signal Processing

Program Elective-2	
Course Code	**Title of the Course**
20 EE E21	High Voltage Engineering
20 EE E22	Control design for Power Converters
20 EE E23	Optimization Techniques
20 EE E24	Electronic Instruments
20 EE E25	Special Electrical Machines
20EE E26	Basic VLSI Design

With effect from the Academic Year 2022-23

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VI Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2022-23

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VI

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		CIE	SEE	
THEORY									
1	20 EE C24	**Core -13** Microprocessors and Microcontrollers	3	0	0	3	40	60	3
2	20 EE C25	**Core -14** Power System Operation and Control	3	0	0	3	40	60	3
3	20 EE C26	**Core -15** Electrical Drives	3	0	0	3	40	60	3
4	20 EE C27	**Core -16** IoT for Electrical Engineering	3	0	0	3	40	60	3
5	20 EE Exx	**PE- 3**	3	0	0	3	40	60	3
6	20 EG M01	Indian Constitution & fundamental Principles	2	0	0	-	--	-	NC
PRACTICALS									
7	20 EE C28	Microprocessors and Microcontrollers Lab	0	0	2	3	50	50	1
8	20 EE C29	**Electrical Simulation Lab**	0	0	2	3	50	50	1
9	20 EE C30	Electrical Drives Lab	0	0	2	3	50	50	1
10	20 EE C31	IoT Lab	0	0	2	3	50	50	1
Total			**17**	**0**	**8**	**-**	**400**	**500**	**19**

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

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

Program Elective-3	
Course Code	**Name of the subject**
20 EE E31	Advanced power System Protection
20 EE E32	Power Quality Engineering
20 EE E33	Utilization of Electrical Energy
20 EE E34	Renewable Energy Technologies
20 EE E35	Advanced Electrical Drives
20EE E36	Computer Organization

With effect from the Academic Year 2024-25

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VII Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2023-24

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VII

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		CIE	SEE	
THEORY									
1	20EE Exx	PE-4	3	0	0	3	40	60	3
2		**OE-2**	3	0	0	3	40	60	3
3		**OE-3**	3	0	0	3	40	60	3
4	20 EG O02	**Gender Sensitization**	2	0	0	-	----	-	NC
5	20MB C01	**EE & A**	3	0	0	3	40	60	3
6	20 EE C31	Project –Part-1	0	0	4	--	50	--	2
7	20 EE C32	Internship	4-6 weeks/ upto180 Hours						3
			14	**0**	**4**	**-**	**210**	**240**	**17**

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

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

Program Elective-4	
Course Code	**Name of the subject**
20 EE E41	Power system Dynamics & Control
20 EE E42	HVDC Transmission Systems
20 EE E43	Artificial Intelligence for Electrical Engineering
20 EE E44	Digital Control Systems
20 EE E45	Machine Modelling and Analysis
20EE E46	Advanced microprocessors and controllers

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With effect from the Academic Year 2024-25

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of VIII Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2023-24

B.E. (ELECTRICAL AND ELECTRONICS ENGINEERING)

SEMESTER-VIII

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		CIE	SEE	
THEORY									
1	20 EE Exx	**PE-5**	3	0	0	3	40	60	3
2		OE-4	3	0	0	3	40	60	3
3	20 EE C33	**Technical Seminar**	0	0	3	-	50	-	1
4	20 EE C34	**Project Part-2**	0	0	12*	-	100	100	4
Total			**6**	**0**	**15**	**-**	**230**	**220**	**11**

*180 hrs for the students working on the paid internship during VIII SEM

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

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

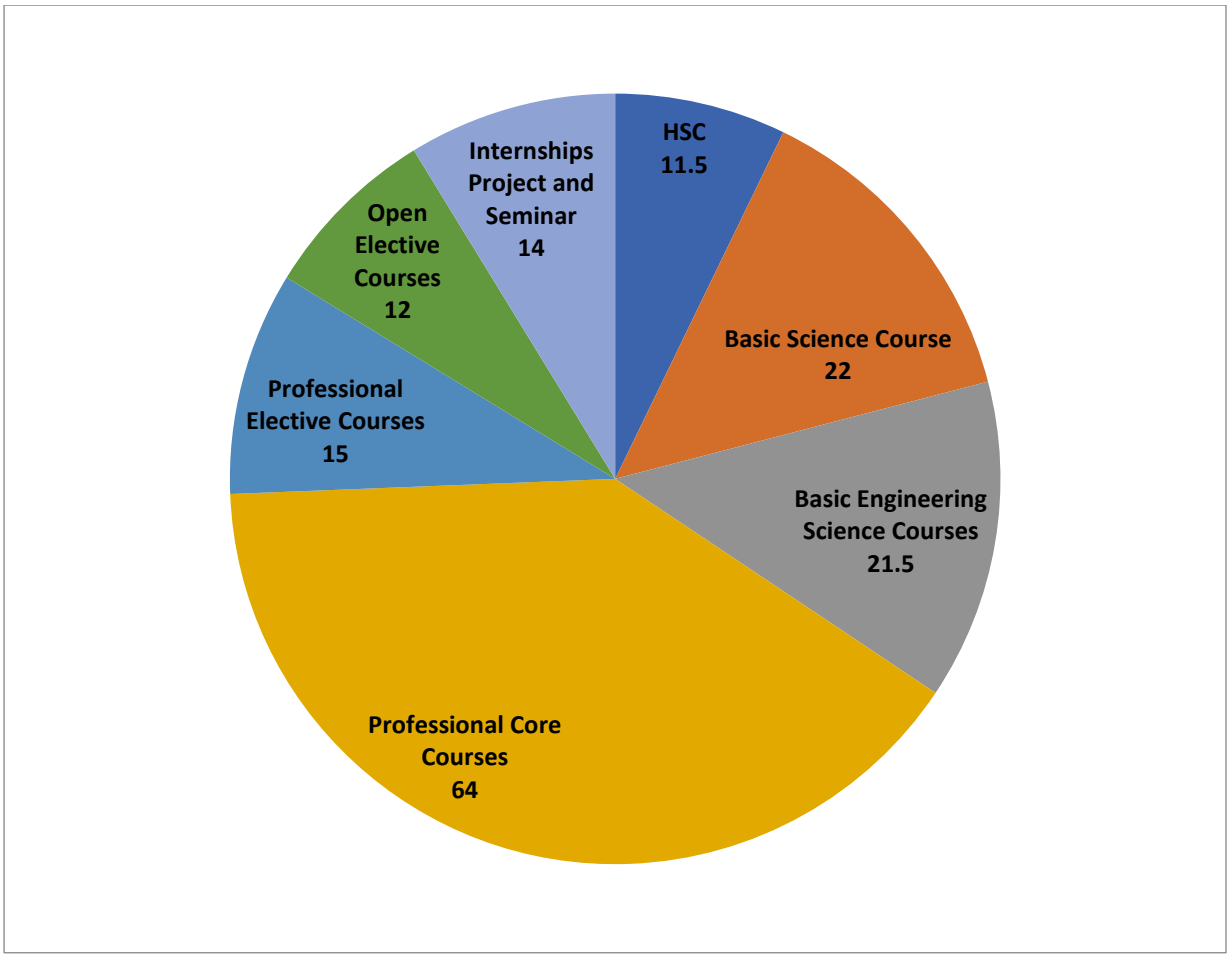
Program Elective-5	
Course Code	**Name of the subject**
20 EE E51	Smart Grid Technologies
20 EE E52	FACTS
20 EE E53	Electrical Estimation and Costing
20 EE E54	Advanced Control Systems
20 EE E55	Electric Hybrid Vehicles
20EE E56	Embedded System Design

DISTRIBUTION OF CREDITS FROM I TO VIII SEMESTERS

ITEM		CREDITS ALLOTED	% OF CREDITS OUT OF TOTAL CREDITS
S	I	21	13.13
E	II	20	12.5
M	III	24	15
E	IV	21	13.13
S	V	27	16.88
T	VI	19	11.88
E	VII	17	10.63
R	VIII	11	6.88
Total		**160**	**100**
HSC		11.5	7.19
BSC		22	13.75
BESC		21.5	10
PCC		64	40
PEC		15	9.38
OEC		12	7.5
I+P+S		14	9.38

Credit Distribution for the B.E. Electrical & Electronics Engineering Curriculum

	Credits
HSC	11.5
Basic Science Course	22
Basic Engineering Science Courses	21.5
Professional Core Courses	64
Professional Elective Courses	15
Open Elective Courses	12
Internships Project and Seminar	14
Total	**160**



III – SEMESTER

With effect from the Academic Year 2021-2022

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

AICTE MODEL CURRICULUM

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		CIE	SEE	
THEORY									
1	20MTC07	Applied Mathematics	3	1	0	3	40	60	4
2	20 CS C06	Basic Data Structures	2	0	0	3	40	60	2
3	20 EE C03	**Core- 1** Electrical Circuit Analysis	3	0	0	3	40	60	3
4	20 EE C04	**Core- 2** Analog Electronic Circuits	3	1	0	3	40	60	4
5	20 EE C05	**Core- 3** Electrical Measurements and Instrumentation	3	0	0	3	40	60	3
6	20 EE C06	**Core- 4** Signals & System	3	0	0	3	40	60	3
7	20 CE M01	Environmental Science	2	0	0	2	----	50	NC
8	20 EE I01	MOOCs/Training/ Internship	2-3 weeks/90 hours				**40**	**60**	2
PRACTICALS									
9	20 EE C 07	Analog Electronic Circuits Lab	0	0	2	3	50	50	1
10	20 EE C08	Electrical Circuits and Measurements Lab	0	0	2	3	50	50	1
11	20 CS C07	Basic Data Structures Lab	0	0	2	3	50	50	1
		Total	**19**	**2**	**6**	**-**	**430**	**620**	**24**

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

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

20MTC07

APPLIED MATHEMATICS
(For ECE/EEE)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Course Objectives:

1. To learn the Laplace, Inverse Laplace Transform and Z-Transforms.
2. To learn the Z-Transform& inverse Z-Transform concepts
3. To form PDE and solve Linear and Non-Linear equations.
4. To find roots of equations, and Numerical solutions of Differential Equations.
5. To learn fitting of distribution and predicting the future values.

Course outcomes: On successful completion of this course the students shall be able to

1. Find Laplace, Inverse Laplace and solution of engineering problems.
2. Find the solution of Difference Equation
3. Understand the methods to find solution of linear and non-linear PDE and solution of wave equation.
4. Solve Non-Linear algebraic and transcendental equations and first order differential equations.
5. Understand the methods for analyzing the random fluctuations using probability distribution and also identify the importance of Principles of Least Squares approximations for predictions.

UNIT-I: Laplace Transforms

Laplace Transform of Elementary functions, Linearity property, First Shifting property, Change of scale property. Laplace Transform of Periodic functions, Transforms of derivatives, Transforms of integrals, Multiplication by t^n and division by t. Evaluation of Integrals by Laplace Transforms. Inverse Laplace transforms of elementary functions, Inverse Laplace Transform by Method of partial fractions and Convolution theorem, Solutions of Ordinary Differential Equations by Laplace Transform method. Laplace transform of Unit step and Unit Impulse function.

UNIT-II: Z-Transforms

Z-transforms of standard functions, linearity property, damping rule, shifting theorems, multiplication by 'n', Initial and Final value theorems. Inverse Z-transforms of standard functions, Inverse Z-transform by Convolution theorem and partial fractions method. Z-transform application to difference equations.

UNIT-III: Partial Differential Equations

Formation of Partial Differential Equations, Linear Equations ofFirst Order (Lagrange's Linear Equations), Solution of First Order Non-linear Partial Differential Equation (Standard forms) and Charpits Method. Solutions by method of separation of variables, solution of one dimensional wave equation and its applications.

UNIT-IV: Numerical Methods

Solution of Algebraic and transcendental equations by Bisection method, Regula-Falsi method Newton-Raphson method. Numerical Solutions of First Order Ordinary differential equations by Taylor's series method, Euler's method, Modified Euler's method and Runge-Kutta method of fourth order.

UNIT-V: Probability Distributions

Basic probability, Conditional probability, Bayes theorem. Random variable, discrete probability distribution and Continuous probability distribution. Expectation, properties of expectation, properties of variance. Poisson distribution, MGF and Cumulates of the Poisson distribution, Normal distribution, characteristics of Normal distribution MGF and CGF of Normal distribution, Areas under normal curve.

Textbooks:

1. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2017.
2. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.

Suggested Reading:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T, "Engineering Mathematics", Tata McGraw-Hill, New Delhi, 2008.
3. S.S. Sastry, "Introductory methods of numerical analysis", PHI, 4th Edition, 2005

CO-PO & PSO Correlation Articulation Matrix: AM3

CO-1	3	3	2	2	-	1	-	-	-	-	-	-	2	2	2
CO-2	3	3	2	2	-	3	-	-	-	-	-	2	2	3	2
CO-3	3	3	3	2	-	2	-	-	-	-	-	1	2	2	2
CO-4	3	2	3	2	-	2	-	-	-	-	-	1	2	2	2
CO-5	3	2	2	2	-	1	-	-	-	-	-	-	2	2	2

20CS C06

Basics of Data Structures
(Common for all Programmes except CSE & IT)

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	2

Prerequisites:
Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: To introduce

1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different sorting and searching techniques and their complexities.

Course Outcomes: The students will be able to

1. Identify various data structures, searching & sorting techniques and their applications.
2. Describe the linear and non-linear data structures, searching and sorting techniques.
3. Apply suitable data structures to solve problems.
4. Analyze various searching and sorting techniques.
5. Evaluate the linear and non-linear data structures.

UNIT – 1
Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms- Complexity- Time and space tradeoff.
Recursion: Introduction, format of recursive functions, recursion Vs. Iteration, examples.

UNIT – 2
Linked Lists: Introduction, Linked lists and types, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays.

UNIT – 3
Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications
Searching and Sorting: Linear searching, binary Searching, sorting algorithms- bubble sort, selection sort, quick sort, heap sort

UNIT – 4
Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Trees, Tree Traversals, Binary search Tree.

Unit –5
Graphs: Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees

Text Books:

1. Narasimha Karumanchi "**Data Structures and Algorithms Made Easy**", Career Monk Publications, 2017
2. E.Horowitz, S. Sahni and Susan Anderson-Freed, "**Fundamentals of Data structures in C**", Silicon Pr; 2 edition (1 August 2007)
3. ReemaThareja, "**Data Structures using C**", Oxford, 2014

Suggested Reading:

1. https://www.tutorialspoint.com/data_structures_algorithms/index.htm
2. https://www.edx.org/course/foundations-of-data-structures

3. https://sites.google.com/site/merasemester/data-structures/data-structures-1#DS
4. https://www.cs.usfca.edu/~galles/visualization/Algorithms
5. https://www.coursera.org/specializations/data-structures-algorithms

CO-PO & PSO Correlation Articulation Matrix-BDS

	PO 1	**P O 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**P0 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**	**PSO 3**
CO 1	2	1	-	-	-	-	-	-	-	-	-	-			
CO 2	2	1	-	-	-	-	-	-	-	-	-	-			
CO 3	2	2	1	-	-	-	-	-	-	-	-	-			
CO 4	2	3	1	-	-	-	-	-	-	-	-	-			
CO 5	2	2	-	-	-	-	-	-	-	-	-	-			

20 EE C03

ELECTRICAL CIRCUIT ANALYSIS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	60 Marks
CIE	40 Marks
Credits	3

pre-requisite : Basics of Electrical Engineering

Course Objectives:

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

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

1. Apply various network analysis techniques to find the responses in the circuits with dependent and independent sources.
2. Determine time constant, steady state and transient responses of RL, RC, RLC networks with initial conditions of network elements.
3. Evaluate the response of electrical circuits with Laplace transformation using initial & final value theorems and to obtain the pole-zero diagrams using network functions.
4. Calculate the response of RLC networks with sinusoidal input at steady state & resonance conditions and to analyze three-phase circuits with different loads
5. Find the impedance, admittance, ABCD, h and g- parameters of given two-port network and interconnected two-port networks.

UNIT I

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.

UNIT II

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.

UNIT III

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, inverse Laplace transform, transformed network with initial conditions. Transfer function representation. Poles and Zeros.

UNIT IV

Sinusoidal steady state analysis: Review of AC fundamentals, 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,

UNIT V

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 Education, 8th Edition, 2013.
4. D. Roy Choudhury, "Networks and Systems", 2nd Edition, New Age International, 2010.

Suggested Reading:

1. Robert L. Boylestad, ", Introductory Circuit Analysis, Pearson Education , 13th Edition, 2011.
2. Sudhakar andSyammohan," Circuits& Networks", Tata McGraw Hill Education, 5th Edition, 2017.
3. Asfaq Hussain, "Networks and Systems", 2nd Edition, Khanna Publishing House, 2021

CO-PO & PSO Correlation Articulation Matrix-ECA

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-2	3	3	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-3	2	3	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-4	3	3	1	2	-	-	-	-	-	-	-	-	-	3	-
CO-5	3	2	1	2	-	-	-	-	-	-	-	-	-	3	-

20EEC04 **ANALOG ELECTRONIC CIRCUITS**

Instruction	3L+1T Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	4

Pre-Requisite: Students should have a prior knowledge of semiconductor Physics and basics of circuit theory.

Course Objectives:

1. To understand the V-I characteristics of diodes, BJTs, MOSFETs and also the biasing techniques of transistors and MOSFETs.
2. To understand the functioning, DC & AC characteristics of Operational Amplifiers (Op-Amps).
3. To Study the linear & non-linear applications of Op-Amps.

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

1. Comprehend the V-I characteristics of Diode and its applications.
2. Understand the V-I characteristics of BJT & MOSFET and to analyze the significance of operating point in the biasing techniques of BJT & MOSFET.
3. Apply the knowledge of differential amplifiers to understand the basic characteristics of Operational Amplifiers (Op-Amps) and their significance.
4. Design and Analyze linear application circuits of Op-Amp like amplifiers, Integrator, differentiator, filters and regulators .
5. Design and Analyze non-linear application circuits of Op-Amps and to design astable and monostable modes of 555 timer circuit.

UNIT-I

Diode Characteristics and Applications: P-N junction diode, I-V characteristics of a diode, Half-wave and Full-wave rectifiers- their operation, performance characteristics- ripple factor calculations and analysis; Filters (C filter). Zener diodes - Regulator.

UNIT-II

BJT and MOSFET Circuits:

BJTs: Structure and Operation of a BJT, Modes of transistor operation, Early effect, BJT input and output characteristics of CB, CE, CC configuration, BJT as a switch. BJT as an amplifier- common-emitter, small-signal model, biasing circuits.

MOSFET: Structure- Enhancement & Depletion mode MOSFETs and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier- common-source, small-signal model and biasing circuits, gain, input and output impedances, trans-conductance -common source.

UNIT-III

Differential and Operational Amplifiers: Differential amplifier- analysis for dual input balanced output configuration, block diagram of an operational amplifier, ideal Op-Amp- characteristics, non-idealities in an Op-Amps (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, common mode rejection ratio), Inverting and non-inverting amplifier with ideal Op-Amps, voltage follower.

UNIT-IV

Applications of Op-Amps -I: Summing amplifier, differential amplifier, logarithmic amplifiers, instrumentation amplifier, ideal and practical integrator and differentiators, Active filters- First order RC, Series voltage regulator, oscillators (Wein bridge).

UNIT-V

Applications of Op-Amps -II: Hysteretic Comparator, Zero Crossing Detector, Square-wave and triangular-wave generators. Precision rectifier, Sample and Hold circuit, clamping and clipping circuits.

555 Timer : Functional diagram, Modes of operation- astable, monostable

Text Books:

1. Robert L. Boylestad, "Electronic Devices and Circuit Theory", 11th Edition, PHI, 2015
2. Gayakwad R.A. Op-Amps and Linear Integrated Circuits, PHI, 4th Edition, 2015.
3. A.S.Sedra & K.C.Smith, "Microelectronic Circuits", New York, Oxford University Press, 7th Edition, 2017
4. J. V. Wait, L. P. Huelsman and G. A. Korn, "Introduction to Operational Amplifier theory and applications", McGraw Hill U. S., 2nd Edition, 2013
5. J. Millman and A. Grabel, "Microelectronics", McGraw Hill Education, 2nd Edition, 2008.

Suggested Readings:

1. Analog Electronics, A.K. Maini, Varsha Agarwal, Khanna Publishing House, 2018
2. Millman and Halkias, "Electronic Devices and Circuits" 4th Edition, McGraw Hill Publication 2015.
3. Roy Choudhury, Linear Integrated Circuits, Shail B. Jain, New Age Intern. (P) Ltd., 4th Edition 2002.
4. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press 2008.

CO-PO & PSO Correlation Articulation Matrix-AEC

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO-1	2	2	2	1	2	-	-	-	-	-	-	-	1	2	1
CO-2	2	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO-3	2	1	2	1	2	-	-	-	-	-	-	-	1	1	2
CO-4	3	3	2	1	2	-	-	-	-	-	-	-	2	3	2
CO-5	3	3	3	2	2	-	-	-	-	-	-	-	2	3	2

20EEC05 ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-Requisite: Students should have

1. Fundamental knowledge in calculus and complex algebra,
2. Electromagnetism and circuit theory concepts.

Course Objectives:

1. To understand the principle of operation of various electrical Instruments
2. To measure electrical and magnetic parameters by demonstrating experimental setups
3. To introduce transducers and digital instruments with their working principle

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

1. Identify a suitable instrument to measure a given electrical parameter.
2. Analyze the working principle by using suitable torque equations for DC and AC Instruments.
3. Design Bridge Circuits for measuring passive electrical parameters.
4. Distinguish between electrical and magnetic measurements and their instruments.
5. Select an Electrical transducer for a given physical quantity measurement.

UNIT- I

Introduction to Measurements: Objectives of measurement, static and dynamic characteristics, accuracy, precision, Significant figures, errors and their classification, Standard cell and standard resistance

Instruments-1: Types of instruments, classification of instruments based on type of measurement and principle of working (PMMC, MI, Dynamometer, Induction and Electrostatic), types of torques (torque equations for MC, MI and dynamometer type instruments).

UNIT- II

Instruments-2: Single phase Induction type energy meter, concepts of driving torque & braking torque equations, (no derivation) ; Errors and their Compensation, Single phase Dynamometer type Power factor meter, Weston type frequency meter. Construction & theory of Instrument Transformers, Equations for ratio and phase angle error of C.T & P.T (Elementary treatment only).

UNIT- III

Resistance, Inductance and Capacitance parameters: Classification of resistance measuring methods Kelvin's double bridge, Wheatstone bridge and meggar. Measurement of inductance using Maxwell's inductance bridge, Anderson's bridge, Measurement of capacitance using De-Sauty's bridge and Schering bridge, merits and demerits, Q-meter, measurement of relative permittivity, applications and related numerical problems.

UNIT- IV

Measurements of Magnetic and Electric Parameters: Ballistic galvanometer- Principle of operation, construction and applications of Ballistic galvanometer, flux meter its construction and principle of operation. Epstein square bridge for measuring Iron losses, Potentiometers, -Principle - Classification – Salient features related to Practical applicability

UNIT-V

Introduction to Digital Instruments (DVM and Transducers): Introduction to digital Instruments, Digital Voltmeters (DVM), Range extension of DVM, $3\frac{1}{2}$ & $3\frac{3}{4}$ display, Resolution, related numerical problems on DVM. Digital Multi meters.

Transducers: Introduction, Role of Transducers in measurement system, Strain Gauge, Linear variable Differential transformer (LVDT), Piezo electric transducer, Temperature transducers, bimetallic strip, Thermocouples, Resistance Temperature Detectors (RTD), Thermostats, Radiation pyrometers.

Text Books:

1. F.W. Golding and Widdis, Electrical Measurements and measuring Instruments, A.H. Wheeler & Co., Jan-2011
2. A.K. Sawhney, A Course in Electrical and Electronics Measurements and Instrumentation, Dhanapat Rai & Sons, New Delhi, 22nd Edition, 2015.
3. CT. Baldwin, Fundamentals of Electrical measurements, Kalyani publications, 2001.

Suggested Readings:

1. Helfrick, Albert D., Cooper, William D., Modern Electronic Instrumentation and Measurement Techniques, PHI Publications, Jan-2015
2. Stanley Wold, Richard F.M. Smith, Student reference manual for Electronic Instrumentation Laboratories, 2nd Edition, PHI.
3. Alan. S. Morris, Essence of Measurement, PHI, Feb-1996

CO-PO & PSO Correlation Articulation Matrix-EMI

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO-2	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO-3	2	1	2	1	2	-	-	-	-	-	-	-	3	-	-
CO-4	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO-5	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-

With effect from the Academic Year 2021-22

20 EEC 06

SIGNALS AND SYSTEMS

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Mathematics -1 & Mathematics-3

Course Objectives:

1. To introduce the concepts of continuous time and discrete time systems and analyse systems in complex frequency domain.
2. To study sampling theorem and its applications.
3. To elucidate the techniques of Laplace and Z- transforms and their applications on various systems

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

1. Understand the basics of signals and systems, their classification and properties.
2. Determine the DTFT & DFT of given discrete signals.
3. Analyze the continuous time systems by using Laplace transform.
4. Apply the Z-transform techniques to discrete time systems
5. Analyze the effect of aliasing and reconstruction of signal using sampling theorem.

UNIT-I

Introduction to Signals and Systems: Signals and systems as seen in everyday life, in various branches of engineering and science, Signal properties: periodicity, absolute integrability, deterministic and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability and their examples.

UNIT-II

Behavior of continuous and discrete-time LTI systems: Impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems, System representation through differential equations and difference equations.

UNIT-III

Fourier Transforms: Review of Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients, Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Property of duality in Fourier. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT-IV

Laplace and z-Transforms: Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, **convolution integral** solution to differential equations and system behaviour. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis

UNIT-V

Sampling and Reconstruction: The Sampling Theorem and its implications, Spectra of sampled signals, Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects, Relation between continuous and discrete time systems,

Text Books:

1. A.V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and systems", Prentice Hall India, 1997
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson, 2006.
3. Anand Kumar. A, "Signals & Systems",3rd Edition, Prentice Hall India, 2017.

Suggested Reading:

1. H. P. Hsu, "Signals and systems", Schaum's series, McGraw Hill Education, 2010.
2. S. Haykin and B. V. Veen, "Signals and Systems", John Wiley and Sons, 2007.
3. Anand Kumar. A, "Digital Signal Processing", 2nd Edition, Prentice Hall India, 2017

CO-PO & PSO Correlation Articulation Matrix-SIGNALS & SYSTEMS

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	1	1	-	-	-	-	-	-	-	-	-	-	1	-
CO-2	3	3	3	2	2	-	-	-	-	-	-	-	-	3	-
CO-3	2	2	1	-	-	-	-	-	-	-	-	-	-	2	-
CO-4	2	2	3	2	1	-	-	-	-	-	-	-	-	2	-

With effect from the Academic Year 2021-22

20 CE M01

ENVIRONMENTAL SCIENCE

Instruction	2 L Hours per week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: To enable the student

1. Identify environmental problems arising due to over utilization of natural resources and understand the importance of use of renewable energy sources
2. Become aware about the importance of eco system and interlinking of food chain.
3. Identify the importance of biodiversity in maintaining ecological balance.
4. Learn about various attributes of pollution management and waste management practices.
5. Contribute for capacity building of nation for arresting and/or managing environmental disasters.

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

1. Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and effects of over utilisation.
2. Understand the concept of ecosystems and realise the importance of interlinking of food chains.
3. Contribute for the conservation of bio-diversity.
4. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
5. Follow the environmental ethics and contribute to the mitigation and management of environmental disasters.

UNIT- I:

Environmental Studies: Definition, Scope and importance, need for public awareness.

Natural resources: Use and over utilization of Natural Resources - Water resources, Food resources, Forest resources, Mineral resources, Energy resources, Land resources.

UNIT – II:

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, role of producers, consumers and decomposers, energy flow in an ecosystem, food chains, food webs, ecological pyramids, Nutrient cycling, Bio-geo chemical cycles, Terrestrial and Aquatic ecosystems.

UNIT – III:

Biodiversity: Genetic, species and ecosystem biodiversity, Bio-geographical classification of India, India as a Mega diversity nation. Values of biodiversity, hot-spots of biodiversity, threats to biodiversity, endangered and endemic species of India, methods of conservation of biodiversity.

UNIT – IV:

Environmental Pollution: Cause, effects and control measures of air pollution, water pollution, marine pollution, soil pollution, noise pollution and Solid waste management, nuclear hazards

Environmental Legislations: Environment protection Act, Air, Water, Forest & Wild life Acts, issues involved in enforcement of environmental legislation, responsibilities of state and central pollution control boards

UNIT – V:

Social issues and the environment: Water conservation methods: Rain water harvesting and watershed management, Environmental ethics, Sustainable development and Climate change: Global warming, Ozone layer depletion, forest fires, and Contemporary issues.

Text Books:

1. Y. Anjaneyulu, “Introduction to Environmental Science”, B S Publications, 2004.
2. Suresh K. Dhameja, “Environmental Studies”, S. K. Kataria& Sons, 2009.

Suggested Reading:

1. C. S. Rao,” Environmental Pollution Control Engineering”, Wiley, 1991.
2. S. S. Dara, “A Text Book of Environmental Chemistry & Pollution Control”, S. Chand Limited, 2006

CO-PO PSO ARTICULATION MATRIX- ES

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	-	3	-	-	-	-	1	-	-	1
CO2	1	-	-	-	-	-	2	1	-	-	-	1	-	-	1
CO3	1	-	-	-	-	-	2	1	-	-	-	1	-	-	1
CO4	1	-	-	-	-	1	2	1	-	-	-	1	-	1	1
CO5	1	-	-	-	-	1	2	1	-	-	-	1	-	1	1
AVG	1	-	-	-	-	1	2.2	1	-	-	-	1	-	1	1

With effect from the Academic Year 2021-22

20EEC07 **ANALOG ELECTRONICS CIRCUTS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	50Marks
Credits	1

Pre-Requisite: Students should have a prior knowledge of semiconductor Physics and basics of circuit theory.

Course objectives:

1. To understand the V-I Characteristics of diode, Transistor and MOSFET.
2. To understand the frequency response of BJT, FET amplifiers.
3. To design linear and non-linear applications of Op-Amp.

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

1. Demonstrate the working principle of PN junction diode, transistor and MOSFET from their V-I characteristics.
2. Realize Half wave and Full wave rectifiers for C & π section filter combinations.
3. Analyze the significance of choosing a DC operating point for a transistor/MOSFET and to analyze the frequency response of CE amplifier.
4. Design of linear and non-applications of Op-Amps.
5. Design a 555 Timer in A stable mode to produce pulses for Pulse Width Modulation (PWM) Schemes.

LIST OF EXPERIMENTS

Part A

1. V-I characteristics of (Silicon and Germanium) diodes and measurement of static and dynamic resistance.
2. Zener diode characteristics and its application as a voltage regulator.
   (a) Design, realization and performance evaluation of rectifier circuits with and without filters (C & π section) Half wave rectifier.
   (b) Design, realization and performance evaluation of rectifier circuits with and without filters (C & π section) Full wave rectifier.
3. Plotting the characteristics of BJT and MOSFET.
4. Design of Biasing circuits for BJT
5. Design of Biasing Circuits for MOSFET
6. Design and Frequency response of Common Emitter BJT amplifier and measurement of Gain, Bandwidth, Input and Output impedances.

Part B

1. Measurements of Op-Amp parameters
2. Design of integrator and differentiator using Op-Amp.
3. Design of Active filters –LPF & HPF
4. Generation of triangular, sine and square wave using IC's.
5. Design of Clampers using Op-Amps.
6. Design of Clippers using Op-Amps.
7. Analysis of Hysteric comparator using Schmitt Trigger circuit.
8. Design of 555 Timer in A stable mode

Note: At least **FOUR** experiments from **Part-A** and **SIX from Part-B** should be conducted in the semester.

CO-PO & PSO Correlation Articulation Matrix-AEC -Lab

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	2	1	2	-	-	-	-	-	-	-	2	2	2
CO-2	2	2	2	2	2	-	-	-	-	-	-	-	2	2	2
CO-3	1	2	2	1	2	-	-	-	-	-	-	-	1	2	2
CO-4	3	3	2	1	2	-	-	-	-	-	-	-	2	3	2
CO-5	1	2	2	1	2	-	-	-	-	-	-	-	1	2	2

20EEC08 **ELECTRICAL CIRCUITS AND MEASUREMENTS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	50 Marks
Credits	1

Pre-Requisite: Students should have

1. Fundamental knowledge in calculus and complex algebra.
2. Electromagnetism and circuit theory concepts.

Course Objectives:

1. To plot the frequency response & locus diagrams of first and second order circuits
2. To verify various circuit theorems and to determine different parameters of two-port network.
3. To measure the unknown values of different electrical elements.
4. To become familiar with different transducers.

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

1. Obtain and plot the frequency response, locus diagrams of RLC circuits.
2. Verify various circuit theorems.
3. Determine various two-port network parameters.
4. Design and validate DC and AC bridges for measuring unknown electrical parameters.
5. Demonstrate the principles of magnetic measurements.
6. Demonstrate the measurement of non-electrical quantity with an appropriate transducer.

PART-A

1. Frequency response of RLC series circuit.
2. Frequency response of RLC Parallel circuit.
3. Locus diagrams of RL & RC circuits.
4. Verification of Maximum power transfer theorem.
5. Verification of Milliman's theorem.
6. Verification of Compensation Theorem.
7. Determination of Z, Y, ABCD & h parameters of two-port network

PART-A

8. Measurement of unknown resistance using Kelvin's double bridge. Measurement of unknown Inductance using Maxwell's bridge and validating with LCR meter.
9. Measurement of unknown inductance using Anderson's bridge and validating with LCR meter.
10. Measurement of unknown capacitance using Schering bridge and validating with LCR meter.
11. Measurement of iron losses using Epstein's square bridge.
12. Measurement of strain using strain gauge.
13. Measurement of Displacement using LVDT.
14. Measurement of unknown voltage using D.C Crompton's potentiometer.
15. Study of measurements with digital current and potential transformers.

Note: Five experiments from **Part-A** and **Five** experiments from **Part-B** should be conducted in the semester.

CO-PO & PSO Correlation Articulation Matrix-EMI Lab

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	2	2	1	-	-	-	-	-	-	-	-	1	-	3	-
CO-2	2	2	-	-	-	-	-	-	-	-	-	1	-	3	-
CO-3	2	2	-	-	-	-	-	-	-	-	-	1	-	3	-
CO-4	2	2	3	1	-	-	-	-	-	-	-	-	2	1	1
CO-5	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO-6	2	2	-	-	-	-	-	-	-	-	-	-	2	-	2

With effect from the Academic Year 2021-22

20CS C07

Basics of Data Structures Lab
(Common for all Programmes except CSE & IT)

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

Pre-requisites: Any Programming Language

Course Objectives:

1. Design and construct simple programs by using the concepts of Data structures as abstract data type.
2. To have a broad idea about how efficiently pointers can be used in the implement of data structures.
3. To enhance programming skills while improving their practical knowledge in data structures.
4. To strengthen the practical ability to apply suitable data structure for real time applications.

Course Outcomes: The students will be able to

1. Implement the abstract data type.
2. Demonstrate the operations on stacks, queues using arrays and linked lists
3. Apply the suitable data structures including stacks, queues to solve problems
4. Analyze various searching and sorting techniques.
5. Choose proper data structures, sorting and searching techniques to solve real world problems

List of Experiments

1. Implementation of operations on arrays
2. Implementation of Stack.
3. Implementation of Queue.
4. Implementation of basic operations on Single Linked List.
5. Implementation of Searching techniques.
6. Implementation of Sorting Techniques
7. Case study like Banking System, Students Marks Management, Canteen Management, Library Management etc

Text Books

1. Brian W Kernighan, Dennis Ritchie, C Programming Language, PH PTR, 2nd Edition.
2. Richard M Reese, Understanding and Using C Pointers, O`Reily , 2013.

Web Links

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

CO-PO & PSO Correlation Articulation Matrix-BDS Lab

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P0 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	2	1	-	-	-	-	-	-	-	-	-			
CO-2	1	2	1	2	-	-	-	-	-	-	-	-			
CO-3	2	2	1	-	-	-	-	-	-	-	-	-			
CO-4	2	3	1	-	-	-	-	-	-	-	-	-			
CO-5	2	3	2	-	-	-	-	-	-	-	-	-			

20 EE I01 **MOOCs/Training/ Internship**

Students have to undergo MOOCs / Training program / Internship of two to three weeks or 90 hours duration either at the end of the second semester or during III semester.

IV SEMESTER

With effect from the Academic Year 2021-22

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Scheme of Instructions of II Semester of B.E. – Electrical & Electronics Engineering as per AICTE Model Curriculum 2021-22

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		CIE	SEE	
THEORY									
1	20 EE C09	**Core -5** Digital Electronics	3	0	0	3	40	60	3
2	20 EE C10	**Core -6** Electrical Machines-1	3	0	0	3	40	60	3
3	20 EE C11	**Core -7** Electromagnetic Fields	3	0	0	3	40	60	3
4	20 EE C12	**Core -8** Power Electronics	3	0	0	3	40	60	3
5	20 EE C13	**Core -9 Power systems I**	3	0	0	3	40	60	3
6	20EGM02	Indian Traditional Knowledge	2	0	0	-	----	-	NC
7	20EGM03	Universal Human Values-II: Understanding Harmony	3	0	0	3	40	60	3
PRACTICALS									
8	20 EE C14	Digital Electronics Lab	0	0	2	3	50	50	1
9	20 EE C 15	Electrical Machines-1 Lab	0	0	2	3	50	50	1
10	20 EE C 16	Power Electronics Lab	0	0	2	3	50	50	1
		Total	**20**	**0**	**6**	**-**	**390**	**510**	**21**

L: Lecture T: Tutorial P: Practical

CIE - Continuous Internal Evaluation SEE - Semester End Examination

With effect from the Academic Year 2021-22

20 EEC 09

DIGITAL ELECTRONICS

Instruction	Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisites: Basics of number systems, basics of transistors and MOSFETs

Course Objectives:

1. To demonstrate the working of logic families and logic gates
2. To present design and implementation of combinational and sequential logic circuits.
3. To illustrate the process of A/D and D/A conversions and PLD's in implementing the given logical problems.

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

1. Understand the fundamental concepts and techniques used in logical operations.
2. Analyze and design various combinational circuits using k Maps and Q-M method
3. Design and implement Sequential logic circuits like counters shift register sand sequence generators
4. Understand the process of Analog to Digital conversion and Digital to Analog conversion.
5. Implement PLD's to solve the given logical problems

UNIT –I

Fundamentals of Digital Systems and Logic families: Digital signals, digital circuits, AND, OR, NOT, NAND, NOR and Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, octal hexadecimal number, binary arithmetic, one's and two's complements arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, and CMOS logic.

UNIT –II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, minimization of logical functions. Don't care conditions, Multiplexer, De-Multiplexer/Decoders, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, digital comparator, parity checker/generator, code converters, priority encoders, decoders/Seven segment display device, Q-M method of function realization.

UNIT –III

Sequential circuits and systems: A 1-bit memory, the circuit properties of bi-stable latch, the clocked SR flip-flop, J- K-T and D-types flip-flops, applications of flip-flops, shift registers, applications of shift registers, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, **sequence detector,** ripple(Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

UNIT –IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, analog to digital converters: parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, specifications of A/D converters.- Significance of size of data on the accuracy of conversion

UNIT –V

Semiconductor memories and Programmable logic devices: Introduction to state diagram- Moore and Mealy machine Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memory, read only memory (ROM), read and write memory (RAM), commonly used memory chips, ROM as a PLD, Programmable logic array, Programmable array logic.

Text Books:

1. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education, 2009.
2. M. M. Mano, "Digital logic and Computer design", Pearson Education India, 2016.

Suggested Readings:

1. A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.
2. S. Salivahanan “Digital circuits and design”, 4th edition, Vikas Publishing house, 2010

CO-PO & PSO Correlation Articulation Matrix-DE

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	-	-	1	1	-
CO2	2	3	3	2	1	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	-	-	1	3	1
CO4	2	2	2	2	1	-	-	-	-	-	-	-	1	1	1
CO5	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2

20EE C10 **ELECTRICAL MACHINES-I**

Instruction	3L Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisites: Basic Electrical Engineering.

Course Objectives: The objective of this course is to:

1. To inculcate the principles of Electromechanical Energy Conversions.
2. To determine the performance of DC Machines by conducting various tests.
3. To analyze and select a suitable DC Machine based on the application.
4. To impart the knowledge of transformers and evaluate its performance.

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

1. Identify the various parts of electrical machines and distinguish the nomenclature of electric and magnetic circuits.
2. Elucidate the principle of operation and characteristics of electrical machines.
3. Analyze the starting methods and speed control of DC machine.
4. Determine the performance parameters of a machine for a given data.
5. Explain the parallel operation of DC generators and single-phase transformers.
6. Choose a suitable DC machine and auto transformer for a specific application.

UNIT-I

Electromechanical energy conversion: Introduction to Magnetic circuits, forces and torques in magnetic field system, energy balance, singly excited and multiple excited magnetic systems, co-energy.

UNIT-II

DC Generators: Review of Constructional features and Principle of operation of a DC machine, armature windings diagram (Lap and Wave winding), analysis of EMF equation of a DC generator, Armature reaction and its effects, process of commutation, methods of improving commutation, methods of excitation and classification of DC generators, voltage build-up in a shunt generator, critical field resistance and critical speed, generator characteristics, losses and efficiency, parallel operation and applications of DC generators.

UNIT-III

DC Motors: Review of Principle of operation**,** back EMF and significance of back EMF, electromagnetic torque, types of DC motors, characteristics, analysis of speed control methods, necessity of starter, three-point starter and four-point starter, soft starters (elementary treatment only) losses and efficiency, applications of DC motors.

Testing of DC machines: Swinburne's test, brake test, Hopkinson's test, fields test, retardation test and separation of losses.

UNIT-IV

Single Phase Transformer: Review of Constructional features, principle of operation, EMF equation and ideal transformer, transformer on no-load and on-load and its phasor diagrams. Detailed study of equivalent circuit, voltage regulation and efficiency. All day efficiency, parallel operation of transformer.

Testing of transformer: Polarity test, analysis of open circuit and short circuit test, Sumpner's test, separation of losses.

Auto transformer: - Construction, principle, applications and comparison with two-winding transformer.

UNIT-V

Three-Phase Transformers: Construction, types of connection and their comparative features, Scott connection. Tap-changing transformers: No-load and on-load tap-changing of transformers, Three-winding transformers, cooling of transformers.

Text Books:

1. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.
2. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011.
3. H. Cotton, Advanced Electrical Technology, Wheeler & Co, CBS publishers, 7th Edition, 2005.
4. J.B Gupta, Theory and performance of electrical machines, S.K. Kataria & Sons, 14th Edition, 2014.

Suggested Readings:

6. A. E. Fitzgerald and C. Kingsley, "Electric Machinery”, New York, McGraw Hill Education, 2013.
7. A. E. Clayton and N. N. Hancock, “Performance and design of DC machines”, CBS Publishers, 2004.
8. M. G. Say, “Performance and design of AC machines”, CBS Publishers, 2002.
9. Ashfaq Hussain “Electrical Machines” Danpat Rai and sons, 3rd Edition 2012.

CO-PO & PSO Correlation Articulation Matrix- EM1

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	1	2	1	--	--	--	--	--	--	--	1	2	2
CO-2	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-3	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-4	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-5	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-6	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2

20EEC11 **ELECTROMAGNETIC FIELDS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite : Mathematics 1 and mathematics 3

Course Objectives:

1. To understand coordinate systems, vector calculus and their applications to analyze electrostatic and magnetic fields.
2. To figure out Maxwell's equations, uniform plane wave and its propagation through different media.
3. To know the sources, effects & control techniques of EMI & EMC.

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

1. Understand the basic concepts of vector calculus, various coordinate systems and apply them appropriately for solving electromagnetic field problems.
2. Obtain the physical quantities like field intensity, flux density and potential due to various types of charge distributions in electric and magnetic fields using fundamental laws.
3. Differentiate between conduction & convections currents, and describe the behaviour of static electric & magnetic fields in different media, boundary conditions and acquire the knowledge about energy storing elements.
4. Illustrate Maxwell's equations and their application to time-harmonic fields, wave propagation in different media and Poynting's power-balance theorem.
5. Recognize what is EMI & EMC, sources & effects of Electromagnetic Interferences in inter and intra systems and various methods to control EMI

UNIT- I

Orthogonal Coordinate Systems: Review of Vector Calculus, Rectangular, Cylindrical, Spherical Coordinate systems; Line, Surface and Volume integrals; Operator Del, Gradient, Divergence, Curl & Laplacian of a field; Divergence and Stokes's theorems.

Electrostatic fields: Various charge configurations, Coulomb's law, Electric field intensity and flux density of different charge distributions, Gauss's law, Integral and Point form of Maxwell's Electrostatic Equation.

UNIT- II

Electrostatic Field in Materials: Electrical Potential, Capacitance of Parallel plate capacitor, Equipotential lines, Properties of materials, convection and conduction currents, conductors, dielectric constant, continuity equation and relaxation 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, Coefficient of Coupling.

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 electromagnetics.

Text Books:

1. Hayt, W.H and J.A Buck, Engineering Electromagnetics, Tata McGraw Hill, 8th Edition, 2018.
2. Sadiku, M.N.O, S.V. Kulkarni, Principles of Electromagnetics, Oxford University press, 7th Edition, 2018.

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, 2015
4. R.L. Yadava, "Electromagnetic Fields & Waves", Khanna Publishing House,
5. R.K. Shevgaonkar, Electromagnetic Waves, , Tata McGraw Hill, India
6. Narayana Rao, Engineering Electromagnetics, PHI Pvt. Ltd

CO-PO & PSO Correlation Articulation Matrix: EMF

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	3	2	1	2	--	2	--	1	1	2	1	--	2	1
CO-2	3	3	2	1	2	--	2	--	1	1	2	1	--	2	1
CO-3	3	3	2	1	2	--	2	--	1	1	2	1	--	3	1
CO-4	3	3	2	1	2	--	2	--	1	1	2	1	--	3	1
CO-5	3	3	2	1	2	1	2	--	1	1	2	1	--	3	1

20EEC12 **POWER ELECTRONICS**

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Prerequisite Analog Electronic Circuits

Course Objective:

1. To identify the characteristics of different static switches and their turn- ON & turn - OFF methods.
2. To know the principles of AC-DC, DC-DC, DC-AC and AC-AC energy conversions.
3. To study various methods of voltage control in power converters.

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

1. Understand the construction, operation and characteristics of various power semiconducting devices and to identify their selection in appropriate application.
2. Comprehend the driver/trigger circuits for various devices & also protection circuit, different turn -OFF methods, series & parallel operation of SCRs.
3. Illustrate the principle of working of AC-DC, AC-AC, DC-DC & DC-AC converters.
4. Analyse the performance for various power converters with different loads and modes of working.
5. Describe various voltage control techniques in power electronic converters with their applications

UNIT-I

Power Switching Devices: Power diode, characteristics, Recovery characteristics, Types of power diodes, General purpose diodes, Fast recovery diodes, their applications. Bipolar Junction Transistors(BJT), Power MOSFET, IGBT Basic structure and working, Steady state and switching characteristics, Gate drive circuits for MOSFET and IGBT, Comparison of BJT, MOSFET and IGBT, Their applications.

UNIT-II

Silicon Controlled Rectifier (SCR): SCR-Static characteristics, Two transistor analogy, Protection of SCRs, Dynamic characteristics, Series and parallel operation of SCRs, SCR trigger circuits-R, RC and UJT triggering circuits, Commutation methods of SCR.

UNIT-III

Thyristors Rectifiers: Study of Single-phase and three-phase half wave and full wave-controlled rectifiers with R, RL, RLE loads, significance of freewheeling diode, Effect of source inductance, Dual converters - circulating and non-circulating current modes.

UNIT-IV

DC-DC Converters: Principles of Step-down, Step-up, Step UP/Down choppers, Time ratio control and current limit control, Types of choppers Type- A, B, C, D and E, Voltage commutated chopper, Introduction to Buck, Boost and Buck-Boost regulators, Basics of flyback and forward converters.

AC-AC Converters: AC Voltage Controller, integral cycle control, phase control, AC Voltage controllers with R and RL loads

UNIT-V

DC-AC Converters: Single-phase Bridge inverters, Voltage control methods, Single pulse width modulation, Multiple pulse width modulation, Sinusoidal pulse width modulation, Three-phase bridge Inverters, 180^0 & 120^0 modes of operation, switch states, instantaneous output voltages, average output voltages for single & three phase inverters, Current source inverters, Comparison of Voltage Source Inverters and Current Source Inverters,

Text Books:

1. Singh. M. D, Khanchandani. K. B, "Power Electronics", Tata McGraw Hill, 2nd Edition, 2017.
2. Rashid. M. H., "Power Electronics Circuits Devices and Applications", 4th Edition, Pearson India, 2017.
3. Bimbra. P. S, "Power Electronics", Khanna Publishers, 3rd Edition, 2013.
4. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science

Suggested Reading:

1. N. Mohan, T.M. Undeland , "Power Electronics: Converters, Applications and Design", John Wiley & Sons,2007
2. P.C. Sen, "Power Electronics", Tata Mc-Graw Hill, 1st Edition, 2001.
3. L.Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

CO-PO & PSO Correlation Articulation Matrix: PE

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	2	3	2	2	2	--	2	--	1	2	--	2	2
CO-2	2	2	2	2	1	--	1	--	1	--	1	--	--	2	2
CO-3	3	2	1	2	1	--	1	--	2	1	3	2	--	2	2
CO-4	3	1	1	2	1	--	--	--	1	1	--	--	--	2	2
CO-5	3	2	2	2	--	--	1	--	1	--	1	1	--	2	2

With effect from the Academic Year 2021-22

20 EE C 13

POWER SYSTEMS –I

Instruction	3 Hours per week
Duration of Semester End Examination	3 Hours
SEE	60 Marks
CIE	40 Marks
Credits	3

Pre-requisite: Knowledge of energy resources, Mathematics1

Course Objectives:

1. To introduce Generation of power through conventional sources such as: Thermal, Hydro, Nuclear and Renewable energy sources
2. To familiarize mechanical design of transmission lines and cables.
3. To familiarize present practices in tariff calculations and understand the classification and Connection schemes of distribution systems

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

1. Discuss the construction and operation of conventional and non-conventional sources of energy along with financial management
2. Determine the line parameters such as inductance and capacitance for different configurations of transmission line
3. Calculate the sag and tension of given transmission line under different weather conditions
4. Discuss the operation of underground cables, insulators and calculate the capacitance of cables and string efficiency of insulators
5. Discuss the different tariff structures, types of costs and general aspects of distribution systems

UNIT-I

Basic Concepts: Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids.

Generation: Thermal- Hydro -Power Plants: Principles, Choice of site, layout and various parts of generating stations, Brief description of Hydro Power Plant Dam, Spillways, Head works, Surge tank, Penstocks, Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses, Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and Cooling towers.

Nuclear Station: Schematic Arrangement of Nuclear Power Station, Advantages and disadvantages, Types of Nuclear reactors

UNIT- II

Solar and Wind Generation: Solar cell fundamentals, Solar Cell characteristics, solar cell classification, solar cell, Module, Panel and Array Construction, Maximizing the solar PV output and load matching, Solar PV Systems, Basic Principles of Wind Energy Conversion, The Nature of the Wind, The Power in the Wind, Forces on the Blades, Wind Energy Conversion, Wind Data and Energy Estimation, Site Selection Considerations

UNIT-III

Line Parameter Calculations: Inductance & Capacitance calculations of Transmission Line, single-phase and three-phase symmetrical composite conductors, GMD, GMR, Transposition of conductors, bundled conductors, effect of earth capacitance.

UNIT-IV

Overhead Transmission Lines and Cables: Overhead line materials, supports, types, Ground wires, **Sag**/Tension calculations, Equal / Unequal supports, Effects of wind, ice / Erection Conditions stringing charts. Insulators, Types, Material for construction, potential distribution over string of insulators, equalizing of potential, Methods.

Underground Cables: Construction of Cables, Insulating Materials for Cables, Classification of Cables, Insulation Resistance of a Single-Core Cable, Capacitance of a Single-Core Cable, Dielectric Stress in a Single-Core Cable, Most Economical Conductor Size in a Cable, Grading of Cables, Capacitance Grading, Inters heath Grading, Capacitance of 3-Core Cables, Measurements of Ce and Cc.

UNIT- V

Economics of Power Generation: Load curve, Load demand and diversified factors, Base load operation, Types of costs and depreciation calculations; Tariffs, different types of tariffs; Methods of power factor improvement.

General Aspects of Distribution Systems-Types of Distribution, Ring Main & Radial Distribution system, Calculations for Distributor fed at one end, distributor fed at both ends.

Text Books:

1. J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
2. C.L. Wadhwa, "Electric Power Systems Theory", New Academic Science Limited, 2012.
3. B.H. Khan, "Non-Conventional Energy Resources" Mc Graw Hill Education, 2015

Suggested Reading:

1. A.R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc., 1999.
2. D.P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill, 2003.
3. B.M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 2012

CO-PO & PSO Correlation Articulation Matrix-PS1

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	1	2	2	1	-	-	2	-	-	-	-	-	1	-	2
CO-2	2	3	2	2	-	-	-	-	-	-	-	-	1	-	2
CO-3	2	3	2	2	-	-	-	-	-	-	-	-	1	-	2
CO-4	2	2	2	2	-	-	-	-	-	-	-	-	-	-	2
CO-5	1	2	2	1	-	-	-						-	-	2

With effect from the Academic Year 2021-22

20EGM02

INDIAN TRADITIONAL KNOWELDGE

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Prerequisite: Knowledge on Indian Culture

Course Objectives:
1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: After completion of this course, students will be able to:
1. Understand philosophy of Indian culture
2. Distinguish the Indian languages and literature
3. Learn the philosophy of ancient, medieval and modern India
4. Acquire the information about the fine arts in India
5. Know the contribution of scientists of different eras.

UNIT-I
Culture and Civilization: Culture, civilization and heritage, general characteristics of culture, importance of culture in human life, Cultural diversity, Aesthetics, Women seers, Indus culture, Indian cuisine, Martial arts

UNIT-II
Education System: Education in ancient, medieval and modern India, aims of education, subjects, Languages, Science and Scientists of ancient, medieval and modern India

UNIT-III
Linguistic Wealth: Indian Languages and Literature: the role of Sanskrit, Paleography, Significance of scriptures to current society, Indian semantics and lexicography, Bhakti literature, Darsanas

UNIT-IV
Art, Technology & Engineering: Sculpture, Painting and Handicrafts, Indian Music, Dance Drama and Theatre, Introduction to Mayamatam, Iron and steel technology, Use of metals in medicinal preparations

UNIT-V
Science and Logic: Helio-centic system, Sulbasutras, Katapayadi, Hindu calendar, 6 pramanas in Indian logic, Scientific method applied to therapeutics, Fallacies, Tarka – Induction &Deduction, Ayurvedic biology, Definition of health

Essential Readings:

1. Kapil Kapoor, **Text and Interpretation: The Indian Tradition,** ISBN: 81246033375, 2005
2. Samskrita Bharati, **Science in Samskrit**, ISBN-13: 978-8187276333, 2007
3. Satya Prakash, **Founders of sciences in Ancient Indi**a, Govindram Hasanand, ISBN-10: 8170770009, 1989
4. Brajendranath Seal, **The Positive Sciences of the Ancient Hindus**, Motilal Banarasidass, ISBN-10: 8120809254, 1915
5. Kancha Ilaiah, Turning the Pot, Tilling the Land: Dignity of Labour in Our Times

Suggested Readings:

- Swami Vivekananda, *Caste, Culture and Socialism*, Advaita Ashrama, Kolkata ISBN-9788175050280
- Swami Lokeswarananda, *Religion and Culture*, Advaita Ashrama, Kolkata ISBN-9788185843384
- Kapil Kapoor, *Language, Linguistics and Literature: The Indian Perspective*, ISBN-10: 8171880649, 1994.
- Karan Singh, *A Treasury of Indian Wisdom: An Anthology of Spiritual Learn*,ISBN: 978-0143426158, 2016
- Swami Vivekananda, *The East and the West*, Advaita Ashrama, Kolkata 9788185301860

- Srivastava R.N., *Studies in Languages and Linguistics*, Kalinga Publications ISBN-13: 978-8185163475
- Subhash Kak and T.R.N. Rao, Computation in Ancient India, Mount Meru Publishing ISBN-1988207126
- R.N Misra, *Outlines of Indian Arts Architecture, Painting, Sculpture, Dance and Drama,* IIAS, Shimla & Aryan Books International, ISBN 8173055149
- S. Narain, *Examinations in ancient India*, Arya Book Depot, 1993
- M. Hiriyanna, Essentials of Indian Philosophy, Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014
- Ravi Prakash Arya, Engineering and Technology in Ancient India, Indian Foundation for Vedic Science, ISBN-10: 1947593072020
- Shashi Tharoor, The Hindu Way
- Amartya Sen, Argumentative Indian

SWAYAM/Nptel:

History of Indian Science and Technology - https://onlinecourses.swayam2.ac.in/arp20_ap35/preview
Introduction to Ancient Indian Technology – https://onlinecourses.nptel.ac.in/noc19_ae07/preview
Indian Culture & Heritage - https://onlinecourses.swayam2.ac.in/nos21_sc11/preview
Language and Society - https://nptel.ac.in/courses/109/106/109106091/
Science, Technology & Society - https://nptel.ac.in/courses/109/103/109103024/
Introduction to Indian Philosophy - https://nptel.ac.in/courses/109/106/109106059/
Introduction to Indian Art - An appreciation - https://onlinecourses.nptel.ac.in/noc20_hs09/preview

With effect from the Academic Year 2021-22

20 EE C 14

DIGITAL ELECTRONICS LAB

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Pre-requisites: Basic knowledge on logical operations, basics of logic gates, basics of flip-flops

Course Objectives:

1. To explain Demorgan's Theorem, SOP, POS forms
2. To demonstrate implementation of Full/Parallel Adders, Subtractors and Magnitude Comparators, multiplexers, de-multiplexers and decoders using logic gates
3. To illustrate various flip-flops, shift registers and design different counters.

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

1. Demonstrate the truth table of various expressions and combinational circuits using logic gates.
2. Design, test and implement various combinational circuits such as adders, subtractors, comparators.
3. Apply knowledge of logic gates to design complex logic circuits like multiplexers and demultiplexers.
4. Design, test and implement various sequential circuits using flip-flops
5. Design various logic circuits using shift registers

LIST OF EXPERIMENTS

1. Verify (a) Demorgan's Theorem for 2 variables.
2. The sum-of product and product-of-sum expressions using gates.
3. Design and implement (a) Full Adder using basic logic gates. (b) Full subtractor using basic logic gates
4. Design and implement 4-bit Parallel Adder/ subtractor using IC 7483.
5. Design and Implementation of 4-bit Magnitude Comparator using IC 7485.
6. Realize (a) 4:1 Multiplexer using gates.
   (b) 3-variable function using IC 74151(8:1MUX).
7. Realize 1:8 Demux and 3:8 Decoder using IC74138.
8. Realize the following flip-flops using NAND Gates. (a) Clocked SR Flip-Flop (b) JK Flip-Flop
9. Realize the following shift registers using IC7474 (a) SISO (b) SIPO (c) PISO (d) PIPO.
10. Realize the Ring Counter and Johnson Counter using IC7476.
11. Realize the Mod-N Counter using IC7490.
12. Design of synchronous counters using flip-flops.
13. Design of Asynchronous counters using flip-flops.

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

CO-PO & PSO Correlation Articulation Matrix-DE lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1	-	-	-	-	-	-	-	1	1	-
CO2	2	3	3	2	1	-	-	-	-	-	-	-	1	2	-
CO3	2	3	3	2	1	-	-	-	-	-	-	-	1	3	1
CO4	2	2	2	2	1	-	-	-	-	-	-	-	1	1	1
CO5	1	2	2	1	1	-	-	-	-	-	-	-	1	1	2

With effect from the Academic Year 2021-22

20EEC15 **ELECTRICAL MACHINES-I LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course objectives:

1. To understand the practical connections of the machines.
2. To draw the characteristics of different types of DC 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. Choose 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. Obtain the characteristics of the given DC generator.
5. Determine the performance of DC machines and single-phase transformer.

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. Swinburne's test on DC shunt machine to predetermine the efficiency at any given load.
5. Brake test on DC series motor.
6. Hopkinson's test on two identical DC shunt machines.
7. Separation of stray losses of DC shunt machine.
8. Load test on single phase transformers.
9. Sumpner's test on two identical single-phase transformers.
10. Separation of Magnetic losses of transformer.
11. Study of three-phase transformer connections.
12. Demonstration of three-point starter and four-point starter.
13. Study of excitation phenomenon of three-phase transformer.
14. Parallel operation of two single-phase transformers.

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

CO-PO & PSO Correlation Articulation Matrix: EM-I Lab

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	1	2	1	--	--	--	--	--	--	--	1	2	2
CO-2	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-3	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-4	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2
CO-5	3	3	2	2	1	--	--	--	--	--	--	--	1	2	2

20EEC16 **POWER ELECTRONICS LAB**

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To obtain and plot the characteristics of different static switches.
2. To analyze the triggering and commutation circuits for SCR.
3. To familiarize and simulate the conversion principles of AC-DC, DC-DC, DC-AC and AC-AC conversion circuits.

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

1. Plot the characteristics of various controlled switches and identifies effect of variation of control signal on the regions of switching operation.
2. Demonstrate the effect of delay angle and nature of load on the performance of various power converters and able to plot the output voltage and current waveforms.
3. Simulate various types of power converters and discriminate between simulation models and practical models of various power converters.
4. Understand various voltage control techniques in different power converters.
5. Select proper equipment, precautions, implement connections keeping technical, safety and economic issues.

List of Experiments

PART-A

1. Study of static characteristics of S.C.R. and to measure latching & holding currents.
2. Study the characteristics of BJT, MOSFET and IGBT.
3. R, RC and UJT triggering circuits for SCR
4. Study of forced commutation techniques of SCR.
5. Single-phase half-controlled bridge rectifier with R and RL loads.
6. Single-phase fully controlled converter with R, RL & RLE loads and freewheeling diode
7. Three-phase half-controlled bridge rectifier with R and RL loads.
8. Three-phase fully controlled bridge rectifier with R and RL loads.
9. DC voltage control using Buck and Boost choppers.
10. Voltage and Current commutated choppers with R&RL loads.
11. Single-phase step down Cyclo-converter with Rand RL loads.
12. Single-phase A.C voltage controller with R and RL loads
13. Half and Full bridge inverters with R&RL loads.

PART-B

1. Simulation of Single-phase Full converter and Semi converter with R & RL loads and freewheeling diode.
2. Simulation of Three-phase Full converter and Semi converter with R & RL loads.
3. Simulation of Single-phase AC voltage controller with R & RL loads
4. Simulation of single-phase half-bridge & full-bridge inverters.
5. Simulation of three-phase bridge inverter in different modes.
6. Simulation of Single-phase Inverter with single, multiple and sinusoidal pulse width modulations.

Note: At least **SEVEN** experiments from PART-A and **THREE** from PART-B should be conducted in the semester.

CO-PO & PSO Correlation Articulation Matrix: PE Lab

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO-1	3	2	--	1	1	--	--	--	2	1	2	1	--	3	2
CO-2	3	3	1	2	2	--	1	--	2	1	2	1	2	3	3
CO-3	3	3	--	2	2	--	1	--	2	1	2	1	3	3	3
CO-4	3	1	1	2	1	--	--	--	1	1	2	1	--	2	2
CO-5	1	2	1	2	--	1	--	--	1	1	2	1	--	2	2

Syllabus of the Courses offered to the other Departments

20 EE M01	Basic Electrical Engineering
20 EE M02	Basic Electrical Engineering Lab
20 EE O01	Engineering Materials
20 EE O02	Energy Management Systems
20 EE O03	Energy Auditing
20 EE O04	Energy Conservation
20 EE O05	Waste Management

20EEC01 **BASIC ELECTRICAL ENGINEERING**

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

Course Objectives:

1. To understand the behaviour of different circuit elements R, L & C, and the basic concepts of electrical AC circuit analysis
2. To understand the basic principle of operation of AC and DC machines
3. To know about different types of electrical wires and cables, domestic and industrial wiring. safety rules and methods of earthing

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

1. Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
2. Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
3. Understand the principle of operation, the emf and torque equations and classification of AC and DC machines
4. Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
5. Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.
6. Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations

UNIT-I

DC Circuits: Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT-II

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III

Transformers: Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation

UNIT-IV

DC and AC Machines: DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators.

DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors.

Three - Phase Induction Motors: Principle of operation, Applications,

UNIT-V

Electrical Installations: Electrical Wiring: Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Earthing (Elementary Treatment only), Elementary calculations for energy consumption

Text Books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989
3. D.C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill,2009
4. P.V. Prasad, S. sivanagaraju, R. Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013

CO-PO Mapping for BEE Theory

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO-1	PSO-2	PSO-3
C01	3	3	2	3	3	-	3	-	1	2	2	3	2	3	2
C02	3	3	2	3	2	-	3	-	1	2	2	3	2	3	2
C03	3	3	2	1	3	-	2	-	1	2	2	3	2	3	2
C04	2	3	-	1	3	-	2	-	1	2	1	3	2	3	2
C05	2	-	-	1	1	2	2	1	1	1	2	3	2	3	2
C06	2	-	-	1	3	1	2	1	1	1	2	3	2	3	2

With effect from the Academic Year 2020-2021

20EEC02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	1

Course Objectives:

1. To acquire the knowledge of different types of electrical elements and to verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil, calculate the time and frequency responses of RLC circuits and to familiarize with measurement of electric power &energy.
3. To determine the characteristics of Transformers, dc, ac machines and switchgear components

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

1. Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.
2. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.
3. Comprehend the circuit analysis techniques using various circuital laws and theorems.
4. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits.
5. Recognize the basic characteristics of transformer and components of switchgear.
6. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.

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 series circuits.
4. Determination of parameters of a choke or coil by Wattmeter Method
5. Verification of Thevenin's and Norton's theorems
6. Turns ratio /voltage ratio verification of single phase Transformers
7. Open Circuit and Short Circuit tests on a given single phase Transformer
8. Observation of Excitation Phenomenon in Transformer
9. Measurement of three phase power in a balanced system using two Wattmeter method.
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle)
11. Load test on DC Shunt motor
12. Speed control of DC Shunt motor
13. Demonstration of Low Tension Switchgear Equipment/Components
14. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: TEN experiments to be conducted from the above list.

CO-PO Mapping for BEE Theory

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO-1	PSO-2	PSO-3
CO-1	2	2	1	1	-	-	1	1	2	1	-	1	1	3	2
CO-2	2	1	1	1	-	-	1	1	2	1	-	1	1	3	2
CO-3	3	3	2	1	-	-	1	-	2	1	-	1	1	3	2
CO-4	3	1	2	1	-	-	1	-	2	1	-	1	1	3	2
CO-5	3	3	2	3	-	-	1	-	2	1	-	1	1	3	2
CO-6	3	3	2	2	-	-	1	-	2	1	-	1	1	3	2

With effect from the Academic Year 2021-2022

Code: 20EGMO3

UNIVERSAL HUMAN VALUES-II: UNDERSTANDING HARMONY

(**B.E/B.Tech II/III Year** -Common to all Branches)

Instruction	3L Hours per Week
Duration of SEE	3 Hours
SEE	60Marks
CIE	40 Marks
Credits	3

Introduction

This course discusses the role of human values in one's family, in society and in nature. In the Induction Program, students would get an initial exposure to human values through Universal Human Values–I. This exposure is to be augmented by this compulsory full semester foundation course.

Course Objectives

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in human being, family, society and nature/existence.
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

Course Outcomes

By the end of the course,

1. Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
2. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. They would have better critical ability.
4. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
5. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.

The course has 28 lectures and 14 practice sessions:

Unit 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current Scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit 2: Understanding Harmony in the Human Being - Harmony in Myself

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'

- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Unit 3: Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co -existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all - pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
  a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
  b. At the level of society: as mutually enriching institutions and organizations

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Mode of Conduct (L-T-P-C 2-1-0-3)

- Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.
- While analysing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

- In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.
- Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.
- Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included.
- The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.

Assessment:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self- assessment, peer assessment etc. will be used in evaluation.

Example:

Assessment by faculty mentor: 10 marks

Self-assessment/Assessment by peers: 10 M

Socially relevant project/Group Activities/Assignments: 20 marks

Semester End Examination: 60 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course.

Text Books

The Text Book

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

The teacher's manual

2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. A Nagaraj Jeevan Vidya: Ek Parichaya, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. Cecile Andrews, Slow is Beautiful
4. Gandhi - Romain Rolland (English)
5. Dharampal, "Rediscovering India"
6. E. FSchumacher. "Small is Beautiful"
7. J. C. Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
10. 10.Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. Maulana Abdul Kalam Azad, India Wins Freedom -
12. Vivekananda - Romain Rolland (English)
13. The Story of Stuff (Book)

With effect from the Academic Year 2021-2022

20EGM01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

(BE/BTech III/IV Semester - Common to all branches)

Instruction	2L Hours per Week
Duration of SEE	2 Hours
SEE	50 Marks
CIE	0 Marks
Credits	0

Course Objectives

The course will introduce the students to:

1. History of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. 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. 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. Identify the difference among Right To equality, Right To freedom and Right to Liberty.
3. Analyze the structuring of the Indian Union and differentiate the powers between Union and States.
4. Distinguish between the functioning of Lok Sabha and Rajya Sabha while appreciating the importance of Judiciary.
5. Differentiate between the functions underlying Municipalities, Panchayats and Co-operative Societies.

Unit-I

Constitution of India: Constitutional history-Govt of India Act 1909, 1919 and 1935, Constitution making and salient features. Directive Principles of State Policy - Its importance and implementation.

Unit-II

Scheme of the Fundamental Rights & Duties: The Fundamental Rights - To Equality, to certain Freedom under Article 19, to Life and Personal Liberty Under Article 21. Fundamental Duties - the legal status.

Unit III

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: Executive-President's role, power and position.

Unit IV

Legislature and Judiciary: Central Legislature-Powers and Functions of Lok Sabha and Rajya Sabha.

Judiciary: Supreme Court-Functions, Judicial Review and Judicial Activism

Unit V

Local Self Government - District's Administration Head (Collector): Role and Importance.

Municipalities: Introduction, Mayor and Role of Elected Representative, CEO of Municipal Corporation.

Panchayati Raj: Introduction, Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Position and Role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and Officials.

Text Books:

1. **Indian Government & Politics**, Ed Prof V Ravindra Sastry, Telugu Akademy, 2nd edition, 2018.
2. **Indian Constitution at Work,** NCERT, First edition 2006, Reprinted- January 2020.

Suggested Reading:

1. **The Constitution of India**, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, **Framing of Indian Constitution**, 1st Edition, 2015.
3. M. P. Jain, **Indian Constitution Law**, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu**, Introduction to the Constitution of India**, Lexis Nexis, 2015.

Online Resources:

1. http://www.nptel.ac.in/courses/103107084/Script.pdf