AL-AMEEN ENGINEERING COLLEGE

(Autonomous)

Accredited by NAAC with "A" Grade :: An ISO Certified Institution
(Affiliated to Anna University, Chennai & Approved by AICTE, New Delhi)
Karundevanpalayam, Nanjai Uthukkuli Post, Erode – 638 104, Tamilnadu, INDIA.

CURRICULUM & SYLLABI

SEMESTERS – I to VIII

(Regulations 2020)

CHOICE BASED CREDIT SYSTEM

B.E. Electrical and Electronics Engineering

Applicable to the Students admitted from the AY 2021-22 onwards

KNOWLEDGE LEVELS (BLOOM'S TAXONOMY)

Notation	Knowledge Levels
K1	Remembering
K2	Understanding
K3	Applying
K4	Analysing
K5	Evaluating
K6	Creating

INSTITUTION VISION
To be a multi-disciplinary institute of academic excellence in Engineering, Technology and allied fields for uplifting the under-privileged and rural; inculcating brotherhood and positivism among its students.

INSTITUTION MISSION
To groom confident, wholesome students with social consciousness and values, by endeavoring experiences for the ever-changing world of work.

DEPARTMENT VISION
To be a centre of excellence to upgrade the knowledge of under privileged and rural students in various fields of Electrical and Electronics Engineering for outstanding performance in academic and social relationship.

DEPARTMENT MISSION	
M1	To groom confident on next generation electrical engineers with a lifelong learning attitude for the ever-changing world of work.
M2	To inculcate the moral and ethical values on students career in industries, training and research activities with social impacts.
M3	To develop the leadership and entrepreneurship skills for uplifting the backward and rural communities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)	
PEO 1	To enable the graduates to be successful in their chosen careers, by applying their continual learning of Electrical and allied engineering in their work and life situations.
PEO 2	To prepare graduates in adopting latest technologies and tools for critical situations in industries by demonstrating effective communication and leadership qualities.
PEO 3	To prepare graduates to be innovative through research and designing projects, catering the specific requirements of start-ups / enterprises to the society, particularly for rural uplift.

PROGRAM OUTCOMES (POs)	
PO 1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/Development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSOs)	
PSO 1	Apply the basic knowledge of electrical and electronics engineering to realize real-time problems related to Electrical and Electronic systems.
PSO 2	Design the electrical systems aligned with power system, power converters, electrical machines, energy conservation and electric vehicle technology.

CURRICULUM

SEMESTER I

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA1T1	Engineering Mathematics I	BS	40	60	3	1	0	4
2	20CY1T2	Engineering Chemistry	BS	40	60	3	0	0	3
3	20EN1T3	Communicative English I	HS	40	60	3	1	0	4
4	20PH1T4	Engineering Physics	BS	40	60	3	0	0	3
5	20CS1T5	Fundamental of Computing and Programming	ES	40	60	3	0	0	3
LABORATORY COURSES									
6	20GE1L1	Physics and Chemistry Laboratory	BS	60	40	0	0	3	1.5
7	20CS1L2	Computer Practices Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
8		Universal Human Values 1 - Induction Programme	MC	-	-	-	-	-	-
Total						**15**	**2**	**6**	**20**

SEMESTER II

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA2T1	Engineering Mathematics II	BS	40	60	3	1	0	4
2	20EN2T3	Communicative English II	HS	40	60	3	0	0	3
3	20CM2T4	Basic Civil and Mechanical Engineering	ES	40	60	3	0	0	3
4	20EE2T5	Circuit Theory	ES	40	60	3	1	0	4
LABORATORY COURSES									
5	20EM2L1	Engineering Practices Laboratory	ES	60	40	0	0	3	1.5
6	20ME2L2	Engineering Drawing Practice	ES	60	40	0	0	2	1
7	20EE2L3	Electrical Circuits Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
8	20CY2T2	Environmental Sciences	MC	100	-	3	0	0	0
Total						**15**	**2**	**8**	**18**

SEMESTER III

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE3T1	Electrical Machines – I	PC	40	60	3	0	0	3
2	20EE3T2	Electromagnetic Theory	PC	40	60	3	1	0	4
3	20MA3T3	Transforms and Partial Differential Equations	BS	40	60	3	1	0	4
4	20EE3T4	Electron Devices and Circuits	ES	40	60	3	0	0	3
5	20EC3T5	Digital Logic Circuits	PC	40	60	3	0	0	3
LABORATORY COURSES									
6	20ENCL1	Communication Skills Laboratory	HS	60	40	0	0	2	1
7	20EE3L2	Electrical Machines Laboratory – I	PC	60	40	0	0	3	1.5
8	20EE3L3	Devices and Circuits Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20MCCT1	Constitution of India	MC	100	-	3	0	0	0
Total						**18**	**2**	**8**	**21**

SEMESTER IV

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE4T1	Electrical Machines – II	PC	40	60	3	0	0	3
2	20EC4T2	Linear Integrated Circuits and Applications	PC	40	60	3	0	0	3
3	20EE4T3	Transmission and Distribution	PC	40	60	3	0	0	3
4	20MA4T4	Numerical Methods	BS	40	60	3	1	0	4
5	20EE4T5	Measurements and Instrumentation	PC	40	60	3	0	0	3
LABORATORY COURSES									
6	20EE4L1	Electrical Machines Laboratory – II	PC	60	40	0	0	3	1.5
7	20EE4L2	Presentation Skills and Technical Seminar	EEC	100	--	0	0	2	1
8	20EC4L3	Linear Integrated Circuits Laboratory	PC	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20HSCT1	Universal Human Values 2: Understanding Harmony	HS	100	-	2	1	0	3
Total						**17**	**2**	**8**	**23**

SEMESTER V

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE5T2	Renewable Energy Systems	PC	40	60	3	0	0	3
2	20EE5T3	Power Electronics	PC	40	60	3	0	0	3
3	20CS5T1	Object Oriented Programming and Data Structures	ES	40	60	3	0	0	3
4		Professional Elective – I	PE	40	60	3	0	0	3
5		Open Elective – I	OE	40	60	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
6	20EE5LT1	Control Systems Engineering	PC	50	50	2	0	4	4
7	20EC5LT2	Microprocessors and Microcontrollers	PC	50	50	2	0	4	4
LABORATORY COURSE									
8	20CS5L1	Object Oriented Programming and Data Structures Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20PT5T1	Career Guidance - I	MC	100	--	2	0	0	0
Total						**21**	**0**	**11**	**24.5**

SEMESTER VI

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE6T1	Power System Analysis	PC	40	60	3	1	0	4
2	20EE6T2	Protection and Switchgear	PC	40	60	3	0	0	3
3	20CSCT5	Python Programming	ES	40	60	3	0	0	3
4		Professional Elective – II	PE	40	60	3	0	0	3
5		Open Elective – II	OE	40	60	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
6	20EE6LT2	Solid State Drives	PC	50	50	2	0	4	4
7	20ECCLT1	Embedded Systems	PC	50	50	2	0	4	4
LABORATORY COURSE									
8	20CS2L3	Python Programming Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20PT6T1	Career Guidance - II	EEC	100	-	2	0	0	0
Total						**21**	**1**	**11**	**25.5**

SEMESTER VII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20HSCT2	Professional Ethics	HS	40	60	3	0	0	3
2		Professional Elective – III	PE	40	60	3	0	0	3
3		Professional Elective – IV	PE	40	60	3	0	0	3
4		Open Elective – III	OE	40	60	3	0	0	3
5		Open Elective – IV	OE	40	60	3	0	0	3
THEORY COURSE WITH LABORATORY COMPONENTS									
6	20EE7LT1	Power System Operation and Control	PC	50	50	2	0	4	4
LABORATORY COURSE									
7	20EE7L1	Mini Project	EEC	100	-	0	0	4	2
Total						**17**	**0**	**8**	**21**

SEMESTER VIII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
LABORATORY COURSES									
1	20EE8L1	Project Work	EEC	60	40	0	0	12	8
2	20EE8L2	Internship / In plant Training	EEC	100	-	2 Weeks			2
Total						**0**	**0**	**12**	**10**

Total Credits: 163

HUMANITIES AND SOCIAL SCIENCES INCLUDING MANAGEMENT (HS)

S. No.	Course Code	Course Title	L	T	P	C
1	20EN1T3	Communicative English I	3	1	0	4
2	20EN2T3	Communicative English II	3	0	0	3
3	20ENCL1	Communication Skills Laboratory	0	0	2	1
4	20HSCT1	Universal Human Values 2: Understanding Harmony	2	1	0	3
5	20HSCT2	Professional Ethics	3	0	0	3

BASIC SCIENCES (BS)

Sl.No.	Course Code	Course Title	L	T	P	C
1	20MA1T1	Engineering Mathematics – I	3	1	0	4
2	20CY1T2	Engineering Chemistry	3	0	0	3
3	20PH1T4	Engineering Physics	3	0	0	3
4	20GE1L1	Physics and Chemistry Laboratory	0	0	3	1.5
5	20MA2T1	Engineering Mathematics II	3	1	0	4
6	20MA3T3	Transforms and Partial Differential Equations	3	1	0	4
7	20MA4T1	Numerical Methods	3	1	0	4

ENGINEERING SCIENCES (ES)

Sl.No.	Course Code	Course Title	L	T	P	C
1	20CS1T5	Fundamentals of Computing and Programming	3	0	0	3
2	20CS1L2	Computer Practices Laboratory	0	0	3	1.5
3	20CM2T4	Basic Civil and Mechanical Engineering	3	0	0	3
4	20EE2T5	Circuit Theory	3	1	0	4

5	20EM2L1	Engineering Practices Laboratory	0	0	3	1.5
6	20ME2L2	Engineering Drawing Laboratory	0	0	2	1
7	20EE2L3	Electrical Circuits Laboratory	0	0	3	1.5
8	20EE3T4	Electron Devices and Circuits	3	0	0	3
9	20EE3L3	Devices and Circuits Laboratory	0	0	3	1.5
10	20CS5T1	Object Oriented Programming and Data Structures	3	0	0	3
11	20CS5L1	Object Oriented Programming and DataStructures Laboratory	0	0	3	1.5
12	20CSCT5	Python Programming	3	0	0	3
13	20CS2L3	Python Programming Laboratory	0	0	3	1.5

PROFESSIONAL CORE (PC)

Sl.No.	Course Code	Course Title	L	T	P	C
1	20EE3T1	Electrical Machines – I	3	0	0	3
2	20EE3T2	Electromagnetic Theory	3	1	0	4
3	20EC3T5	Digital Logic Circuits	3	0	0	3
4	20EE3L2	Electrical Machines Laboratory – I	0	0	3	1.5
5	20EE4T1	Electrical Machines – II	3	0	0	3
6	20EC4T2	Linear Integrated Circuits and Applications	3	0	0	3
7	20EE4T3	Transmission and Distribution	3	0	0	3
8	20EE4T5	Measurements and Instrumentation	3	0	0	3
9	20EE4L1	Electrical Machines Laboratory – II	0	0	3	1.5
10	20EC4L2	Linear Integrated Circuits Laboratory	0	0	3	1.5
11	20EE5T2	Renewable Energy Systems	3	0	0	3

12	20EE5T3	Power Electronics	3	0	0	3
13	20EE5LT1	Control Systems Engineering	2	0	4	4
14	20EC5LT2	Microprocessors and Microcontrollers	2	0	4	4
15	20EE6T1	Power System Analysis	3	1	0	4
16	20EE6T2	Protection and Switchgear	3	0	0	3
17	20EE6LT2	Solid State Drives	2	0	4	4
18	20ECCLT1	Embedded Systems	2	0	4	4
19	20EE7LT1	Power System Operation and Control	2	0	4	4

PROFESSIONAL ELECTIVES (PE)

Semester – V (Elective I)						
Sl.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20EE5E1	Electrical Machine Design	3	0	0	3
2	20EE5E2	Modern Power Converters	3	0	0	3
3	20EC5T1	Digital Signal Processing	3	0	0	3
4	20CS4T3	Database Management Systems	3	0	0	3

Semester – VI (Elective II)						
Sl.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20EE6E1	High Voltage Engineering	3	0	0	3
2	20EE6E2	Special Electrical Machines	3	0	0	3
3	20EE6E3	Communication Engineering	3	0	0	3
4	20EE6E4	NPTEL Course	3	0	0	3

Semester – VII (Elective III)						
Sl.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20EE7E1	Power Quality	3	0	0	3
2	20EE7E3	Power Electronics for Renewable Energy Systems	3	0	0	3
3	20EC6T2	VLSI Design	3	0	0	3
4	20EE6E4	NPTEL Course	3	0	0	3

Semester – VII (Elective IV)						
Sl.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**
1	20EE7E5	Electric Energy Generation, Utilization and Conservation	3	0	0	3
2	20EE7E6	Microcontroller Based System Design	3	0	0	3
3	20EE7E7	Flexible AC Transmission Systems	3	0	0	3
4	20EE7E8	Electric and Hybrid Vehicle	3	0	0	3

OPEN ELECTIVES (OE)

Sl.No.	Course Code	Course Title	L	T	P	C
1	20EE7E5	Electric Energy Generation, Utilization and Conservation	3	0	0	3
2	20EE7E8	Electric and Hybrid Vehicle	3	0	0	3
3	20EE5E2	Modern Power Converters	3	0	0	3
4	20EE5T2	Renewable Energy Systems	3	0	0	3

EMPLOYABILITY ENHANCEMENT COURSES (EEC)
PRACTICAL COURSES AND PROJECT WORK

Sl. No.	Course Code	Course Title	L	T	P	C
1	20EE4L3	Presentation Skills and Technical Seminar	0	0	2	1
2	20EE7L1	Mini Project	0	0	4	2
3	20EE8L1	Project Work	0	0	12	8
4	20EE8L2	Internship/In plant Training	2 Weeks			2

MANDATORY COURSES (MC)

Sl.No.	Course Code	Course Title	L	T	P	C
1		Universal Human Values 1 - Induction Programme	0	0	0	Non Credit
2	20CY2T2	Environmental Sciences	3	0	0	Non Credit
3	20MCCT1	Constitution of India	3	0	0	Non Credit
4	20HSCT1	Universal Human Values 2: Understanding Harmony	2	1	0	3
5	20PT5T1	Career Guidance - I	2	0	0	0
6	20PT6T1	Career Guidance - II	2	0	0	0

VALUE ADDED COURSES (VAC)

S.No.	Course Code	Course Title	Credit
1	20EEV01	PCB Designing	1
2	20EEV02	ARDUINO Programming	1
3	20EEV03	Matlab & Simulink	1
4	20EEV04	Solar Energy	1
5	20EEV05	PLC & SCADA	1

CURRICULUM BREAKDOWN STRUCTURE

Subject	AICTE suggested breakdown of credits	Total number of credits	Curriculum Content (% of total number of credits of the program)
Humanities and Social Sciences including Management (HS)	15	14	8.59
Basic Sciences (BS)	26	23.5	14.42
Engineering Sciences (ES)	20	29	17.79
Professional Core (PC)	53	59.5	36.50
Program Electives (PE)	18	12	7.36
Open Electives (OE)	18	12	7.36
Employability Enhancement Courses (EEC) – Practical Courses and Project Work	11	13	7.98
Mandatory Courses (MC)	0	0	0
Total	**161**	**163**	**100.00**

CREDIT SUMMARY

Sl. No.	Subject Area	Credits per Semester								Total Credits	AICTE Suggested Credits
		I	II	III	IV	V	VI	VII	VIII		
1	**HS**	4	3	1	3			3		**14**	**15**
2	**BS**	11.5	4	4	4					**23.5**	**26**
3	**ES**	4.5	11	4.5		4.5	4.5			**29**	**20**
4	**PC**			11.5	15	14	15	4		**59.5**	**53**
5	**PE**					3	3	6		**12**	**18**
6	**OE**					3	3	6		**12**	**18**
7	**EEC**				1			2	10	**13**	**11**
8	**MC**									**0**	**0**
TOTAL		**20**	**18**	**21**	**23**	**24.5**	**25.5**	**21**	**10**	**163**	**161**

HS – Humanities and Social Sciences including Management
BS – Basic Sciences
ES – Engineering Sciences
PC – Professional Core
PE – Professional Electives
OE – Open Electives
EEC – Employability Enhancement Courses
MC – Mandatory Courses

SEMESTER I

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA1T1	Engineering Mathematics I	BS	40	60	3	1	0	4
2	20CY1T2	Engineering Chemistry	BS	40	60	3	0	0	3
3	20EN1T3	Communicative English I	HS	40	60	3	1	0	4
4	20PH1T4	Engineering Physics	BS	40	60	3	0	0	3
5	20CS1T5	Fundamental of Computing and Programming	ES	40	60	3	0	0	3
LABORATORY COURSES									
6	20GE1L1	Physics and Chemistry Laboratory	BS	60	40	0	0	3	1.5
7	20CS1L2	Computer Practices Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
8		Universal Human Values 1 - Induction Programme	MC	-	-	-	-	-	-
Total						**15**	**2**	**6**	**20**

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20MA1T1	ENGINEERING MATHEMATICS I	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify Eigen values and Eigenvectors and apply orthogonal diagonalization to convert quadratic form to canonical form.	K3	1
CO2	Apply differentiation and integration technique to solve algebraic and transcendental function	K3	2
CO3	Evaluate the total derivative of the function, expand the given as series and locate the maximum and minimum for multivariate function	K5	3
CO4	Solve first order Ordinary Differential Equations and apply them to certain physical situations	K3	4
CO5	Choose appropriate integral techniques to find area and volume of the given region	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	3	3		3		
CO2	3	3		3				1	3	3		3		
CO3	3	3		3				1	3	3		3		
CO4	3	3		3				1	3	3		3	2	
CO5	3	3		3				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**MATRICES**	**9 + 3**
Eigen values and Eigen vectors of a real matrix – properties of Eigen values and Eigen vectors (without proof) – Cayley-Hamilton theorem (statement and applications) – orthogonal transformation of a symmetric matrix to diagonal form (concept only) – Reduction of quadratic form to canonical form by an orthogonal transformation		
Topic - 2	**DIFFERENTIATION AND INTEGRATION**	**9 + 3**
Basic differentiation formula for algebraic and transcendental functions – derivatives – differentiability rules and properties (without proof) – basic integral formula for algebraic and transcendental functions – integration by parts – partial fraction methods.		
Topic - 3	**FUNCTIONS OF SEVERAL VARIABLES**	**9 + 3**
Total derivatives – Taylor's series expansion – maxima and minima – Lagrange's multipliers method – Jacobian's method		
Topic - 4	**FIRST ORDER ORDINARY DIFFERENTIAL EQUATION**	**9 + 3**
Leibnitz's equations – Bernoulli's equation – equation of first order and higher degree – Clairaut's form – Linear first order differential equations and its applications.		
Topic - 5	**MULTIPLE INTEGRALS**	**9 + 3**
Double integrals: Double integration in Cartesian co-ordinates – change of order of integration – area as a double integration in Cartesian – volume as a triple integral in Cartesian co-ordinates (simple problems)		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House, New Delhi, Reprint 2009.
2	Ramana B.V., "Higher Engineering Mathematics", Tata Mcgraw Hill Publishing Company, New Delhi, 2008.
3	Kreyszig E., "Advanced Engineering Mathematics", 9th Edition, John Wiley Sons, 2012.
4	Glyn James., "Advanced Modern Engineering Mathematics", Pearson Education Limited, 2007.
5	N P Bali, Manish Goyal, "A Text Book of Engineering Mathematics", 3rd Edition, Laxmi Publication Private Limited, 2009.

OTHER REFERENCES	
1	https://www.slideshare.net/mailrenuka/matrices-and-application-of-matrices
2	https://www.slideshare.net/mailrenuka/matrices-and-application-of-matrices
3	https://youtu.be/wtuq1oSButE
4	https://www.slideshare.net/abhinavsomani3/applications-of-maths-in-our-daily-life-41607055

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20CY1T2	ENGINEERING CHEMISTRY	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Explain the properties & working techniques along with potential applications.	K2	1
CO2	Choose the appropriate method for specific application in engineering technology.	K3	2
CO3	Analyse new solutions to problems in materials and energy usage in daily life	K4	3
CO4	Identify the structure of unknown/new compounds with their properties.	K3	4
CO5	Categorize the important features of various materials and methods for burgeoning society.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2					1	3	3		3		
CO2	3	2						1	3	3		3		
CO3	3	2						1	3	3		3		
CO4	3		2					1	3	3		3	2	
CO5	3	2	2					1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**WATER CHEMISTRY**	**9**
Hardness of water – types – units –boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, carbonate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water – Reverse Osmosis.		
Topic - 2	**FUELS AND COMBUSTION**	**9**
Fuels: Introduction - classification of fuels – Combustion- coal – Analysis of coal - carbonization - manufacture of metallurgical coke (Otto Hoffmann method) - petroleum - knocking - octane number - diesel oil - cetane number - natural gas - compressed natural gas (CNG) - liquefied petroleum gases (LPG) - power alcohol.		
Topic - 3	**ENERGY STORAGE DEVICES**	**9**
Batteries - Types of batteries – primary battery - dry cell. Secondary battery - lead acid battery, Nickel-Cadmium battery, fuel cells – Hydrogen -Oxygen fuel cell. - Solar energy conversion - solar cells – Application.		
Topic - 4	**SPECTROSCOPY**	**9**
Introduction – Laws of spectroscopy - Block diagram, Instrumentation, Working and application of Visible spectroscopy and Ultra Violet spectroscopy – Infrared spectroscopy – Flame photometry – Atomic adsorption spectroscopy.		
Topic - 5	**ENGINEERING MATERIALS**	**9**
Polymer – Types of polymerization – Preparation, properties, uses of Nylon(6,6), Poly Vinyl Chloride (PVC). Plastics – Types - Rubbers – SBR – Nanomaterial – Synthesis and its applications of Nanomaterial. Abrasives – Classification, Properties- Manufacture of SiC.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	S.S Dara and S.S. Umare ‘Engineering Chemistry’, S.Chand Publication, 2013
2	Jain & Jain ‘Engineering chemistry’ Dhanpat Rai Publishing Company, 2012
3	Shikha Agarwal , Engineering Chemistry, Cambridge University Press, 2015 edition
4	Manas Senapati, Advanced Engineering Chemistry, Firewall Media, 2006

OTHER REFERENCES	
1	https://www.freebookcentre.net/chemistry-books-download
2	https://nptel.ac.in/course.html
3	https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm
4	https://edu.rsc.org/resources/collections/analytical-chemistry-introductions

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20EN1T3	COMMUNICATIVE ENGLISH I	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Apply the rules of grammar to parts of speech, tenses, voices, degrees of comparison, compound nouns and articles	K3	1
CO2	Interpret graphical representation for composing passages and paraphrase technical texts	K4	2
CO3	Analyze different spoken discourses like, short talks, comprehend different dialogues, practice conversation for speaking skills	K4	3
CO4	Examine grammatical errors using correct vocabulary and generating ideas logically on a topic	K5	4
CO5	Develop language and vocabulary effectively for our real-life contexts	K6	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			2	3		3		
CO2						2			2	3		2		
CO3						3			2	2		1		
CO4						2			2	3		2	2	
CO5						3			1	3		2		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Grammar Quizzes
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**GRAMMAR AND VOCABULARY**	**9 + 3**
Word formation with Prefix and Suffix – Parts of Speech – Tenses - Voices – Degrees of comparison – Compound Nouns - Basic Vocabulary – Homonyms and Homophones – Articles- Idioms – Phrasal verbs – Subject-Verb Agreement.		
Topic - 2	**LISTENING**	**9 + 3**
Introduction to Listening – Listening Comprehension – Extensive and Intensive listening – Pronunciation – Intonation – Stress – Pause – Rhythm – Short and Long conversations.		
Topic - 3	**SPEAKING**	**9 + 3**
An introduction to Speech sounds – Verbal and Non-verbal Communication – Describing places, people, Technical Processes – Telephonic skills – Different types of Interview – Group Discussions – Debates.		
Topic - 4	**READING**	**9 + 3**
Skimming and Scanning – Reading Newspaper articles – Reading different types of texts – Speed Reading – Reading to identify Stylistic Features (Syntax, Lexis, Sentence Structures) – Comprehension.		
Topic - 5	**WRITING**	**9 + 3**
Introduction to aspects of technical writing – Letter writing – Formal Letters – Job application letter with CV and Resume - Official letters- Business letters- Circular letters- Employment letters – Punctuation – Writing reviews on books and movies – recommendations – Creative writing – email writing.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Board of Editors, Using English, Orient Black Swan, 2015.
2	Practical English Usage, Michael Swan, OUP 1995.
3	Communicative English, J.Anbazhagan Vijay, Global Publishers – Chennai 2018.
4	Effective Communication, Adair, John. London: Pan Macmillan Ltd., 2003.
5	Brilliant Communication Skills, Hasson, Gill. Great Britain: Pearson Education, 2012.

OTHER REFERENCES	
1	http://networketiquette.net/
2	http://www.englishdaily626.com/c-errors.php
3	http://www.dailywritingtips.com/

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20PH1T4	ENGINEERING PHYSICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify the extensive properties of solid materials to use in current field.	K2	1
CO2	Identify and develop the knowledge of atoms in solid crystals to apply recent engineering fields.	K3	2
CO3	Describe the fundamentals of lasers, laser systems, their characteristics and diversified applications including industry and medicine.	K4	3
CO4	Demonstrate a mastery of the core knowledge base in thermal physics.	K3	4
CO5	Evaluate the nano materials and its fabrication with behaviour by using advanced technical methods.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			1	3	2	3	3	3	3	3		
CO2	2	1				3	2	3	3	3	3	3		
CO3	3	2	2			3	2	3	3	3	3	3		
CO4	2					3	2	3	3	3	3	3		
CO5	3	2				3	2	3	3	3	3	3	3	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini Project
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**PROPERTIES OF MATTER**	**9**
Hooke's Law - Stress-Strain Diagram - Elastic moduli - Poisson's Ratio - Expression for bending moment of beam and depression of Cantilever - Expression for Young's modulus by Non-uniform bending and its experimental determination.		
Topic - 2	**CRYSTAL PHYSICS**	**9**
Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - growth of single crystals: solution and melt growth techniques.		
Topic - 3	**LASER TECHNOLOGY**	**9**
Introduction – principle of spontaneous emission and stimulated emission, population inversion, pumping mechanism. Laser characteristics - Einstein's A and B coefficients derivation. Two, three and four level systems. Threshold gain coefficient- Component of laser. Solid state laser (Nd:YAG). Diode lasers – Application of laser in science and engineering.		
Topic - 4	**THERMAL PHYSICS**	**9**
Transfer of heat energy - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Lee's disc method - theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.		
Topic - 5	**NANO TECHNOLOGY**	**9**
Introduction to Nano materials- Moore's law- Properties of Nano materials- Quantum well, wire and dot- Fullerene, Carbon Nanotubes- Application of Nanotechnology in industry.		

THEORY	**45**		**TUTORIAL**	**00**		**PRACTICAL**	**00**		**TOTAL**	**45**

BOOK REFERENCES	
1	Serway and Jewett, "Physics for Scientists and Engineers with Modern Physics", 6th Edition, Thomson Brooks Cole, 2008
2	Charles P. Poole and Frank J.Owens, "Introduction to Nanotechnology", 2nd Edition, Wiley, Delhi, 2008.
3	S.O. Pillai, "Solid state Physics", 6th Edition, New Age International Publishers, 2008.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/115/105/115105099/
2	https://nptel.ac.in/courses/115/106/115106061/
3	https://www.youtube.com/watch?v=_JOchLyNO_w
4	https://www.journals.elsevier.com › Journals
5	https://nptel.ac.in/courses/118/104/118104008/

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20CS1T5	FUNDAMENTALS OF COMPUTING AND PROGRAMMING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand the word processing tools with text documents	K2	1
CO2	Organize spreadsheet manipulation tools with sheets also describe the presentation and sliding with layouts	K3	2
CO3	Develop C program using managing input and output operations.	K6	3
CO4	Design array and string implementation in C	K6	4
CO5	Evaluate the function and structure concepts in C	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				3		3	1	3	3		3		
CO2	3		2		2			1	3	3		3		
CO3	3		2		3			1	3	3		3		
CO4	3							1	3	3		3		
CO5	3				2			1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO MS-WORD AND MS-EXCEL**	**9**
Introduction to word – Creating, editing, saving and printing text documents - Font and paragraph formatting - Simple character formatting -Inserting tables, smart art, page breaks -Using lists and styles- Working with images -Using Spelling and Grammar check -Understanding document properties Introduction to Spreadsheet basics - Creating, editing, saving and printing spreadsheets -Working with functions & formulas -Modifying worksheets with color & auto formats -Graphically representing data : Charts & Graphs - Data Menu, Subtotal, Filtering Data -Formatting worksheets -Securing & Protecting spreadsheets		
Topic - 2	**MS-POWERPOINT AND INTERNET**	**9**
Introduction to Powerpoint- Opening, viewing, creating, and printing slides -Applying auto layouts - Adding custom animation -Using slide transitions -Graphically representing data : Charts & Graphs - Creating Professional Slide for Presentation. Internet - Understanding how to search/Google -bookmarking and Going to a specific website -Copy and paste Internet content into your word file and emails -Understanding social media platforms such as Facebook & Many more -learn with best practices		
Topic - 3	**C PROGRAMMING BASICS**	**9**
Problem formulation – Problem Solving - Introduction to ‘ C’ programming –fundamentals – structure of a ‘C’ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.		
Topic - 4	**ARRAYS AND STRINGS**	**9**
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.		
Topic - 5	**FUNCTIONS, STRUCTURES AND UNIONS**	**9**
Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion - Structure – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Microsoft Office 2010 In Depth 1st Edition by Joe Habraken (Author) ,2010
2	Byron S Gottfried, “Programming with C”, Schaum’s Outlines, Second Edition, Tata McGraw-Hill,2006.
3	“Computer basics absolute beginners”9thEdition, Michale Miller,2019

OTHER REFERENCES	
1	https://youtu.be/ZXAPCy2c33o
2	https://courses.lumenlearning.com/wm-compapp/chapter/internet-and-powerpoint/
3	https://www.geeksforgeeks.org/c-language-set-1-introduction/
4	https://www.studytonight.com/c/string-and-character-array.php
5	https://www.geeksforgeeks.org/difference-structure-union-c/

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20GE1L1	PHYSICS & CHEMISTRY LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Physics & Chemistry laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1	2	
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Lab Record
	2	End Semester Examinations
INDIRECT	1	Course exit Survey

LIST OF EXPERIMENTS	
PHYSICS LABORATORY (Any Five Experiments)	
1	Torsional pendulum - determination of moment of inertia and rigidity modulus
2	Determination of young's modulus by non- uniform bending
3	(a) Determination of Wavelength, and particle size using Laser (b) Determination of acceptance angle in an optical fiber.
4	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
5	Air wedge – determination of thickness of a thin wire.
6	Determination of band gap of a semiconductor.
LIST OF EXPERIMENTS	
CHEMISTRY LABORATORY (Any Five Experiments)	
1	Determination of total, temporary and permanent hardness of water by EDTA method.
2	Estimate the dissolved oxygen content of the given water sample by Winkler's method.
3	Determine the chloride content of the given potassium chloride sample using standardized silver nitrate solution.
4	Determination of iron content of the given solution using a potentiometer
5	Determination of strength of acid using conductivity meter.
6	Using conductance measurements, determine the strength of acids in a mixture.

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	C. Ramesh Kumar & Y. Devakumari, "Physics Laboratory Manual", Al-Ameen Publications, 2020.
2	N. Jafarulla & C. Krishna Moorthy C "Chemistry Laboratory Manual", Al-Ameen Publications, 2020.

Semester	Programme	Course Code	Course Name	L	T	P	C
I	B.E. / B.Tech., Common to all	20CS1L2	COMPUTER PRACTICES LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Computer Practices Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1	2	
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Study Experiment a) Hardware specification and PC Assembly b) Getting connected to internet
2	Word processing a) Documentation creation, Text Manipulation with scientific notation b) Table Creation, Table Formatting and Conversion c) Mail Merge d) Flow Chart Preparation.
3	Spread Sheet a) Charts- Bar Chart, Pie Chart, Line Chart, X,Y-Chart b) Object Inclusion, Picture and Graphics c) Protecting the Document
4	Power Point Presentation and Access a) Creation of Presentation b) Generation of Report Using Access
5	C Programming a) Simple C Program with Data Types, Expressions and Comment Lines b) Programming with Conditional Statements c) Programming with Branching and Looping Statements d) Programming with Arrays and String e) Programming with Function and Structure

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	Computer Practices Laboratory manual, Al - Ameen Publications 2020
2	Microsoft Office 2008 In Depth 2nd Edition by Joe (Author), 2010

OTHER REFERENCES	
1	https://youtu.be/ftyWKjT20S4
2	https://nptel.ac.in/about_nptel.html
3	https://nptel.ac.in/courses/106/106/106106092/

SEMESTER II

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20MA2T1	Engineering Mathematics II	BS	40	60	3	1	0	4
2	20EN2T3	Communicative English II	HS	40	60	3	0	0	3
3	20CM2T4	Basic Civil and Mechanical Engineering	ES	40	60	3	0	0	3
4	20EE2T5	Circuit Theory	ES	40	60	3	1	0	4
LABORATORY COURSES									
5	20EM2L1	Engineering Practices Laboratory	ES	60	40	0	0	3	1.5
6	20ME2L2	Engineering Drawing Practice	ES	60	40	0	0	2	1
7	20EE2L3	Electrical Circuits Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
8	20CY2T2	Environmental Sciences	MC	100	0	3	0	0	0
Total						**15**	**2**	**8**	**18**

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to all	20MA2T1	ENGINEERING MATHEMATICS II	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Solve higher order differential equations and apply them to certain physical situations	K3	1
CO2	Apply various integral theorems for solving engineering problems involving cubes and parallelepipeds.	K3	2
CO3	Solve linear differential equations using Laplace transform techniques.	K3	3
CO4	Construct analytic function of complex variables and transform functions from z- plane to w- plane and vice-versa using conformal mappings. .	K3	4
CO5	Apply the techniques of complex integration to evaluate real and complex integrals over suitable closed paths or contours	K3	5

PRE-REQUISITE	Engineering Mathematics I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	3	3		3		
CO2	3	3		3				1	3	3		3		
CO3	3	3		3				1	3	3		3		
CO4	3	3		3				1	3	3		3		
CO5	3	3		3				1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**SECOND AND HIGHER ORDER ORDINARY DIFFERENTIAL EQUATIONS**	**9 + 3**
Second order linear differential equations with constant co-efficient – Cauchy equation – Euler equation– Cauchy –Legendre equation– Method of variation of parameters– Solution of simultaneous equation with constant coefficients		
Topic - 2	**VECTOR CALCULUS**	**9 + 3**
Introduction– gradient–directional derivative–divergence and curl–angel between the surfaces–solenoidal and irrotational vector fields–Green's theorem in a plane–Gauss divergence theorem–Stoke's theorem (without proof).		
Topic - 3	**LAPLACE TRANSFORMS**	**9 + 3**
Condition for existence– Transform of elementary function– Basic properties (without proof)– Derivatives and integrals of transforms– Transform of unit step function– Initial and final value theorem (statement only)– Transform of a periodic function– Inverse Laplace transform– Partial fractions method– convolution theorem (statement only) – Solution of linear ODE of second order with constant co-efficients.		
Topic - 4	**ANALYTIC FUNCTIONS**	**9 + 3**
Analytic function – Necessary and sufficient condition – Cauchy Rieman equation (without proof) – Properties of analytic function (statement only) – Harmonic function – Constructions of analytic function – Bilinear transformation – Conformal mappings $w = z + a$, $w = az$, $w = \frac{1}{z}$		
Topic - 5	**COMPLEX INTEGRATION**	**9 + 3**
Cauchy's integral theorem (without proof) –Cauchy integral formula –Taylor's and Laurent's series (without proof) – Singularities –Cauchy's residue theorem – Contour Integration: Circular and Semi circular contour (excluding polar on real axis).		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Grewal B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publications New Delhi, 2011
2	Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics",4th Edition, Narosa Publishing House, New Delhi, Reprint 2014.
3	Ramana B.V., "Higher Engineering Mathematics",Tata Mcgraw Hill Publishing Company, New Delhi, 2011.
4	Kreyszig E., "Advanced Engineering Mathematics", 10th Edition, John Wiley Sons, 2010..

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to all (Except Civil)	20EN2T3	COMMUNICATIVE ENGLISH II	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Initiate and sustain a discussion maintaining appropriate group behaviour, for a given communication scenario.	K5	1
CO2	Speak effectively and express opinions clearly for a given communicative context.	K3	2
CO3	Read different technical and professional texts, infer implied meanings and critically analyse evaluate the ideas presented.	K4	3
CO4	Use functional grammar for improving employment oriented skills. Use appropriate vocabulary and grammatical forms to complete a passage.	K3	4
CO5	Comprehend different spoken experts critically and infer spoken and implied meaning.	K6	5

PRE-REQUISITE	Communicative English I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
	Programme Learning Outcomes (POs)												PSOs	
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		3		
CO3						3			3	3		3		
CO4						2			3	3		3	2	
CO5						3			3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Grammar Quizzes
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1		**9 + 3**
Listening: Listening practice – different types of conversation and answering questions – gap exercises **Speaking:** Introduce one self and others – Opening a conversation **Reading:** Reading a novel, itinerary, Magazine and News papers **Writing:** Formal Letters – Job application letter with CV and Resume **Grammar:** Kinds of Sentences – Sentence Pattern (Parts/ Patterns/ Column Analysis).		
Topic - 2		**9 + 3**
Listening: Short texts – Listening to situation based dialogues – Listening to talks on engineering - **Speaking:** Sharing information of a personal kind – greeting – taking leave– **Reading:** Comprehension Questions (multiple choice questions and short questions) – short narrative stories - **Writing:** Paragraph Writing – Filling Forms – Basics of Business writing – Placing Orders, Letter of Complaint - **Grammar:** Asking Questions in the Simple Present – Using reference words, Yes/No type questions.		
Topic - 3		**9 + 3**
Listening: Listening to academic lectures and live speech – advertisements and announcements – **Speaking:** Giving and Justifying opinions – apologizing – Introduction to Presentation – **Reading:** Reading Blogs – Website articles – Paragraphing – **Writing:** Tweets – Texting and SMS language – Use of Sequence Words - **Grammar:** Using Past Tense to make correct sentences – WH questions.		
Topic - 4		**9 + 3**
Listening: Listening to a telephone conversation – Documentaries and making notes – **Speaking:** Giving Instructions – Role play – Asking about routine actions – **Reading:** Reading detailed comprehension - **Writing:** Writing Reports – Preparing Checklist - **Grammar:** Make sentences from Future Tense and their Usages (Compare the sentences with Degrees of Comparison).		
Topic - 5		**9 + 3**
Listening: Viewing a model group discussion and reviewing the performance of each participant – Casual Conversation - **Speaking:** Participating in a Group Discussion – Speeches for special Occasions– **Reading:** Making notes from long passage or any form of written materials – providing a suitable title – **Writing:** Brainstorming – Writing short essays - **Grammar:** Numerical Adjectives – Misspelled Words – Direct and Indirect speech – Spot the Errors.		

THEORY	**45**		**TUTORIAL**		**15**	**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Dr. Elango et al. "Resonance: English for Engineers and Technologist", Foundation, Chennai, 2013.
2	Anderson, Paul V., "Technical Communication: A Reader-Centered Approach", Cengage.
3	Sharma, Sangeetha and Binod Mishra, "Communication Skills for Engineers and Scientists", PHI Learning , New Delhi, 2009.
4	"Exercises in Spoken English Part I –III". EFLU, Hyderabad, OUP, 2014.
5	Raman, Meenakshi, & Sangeeta Sharma. Technical Communication: Principles and Practice, Second Edition. New Delhi: Oxford University Press, 2011.
OTHER REFERENCES	
1	http://www.owlnet.rice.edu/
2	http://zzyx.ucsc.edu/archer/intro.html
3	http://www.indiabix.com/group-discussion/topics-with-answers/

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. EEE & ECE	20EE2T5	CIRCUIT THEORY	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate the basic concepts related to electrical circuits / Networks.	K2	1
CO2	Apply the Laws / Rules of circuits in electrical networks.	K3	2
CO3	Compare electrical networks to rate its performance.	K4	3
CO4	Analyze electrical networks to infer their limitations.	K4	4
CO5	Evaluate a network based on a set of criteria / application and recommend a suitable electrical system.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	2	2		1	3	3		3		2
CO2	3	3	3	2	2			1	3	3		3		2
CO3	3	3	3		2			1	3	3		3		
CO4	3	3	3	2	2			1	3	3		3		
CO5	3	3	3	2	2			1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**BASIC CIRCUITS ANALYSIS**	**12**
Fundamentals of Electrical Engineering - Ohm's Law –Kirchoff's Law – DC & AC Circuits –Resistors in series and parallel circuits – Mesh current and node voltage analysis for DC & AC Circuits.		
Topic - 2	**NETWORK REDUCTION AND THEOREMS**	**12**
Network reduction: voltage and current division – source transformation – Star delta conversion – Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem.		
Topic - 3	**TRANSIENT RESPONSE ANALYSIS**	**12**
Basic R, L and C elements -Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input– Two port Networks– Z & Y parameters.		
Topic - 4	**RESONANCE AND COUPLED CIRCUITS**	**12**
Series and parallel resonance – Frequency response – Quality factor and Bandwidth – Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.		
Topic - 5	**THREE PHASE CIRCUITS**	**12**
A.C. circuits – Power, Power Factor and Energy– Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced& un-balanced – power measurement in three phase circuits.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Ramesh Babu, " Circuit Analysis", Scitech Publications, Bangalore, 6Th Edition, 2017.
2	Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.
3	Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
4	Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
5	Rao, " Electrical Circuit Analysis", Cengage Publications, New Delhi, 2013.

OTHER REFERENCES	
1	https://youtu.be/5hFC9ugTGLs
2	https://youtu.be/zs4MnEx7wTQ
3	https://youtu.be/shJAV59NS6k
4	https://youtu.be/zXMQeIpUzhQ
5	https://youtu.be/mc979OhitAg

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. EEE	20CM2T4	BASIC CIVIL AND MECHANICAL ENGINEERING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyse the role of civil engineering in society and to relate the various disciplines of civil engineering	K4	1
CO2	Understand the concept of irrigation engineering	K2	2
CO3	Understand the concept of transportation engineering	K2	3
CO4	Identify the subsystem requirements in Power plant and pump.	K3	4
CO5	Explain the working principles of IC engines and boilers.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					3	2						2	
CO2	3					2	2	2					2	
CO3	3					2	2	2					2	
CO4	3	2					2						2	
CO5	3	2					2							

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT										
Topic - 1	**BUILDING MATERIALS**									**9**
Introduction to Civil Engineering – Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.										
Topic - 2	**IRRIGATION ENGINEERING**									**9**
Need and classification of irrigation –historical development and merits and demerits of irrigation-purpose and functions of storage structures – Dams– parts of the dam and their functions.										
Topic - 3	**TRANSPORTATION ENGINEERING**									**9**
Mode of Transportation - Highways - Classification of Roads - Railways – Zone and Headquarters - Permanent way and its requirement - Components of Permanent way.										
Topic - 4	**POWER PLANT ENGINEERING**									**9**
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.										
Topic - 5	**IC ENGINES**									**9**
Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.										
THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Ramesh Babu, “Basic Civil and Mechanical Engineering”, VRB Publications, Chennai, 2016.
2	Seetharaman S., “Basic Civil Engineering”, Anuradha Agencies, 2005.
3	Transportation Engineering, L.R. Kadiyali, (ISBN: 978-93-82609-85-8), Khanna Publishing

OTHER REFERENCES	
1	https://nptel.ac.in/courses/105/106/105106201/
2	https://nptel.ac.in/courses/105/102/105102088/
3	https://nptel.ac.in/courses/105/105/105105107/

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., (Common to all)	20EM2L1	ENGINEERING PRACTICES LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Engineering Practices Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	**GROUP A (CIVIL & MECHANICAL)** **I. CIVIL ENGINEERING PRACTICE** **Buildings:** a) Study of plumbing and carpentry components of residential and industrial buildings safety aspects. **Plumbing Works:** a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings. b) Preparation of plumbing line sketches for water supply and sewage works. c) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components. d) Demonstration of plumbing requirements of high-rise buildings. **Carpentry using manual and power tools:** a) Study of the joints in roofs, doors, windows and furniture. b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.
2	**II. MECHANICAL ENGINEERING PRACTICE** **Welding:** a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding. b) Gas welding practice **Basic Machining:** a) Simple Turning and Taper turning b) Drilling Practice **Sheet Metal Work:** a) Forming & Bending b) Model making – Trays and funnels. c) Different type of joints. **Machine Study practice:** a) Study of centrifugal pump b) Study of air conditioner
3	**GROUP B (ELECTRICAL AND ELECTRONICS)** **III. ELECTRICAL ENGINEERING PRACTICE** 1. Testing and connection of Fluorescent lamp wiring. 2. Stair case wiring. 3. Measurement of energy using single phase energy meter. 4. Assembly of Residential house wiring. 5. Measurement of earth resistance of an electrical equipment using meggar.
4	**IV. ELECTRONICS ENGINEERING PRACTICE** 1. Resistor colour coding & Measurement of AC signal parameters (Peak-Peak, RMS period, Frequency) using CRO. 2. Study of logic gates AND, OR, EX-OR and NOT. 3. Measurement of ripple factor of HWR and FWR. 4. Soldering practice for Components, Devices and Circuits. 5. Generation of Clock Signal.

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	"Engineering Practices Laboratory", Al-Ameen Publications, 2020.

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. EEE	20EE2L3	ELECTRICAL CIRCUITS LABORATORY	0	0	2	1

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Electrical Circuits Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
Cos	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Simulation and experimental verification of electrical circuit problems using Kirchhoff's voltage and current laws.
2	Simulation and experimental verification of electrical circuit problems using Thevenin's theorem.
3	Simulation and experimental verification of electrical circuit problems using Norton's theorem.
4	Simulation and experimental verification of electrical circuit problems using Superposition theorem.
5	Simulation and experimental verification of Maximum Power transfer Theorem.
6	Simulation and Experimental validation of R-C electric circuit transients.
7	Simulation and Experimental validation of frequency response of RLC electric circuit.
8	Design and Simulation of series resonance circuit.
9	Design and Simulation of parallel resonant circuits.
10	Simulation of three phase balanced and unbalanced star, delta networks circuits.

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	Electrical Circuits Laboratory Manual, Al-Ameen Publications, 2020.

OTHER REFERENCES	
1	https://youtu.be/56flDi-AwY4
2	https://youtu.be/32K7YjawjYI
3	https://youtu.be/J6BAUYE6mfs
4	https://youtu.be/SheW7HjDAUg
5	https://youtu.be/FbvDMetY

Semester	Programme	Course Code	Course Name	L	T	P	C
II	B.E. / B.Tech., Common to all	20CY2T2	ENVIRONMENTAL SCIENCES	3	0	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate the importance of interdisciplinary nature of environment and health risk assessment.	K2	1
CO2	Discuss the ecosystem and their importance in the environment and conservation of biodiversity.	K2	2
CO3	Design the rain water harvesting system in their living area.	K6	3
CO4	Analyze the impact of pollution and hazardous waste in a global and societal context.	K4	4
CO5	Understand contemporary issues that result in environmental degradation that would attempt to provide solutions to overcome the problems.	K3	5

PRE-REQUISITE	Engineering Chemistry

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1					2	1	3	3		3		
CO2	2	2					1	1	3	3		3		
CO3	3	1	1					1	3	3		3		
CO4	3	2	1					1	3	3		3		
CO5	3	1					2	1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignment
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**ENVIRONMENT AND ECOSYSTEMS**	**9**
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs – Introduction, types, characteristic features, structure and function of the forest ecosystem aquatic ecosystems (ponds, river and marine). Activity: Study of the ecosystem structure in Cauvery River.		
Topic - 2	**BIODIVERSITY**	**9**
Introduction to biodiversity definition: genetic, species and ecosystem diversity –value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity– endangered and endemic species of India – In-situ and ex- situ conservation of biodiversity. Activity: Study of common plants, insects, birds.		
Topic - 3	**ENVIRONMENTAL POLLUTION**	**9**
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Thermal pollution (d) Noise pollution – solid waste management: causes, effects and control measures of municipal solid wastes – Hazardous and biomedical waste management -pollution case studies. Activity: Study of air and water pollution in industry.		
Topic - 4	**NATURAL RESOURCES**	**9**
Forest resources: over-exploitation, deforestation, – Water resources: Rain water harvesting-watershed management - utilization of surface and ground water, conflicts over water, dams-benefits and problems Food resources: effects of modern agriculture, fertilizer-pesticide problems - Principles of Green Chemistry- Case studies Activity: Tree plantation and maintenance within the campus.		
Topic - 5	**SUSTAINABILITY AND POPULATION**	**9**
From unsustainable to sustainable development – environmental Impact Assessment (EIA) – environmental ethics: Issues and possible solutions – climate change, acid rain, ozone layer depletion, and case studies – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act - environment and human health – value education – HIV / AIDS – women and child welfare. Activity: Small group meetings about environment and human health in local area peoples and making poster and short films about HIV / AIDS – women and child welfare.		

THEORY	**45**	**TUTORIAL**	**00**	**PRACTICAL**	**00**	**TOTAL**	**45**

BOOK REFERENCES	
1	Erach Bharucha,"Textbook of Environmental Studies", Universities Press(I) Pvt, Ltd, Hydrabad,2015.
2	Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
3	Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill Education, 2014.
OTHER REFERENCES	
1	https://www.onlinebiologynotes.com/food-chain-food-web-and-ecological-pyramids/
2	https://vikaspedia.in/energy/environment/biodiversity-1/conservation-of-biodiversity
3	https://www.sciencedirect.com/topics/earth-and-planetary-sciences/ozone-layer-depletion

SEMESTER III

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE3T1	Electrical Machines – I	PC	40	60	3	0	0	3
2	20EE3T2	Electromagnetic Theory	PC	40	60	3	1	0	4
3	20MA3T3	Transforms and Partial Differential Equations	BS	40	60	3	1	0	4
4	20EE3T4	Electron Devices and Circuits	ES	40	60	3	0	0	3
5	20EC3T5	Digital Logic Circuits	PC	40	60	3	0	0	3
LABORATORY COURSES									
6	20ENCL1	Communication Skills Laboratory	HS	60	40	0	0	2	1
7	20EE3L2	Electrical Machines Laboratory – I	PC	60	40	0	0	3	1.5
8	20EE3L3	Devices and Circuits Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20MCCT1	Constitution of India	MC	100	0	3	0	0	0
Total						**18**	**2**	**8**	**21**

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. EEE	20EE3T1	ELECTRICAL MACHINES - I	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyze the magnetic-circuits and understand the concepts of electromechanical energy conversion.	K4	1
CO2	Develop the knowledge in working principles of DC Generator.	K3	2
CO3	Develop the knowledge in working principles of DC Motor.	K3	3
CO4	Elaborate the knowledge in constructional details of transformers.	K6	4
CO5	Evaluate the DC Machines and transformers by conducting various tests.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3							1	3	3		3		
CO2	2	2	3			2		1	3	3		3		
CO3	3	2	3		2	2		1	3	3		3	2	
CO4	2				3			1	3	3		3		
CO5	3		3	3				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**MAGNETIC CIRCUITS AND CONCEPT OF ROTATING MACHINES**	**9**
Magnetic Circuits –Laws governing magnetic circuits – Statically and Dynamically induced EMF- Hysteresis and Eddy current losses- Principle of electromechanical energy conversion- Single and Multiple Excited systems –MMF of Distributed Winding.		
Topic - 2	**DC GENERATORS**	**9**
Construction & principle of operation- EMF equation- Types of DC Generators- Characteristics of DC Generator- Armature Reaction- Commutation- Losses and Efficiency –Applications of DC Generator.		
Topic - 3	**DC MOTORS**	**9**
Construction & principle of operation- Back EMF – Torque Equation - Types of DC Motors- Characteristics of DC Motor – Starting and Speed control of DC Motor- Losses and Efficiency –Selection of DC motor -Applications of DC Motor.		
Topic - 4	**TRANSFORMERS**	**9**
Single Phase transformer: Construction & principle of operation- EMF Equation- Transformer under No load and On load- Equivalent circuit- Phasor diagram- Voltage regulation- Losses and Efficiency -All Day Efficiency- Auto transformer- Parallel operation -Three Phase transformer Connections- Phase conversion- Tap changing Transformers.		
Topic - 5	**TESTING OF DC MACHINES AND TRANSFORMERS**	**9**
DC Motors: Load test- Brake Test -Retardation Test – Swinburne's test and Hopkinson's test. Transformers: Load test- Open circuit and short test- Sumpner's test- Separation of no load losses- Polarity test.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Jacek F. Gieras, "Electrical Machines: Fundamentals of Electromechanical Energy Conversion", CRC press,2016
2	Bhattacharya," Electrical Machines", Tata McGraw Hill, Pune, 2013.
3	AbhijithChakrabarti, SudiptaDebnath, "Electrical Machines", McGraw Hill Education, NewDelhi 2015.
4	Deshpande M. V., "Electrical Machines", Prentice Hall India, New Delhi, 2011.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=ikqXDWrwf4c

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. EEE	20EE3T2	ELECTROMAGNETIC THEORY	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Relate the applications of vector calculus with electromagnetic theory concepts.	K2	1
CO2	Analyze the behaviour of electrostatic fields for different configurations.	K4	2
CO3	Analyze the behaviour of magnetostatic fields for different configurations.	K4	3
CO4	Develop Maxwell's equations using various laws.	K3	4
CO5	Examine electromagnetic wave propagation in different mediums.	K4	5

PRE-REQUISITE	CIRCUIT THEORY

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	3	3		3		
CO2	2		2	3	2			1	3	3		3		
CO3	3			3	2			1	3	3		3		2
CO4	3			2				1	3	3		3		
CO5	2	2	3	2				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**VECTOR CALCULUS AND THEOREMS**	**9 + 3**
Scalar and Vector - Coordinate Systems –Gradient, Divergence and Curl –Divergence theorem – Stoke's Theorem–Gauss's law.		
Topic - 2	**ELECTRO STATIC FIELD**	**9 + 3**
Coulomb's Law, Electric field intensity: Line charge and circular disc - Electric potential – Electric Dipole – Poisson's and Laplace's equations -Boundary conditions, Capacitance: Two dielectric media, Co-axial cable, Transmission Line.		
Topic - 3	**MAGNETO STATIC FIELD**	**9 + 3**
Lorentz force – Biot–Savart's Law - Ampere's Circuit Law, Magnetic field intensity (H) : straight conductors, circular loop, Magnetic flux density (B) – Properties of magnetic materials –Boundary conditions –Inductance : Toroid & Co-axial cable.		
Topic - 4	**ELECTRODYNAMIC FIELDS**	**9 + 3**
Faraday's law – Transformer and motional EMF –Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory.		
Topic - 5	**ELECTROMAGNETIC WAVES**	**9 + 3**
Electromagnetic wave equations – Waves in lossy and lossless dielectrics - Poynting Theorem and vector.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Sandeepwali, "Electromagnetic Theory", Texmax Publications, Chennai ,2015.
2	EdwareCJordan, "Electromagnetic waves & Radiation Systems", Prentice hall of india, Chennai, 2018.
3	Kraus John. D and Fleishch, Daniel., —Electromagnetics, 5th Edition, McGraw Hill, New York, 2010.
4	Edminister and Joseph A., —Theory and Problems of Electromagnetics, Revised 2nd Edition, Tata McGraw Hill Publishing Company, New Delhi, 2013.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=bwreHReBH2A
2	https://nptel.ac.in/courses/108/104/108104087/

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E., EEE, ECE & MECH	20MA3T3	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Solve partial differential equations and apply them to certain physical situations	K3	1
CO2	Choose the appropriate methods related to Fourier series to solve the problems based on periodic and non periodic functions.	K6	2
CO3	Classify the PDE and use Fourier series techniques to find the solutions of one dimensional wave and heat equations.	K3	3
CO4	Analyse the situation and select an appropriate techniques for solving problems based on Fourier transforms.	K4	4
CO5	Evaluate Z-transform and estimate inverse Z-transform of certain functions and use it to solve difference equations	K5	5

PRE-REQUISITE	Engineering Mathematics I & Engineering Mathematics II

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	2	3		3		
CO2	3	3		3				1	2	3		3		
CO3	3	3		3				1	2	3		3		
CO4	3	3		3				1	2	3		3		
CO5	3	3		3				1	2	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments and Tutorials
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**PARTIAL DIFFERENTIAL EQUATIONS**	**9 + 3**
Formation of partial differential equations- Solutions of standard types of first order partial differential equations- Lagrange's linear equation- Linear partial differential equations of second and higher order with constant coefficients of homogeneous type.		
Topic - 2	**FOURIER SERIES**	**9 + 3**
Dirichlet's conditions- General Fourier series- Odd and even functions- Half range sine series- Half range cosine series- Parseval's identity- Harmonic analysis.		
Topic - 3	**APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS**	**9 + 3**
Classification of PDE- Method of separation of variables- Fourier series solutions of one dimensional wave equation- One dimensional equation of heat conduction- Steady state solution of two dimensional equation of heat conduction		
Topic - 4	**FOURIER TRANSFORMS**	**9 + 3**
Statement of Fourier integral theorem- Fourier transform pair- Fourier sine and cosine transforms- Properties (statement only)- Transforms of simple functions- Convolution theorem (without proof)- Parseval's identity.		
Topic - 5	**Z TRANSFORMS AND DIFFERENCE EQUATIONS**	**9 + 3**
Z-transforms- Elementary properties (statement only)- Inverse Z-transform (using partial fractions and residues)- Initial and final value theorems- Convolution theorem (without proof)- Formation of difference equations-Solution of difference equations using Z-transform.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Jain .R.K And Iyengar S.R.K,"Advanced Engineering Mathematics",3rd Edition, Narosa Publishing House, New Delhi , Reprint 2009
2	Ramana B.V., "Higher Engineering Mathematics",Tata Mcgraw Hill Publishing Company, New Delhi, 2008
3	Kreyszig.E.,"Advanced engineering mathematics', 9th Edition , John Wiley Sons , 2012
4	Glyn James., "Advanecd Modern Engineering Mathematics", Pearson Education Limited, 2007

OTHER REFERENCES	
1	https://byjus.com/maths/differential-equations-applications/
2	https://www.analyzemath.com/calculus/Differential_Equations/applications.html
3	https://math.stackexchange.com/questions/579453/real-world-application-of-fourier-series
4	https://www.slideshare.net/zakilivebuzz/math-presentation-by-syed-ahmed-zaki
5	https://cadcammodelling.wordpress.com/2011/04/14/fourier-transform-and-its-applications/

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. EEE	20EE3T4	ELECTRONIC DEVICES AND CIRCUITS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Summarize the structure and working operation of basic electronic components.	K2	1
CO2	Analyze the characteristics of transistors and thyristors.	K4	2
CO3	Construct an amplifier circuit by adapting required components.	K3	3
CO4	Examine the differential amplifier under various modes.	K4	4
CO5	Conclude the design of feedback amplifiers and various oscillators.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2							1	3	3		3		
CO2	3	2	2					1	3	3		3		
CO3	3		3		3	2		1	3	3		3		2
CO4	3	2	2	2		2	3	1	3	3		3	2	
CO5	2	2	3	2				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Assignments
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**PN JUNCTION DEVICES**	**9**
PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier –LED- Zener diode characteristics and its applications.		
Topic - 2	**TRANSISTORS AND THYRISTORS**	**9**
BJT, JFET, MOSFET and IGBT- Structure, operation, and characteristics – Biasing- SCR and its characteristics.		
Topic - 3	**AMPLIFIERS**	**9**
BJT small signal model –CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model–CS and Source follower – Gain and frequency response.		
Topic - 4	**DIFFERENTIAL AMPLIFIER**	**9**
Differential amplifier – Common mode and Difference mode analysis – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers and its types.		
Topic - 5	**FEEDBACK AMPLIFIERS AND OSCILLATORS**	**9**
Voltage and current, series, Shunt feedbacks – Advantages of Negative feedback- Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Millman, Christos C Halkias, Satyabrata Jit, “Electron Devices and Circuits”, Tata McGraw Hill, 4th Edition ,2015.
2	Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Education,11th Edition, 2015
3	Thomas L. Floyd, “Electronic Devices”, 9th edition, Pearson Education, 2012
4	David A Bell, “Fundamentals of Electronic Devices and Circuits”, Fifth edition Oxford Press, 2009.
5	Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 6th Edition, Oxford University Press, 2010.
6	Mathur Kulshrestha and Chadha.,” Electron devices and Applications and Integrated circuits”, Umesh Publications 2005.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=qqQ8wO-lNmI
2	https://www.youtube.com/watch?v=usmdrcB_BFA
3	https://www.youtube.com/watch?v=Rx43l-QpeWQ
4	https://www.youtube.com/watch?v=zHjohO646FE
5	https://www.youtube.com/watch?v=sTwRQDVHNiw

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E., EEE	20EC3T5	DIGITAL LOGIC CIRCUITS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Outline the various number systems and simplify the logical expressions using Boolean functions.	K2	1
CO2	Construct the combinational logic circuits for development of application oriented circuits.	K3	2
CO3	Analyze state machine models to design sequential logic circuits.	K4	3
CO4	Design asynchronous sequential circuits and programmable logic devices.	K6	4
CO5	Conclude the logic families with digital IC terminology and memory organisation.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2			1	2	1	1	1	1	1	2	
CO2	3	2	2	2	2	1	2	1	1	1	1	1		
CO3	3	2	3		2	1	2	1	1	1	1	1	2	
CO4	2		3	2	2	1	2	1	1	1	1	1		
CO5	2		3	2	2	1	2	1	1	1	1	1		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Mini projects
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**BOOLEAN ALGERBA**	**9**
Laws of Boolean Algebra – Reducing Boolean Expressions – Boolean Functions and their representation- Boolean Expressions and Logic Diagrams- Converting AND/OR/INVERT Logic to NAND/NOR Logic. Minimization of Switching Functions: Two Variable K Map- Three Variable K Map - Four Variable K Map.		
Topic - 2	**COMBINATIONAL LOGIC DESIGN**	**9**
Design Procedure: Adders - Subtractors. Code converters: Binary to Gray - Gray to Binary - Parity bit generators/Checkers - Encoders: Octal to Binary Encoder - Decoders: 3 Line to 8 Line Decoder - Multiplexers – Demultiplexers.		
Topic - 3	**SYNCHRONOUS SEQUENTIAL CIRCUITS**	**9**
Flipflops: Triggering and Characteristics equations of Flipflops. Race around condition- Master slave J-K Flipflop - Synchronous Sequential Logic: Analysis of Clocked Sequential Circuits-State Reduction and Assignment – Design Procedure- Ring counter & Registers- Universal shift registers.		
Topic - 4	**ASYNCHRONOUS SEQUENTIAL LOGIC**	**9**
Analysis Procedure- Design Procedure – Reduction of State and Flow Tables- State Assignments – Hazards and Hazard Free Realizations: Static Hazards- Dynamic Hazards – Essential Hazards.		
Topic - 5	**LOGIC FAMILIES AND MEMORY**	**9**
Digital IC Specification Terminology: Propagation Delay - Noise Margin –Speed Power Product. Transistor Transistor Logic (TTL): Two-input TTL NAND Gate – Three-input TTL NAND Gate. Emitter Coupled Logic (ECL) -Complementary Metal Oxide Semiconductor (CMOS) Logic: Memory Organization and operation - Semiconductor RAMs: Static RAMs (SRAMs)- Dynamic RAMs(DRAMs). Read-Only Memory (ROM)-ROM organization – Types of ROMs- Programmable ROM (PROM)		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education,2015.
2	A.Anand Kumar, "Fundamentals of Digital Circuits", 3rd Edition, PHI Learning Pvt.Ltd, New Delhi, 2014.
3	Singh, "Digital Logic Circuits",New age Publications, New Delhi, 2014
4	Lee, "Digital Logic Design", Cengage Publications,New Delhi, 2012.
5	Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015

OTHER REFERENCES	
1	https://youtu.be/oNh6V91zdPY
2	https://youtu.be/CeD2L6KbtVM
3	https://youtu.be/zok4iU9YJiE
4	https://youtu.be/oNh6V91zdPY
5	https://youtu.be/Mt3AToASuFo

Semester	Programme	Course Code	Course Name	L	T	P	C
II – B.E. CIVIL, IV – B.E. CSE, III – B.E. EEE, III – B.E. ECE, III – B.E. MECH, IV – B.Tech., IT		20ENCL1	COMMUNICATION SKILLS LABORATORY	0	0	2	1

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Communication Skills Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1	2	
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Laboratory Practice Sessions
2	Conversation Practice Sessions (To be done as real life interactions)
3	Group Discussion Sessions
4	Interview Sessions
5	Presentation

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	Baul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005.
2	Arthur Brookes and Peter Grundy, 'Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003.
3	George, Livingston. 'Using Communication Skills Lab in Enhancing Speaking Skills of Engineering Students' 2018.
4	Nira Konar: English Language Laboratory: A Comprehensive Manual, PHI Learning, 2011.
5	Pandey, Dr.Meenu. 'A Practical Book of Communication Skills', NIRALI Prakashan advancement of knowledge, second edition 2018.

OTHER REFERENCES	
1	Khan Academy Videos on English Speaking and Writing
2	https://learningenglish.britishcouncil.org/en/listening
3	Adrian Duff et.al. (ed.): Cambridge Skills for Fluency
4	Mark Hancock: English Pronunciation in Use
5	Audio Cassettes/CD'S OUP 2004

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E.EEE	20EE3L2	ELECTRICAL MACHINES LABORATORY –I	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Electrical Machines Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1	3	
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Open Circuit and load Characteristics of DC Shunt Generator.
2	Load test on DC Compound Generator.(Cumulative and Differential)
3	Load test on DC Series Generator
4	Load test on DC Shunt Motor
5	Load test on DC Series Motor
6	Load test on DC Compound Motor
7	Speed Control on DC Shunt Motor
8	Load test on Single phase Transformer
9	Open Circuit and Short circuit tests on single phase transformers
10	Separation of no load losses in single phase transformers

THEORY	0		TUTORIAL	0		PRACTICAL	45		TOTAL	45

BOOK REFERENCES	
1	Electrical Machines Laboratory - I Manual, Al-Ameen Publications, 2020

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=nka7rgDlvfg
2	https://www.youtube.com/watch?v=cXtaewvrC54

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. / EEE	20EE3L3	DEVICES AND CIRCUITS LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Devices and Circuits Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1	3	
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Characteristics of PN junction and Zener diode.
2	Input, Output and Transfer characteristics of CE Configuration.
3	Input, Output and Transfer characteristics of CC Configuration.
4	Characteristics of LDR, Photo-diode and Phototransistor.
5	Transfer characteristics of JFET.
6	Transfer characteristics of MOSFET. (With depletion and enhancement mode)
7	Characteristics of LED with three different wavelengths.
8	Half wave rectifier, Full wave rectifier and Full wave Bridge rectifier with and without capacitive filter.
9	Series voltage Regulator.
10	Simulation experiments 1, 2,3,5,6 using PSPICE or Multisim.

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	"Electronic Devices and Circuits Laboratory Manual", Al-Ameen Publications 2020**.**
2	Millman, Christos C Halkias, Satyabrata Jit, "Electron Devices and Circuits", Tata McGraw Hill, 4th Edition ,2015.
3	Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Pearson Education,11th Edition, 2015
4	Thomas L. Floyd, "Electronic Devices", 9th edition, Pearson Education, 2012
5	David A Bell, "Fundamentals of Electronic Devices and Circuits", Fifth edition Oxford Press, 2009.
6	Adel .S. Sedra, Kenneth C. Smith, Micro Electronic circuits, 6th Edition, Oxford University Press, 2010.
7	Mathur Kulshrestha and Chadha.," Electron devices and Applications and Integrated circuits", Umesh Publications 2005.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=qqQ8wO-lNmI
2	https://www.youtube.com/watch?v=usmdrcB_BFA
3	https://www.youtube.com/watch?v=Rx43l-QpeWQ
4	https://www.youtube.com/watch?v=zHjohO646FE
5	https://www.youtube.com/watch?v=sTwRQDVHNiw

Semester	Programme	Course Code	Course Name	L	T	P	C
III	B.E. /B. Tech. Common to All	20MCCT1	CONSTITUTION OF INDIA	3	0	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand and abide the rules of the Indian constitution.	K2	1
CO2	Applying the functions of Central government.	K2	2
CO3	Applying the function of state government.	K2	3
CO4	Evaluate the various constitutional functions.	K2	4
CO5	Explain the different culture among the people of India	K2	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1							2	2	3	3		3		
CO2							2	2	3	3		3		
CO3							2	2	3	3		3		
CO4							2	2	3	3		3	2	
CO5							2	2	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Seminar
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Role of the Election Commission.		
Topic - 2	**STRUCTURE AND FUNCTION OF CENTRAL AND STATE GOVERNMENT**	**9**
Union Government – Structures of the Union Government and Functions – President – Vice President– Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.		
Topic - 3	**CONSTITUTION FUNCTIONS OF INDIA AND INDIAN SOCIETY**	**9**
Indian Federal System – Central – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India. Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections		
Topic - 4	**POLICIES AND ACTS – GENERAL**	**9**
Insurance and Bonding – Laws Governing Sale, Purchase and use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax , Excise and Custom duties and their Influence on Construction Cost – Legal Requirements for Planning – Property Law– Agency Law – Local Government Laws for Approval.		
Topic - 5	**POLICIES AND ACTS ON INFRASTRUCTURE DEVELOPMENT**	**9**
A Historical Review of the Government Policies on Infrastructure – Current Public Policies on Transportations – Power and telecom Sector – Plans for Infrastructure Development – Legal framework for Regulating Private Participation in Roads and Highways – Ports and Airport and Telecom		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Durga Das Basu, "Introduction to the Constitution of India", Prentice Hall of India, New Delhi,2018.
2	R.C.Agarwal, "Indian Political System", S.Chand and Company, New Delhi, 2004
3	Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi,2007
4	K.L.Sharma, "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi,2006.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/106/105/106105034/
2	https://www.youtube.com/watch?v=6XTYoZymbwE
3	https://www.youtube.com/watch?v=MP6VlAE_7WY

SEMESTER IV

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE4T1	Electrical Machines – II	PC	40	60	3	0	0	3
2	20EC4T2	Linear Integrated Circuits and Applications	PC	40	60	3	0	0	3
3	20EE4T3	Transmission and Distribution	PC	40	60	3	0	0	3
4	20MA4T4	Numerical Methods	BS	40	60	3	1	0	4
5	20EE4T5	Measurements and Instrumentation	PC	40	60	3	0	0	3
LABORATORY COURSES									
6	20EE4L1	Electrical Machines Laboratory – II	PC	60	40	0	0	3	1.5
7	20EC4L2	Linear Integrated Circuits Laboratory	PC	60	40	0	0	3	1.5
8	20EE4L3	Presentation Skills and Technical Seminar	EEC	100	--	0	0	2	1
MANDATORY COURSE									
9	20HSCT1	Universal Human Values 2: Understanding Harmony	HS	100	0	2	1	0	3
Total						**17**	**2**	**8**	**23**

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EE4T1	ELECTRICAL MACHINES - II	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Construct and analyze the working principle of Synchronous generators.	K3	1
CO2	Relate the performance of Synchronous motor with various parameters and applications.	K2	2
CO3	Analyze the performance of induction machines.	K4	3
CO4	Compare various starting and speed control methods of Induction machines.	K3	4
CO5	Evaluate the characteristics and applications of special machines.	K5	5

PRE-REQUISITE	ELECTRICAL MACHINES I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		3			1	3	3		3		
CO2	3	2						1	3	3		3		
CO3	3	2	2	2		2		1	3	3		3	3	
CO4	3		3		3			1	3	3		3		
CO5	3		2		2	2		1	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**ALTERNATOR**	**9**
Constructional Details – Types of Rotors – EMF Equation – Synchronous Reactance – Armature Reaction – Voltage Regulation – EMF, MMF and ZPF Methods – Synchronizing and Parallel Operation – Synchronizing Power - Power Output Equations - Change of Excitation and Mechanical Input.		
Topic - 2	**SYNCHRONOUS MOTOR**	**9**
Principle of Operation – Torque Equation – Starting Methods -Operation on Infinite Busbars – V and Inverted V Curves – Input and Output Power Equations – Power/Power Angle Relations – Hunting - Synchronous Condenser - Applications.		
Topic - 3	**THREE PHASE INDUCTION MOTOR**	**9**
Constructional Details – Types of Rotors – Squirrel Cage and Slip Ring – Principle of Operation – Slip – Torque Equations -Slip-Torque Characteristics – Losses and Efficiency – Load Test - No Load and Blocked Rotor Tests - Equivalent Circuit- Circle Diagram – Separation of No Load Losses – Crawling and Cogging – Double Cage Rotors – Induction Generator.		
Topic - 4	**STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR**	**9**
Need for Starters – Types of Starters – Stator Resistance, Rotor Resistance, Autotransformer, Star-Delta Starters and DOL Starters - Speed Control by Varying Voltage, Frequency, Poles and Rotor Resistance – Slip Power Recovery Scheme.		
Topic - 5	**SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES**	**9**
Constructional Details – Double Revolving Field Theory – Equivalent Circuit – Starting Methods – Applications – Reluctance Motor, Servo Motor, Stepper Motor and Universal Motor- Magnetic levitation system (concept of bullet train).		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Rajput R.K., ―Electrical Machines‖, 5th Edition, Laxmi Publications, New Delhi, 2008.
2	Kothari D.P., Nagrath I.J., ―Electric Machines‖, 4th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2010.
4	Fitzgerald A.E., Kingsley, Charles and Umans, Stephen D., ―Electric Machinery‖, 6th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2010.

OTHER REFERENCES	
1	https://www.btechguru.com/GATE--electrical-engineering--electrical-machines--synchronous-machines--reactances-of-salient-pole-synchronous-machines-ii-video-lecture--13295--33--213.html

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EC4T2	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic structure of operational amplifiers and its characteristics.	K2	1
CO2	Characterize and analyze the applications of op-amp.	K3	2
CO3	Design waveform generators and signal conditioning circuits.	K6	3
CO4	Analyze the concept of PLL, VCO and special function ICs with applications	K4	4
CO5	Examine the different types of A/D and D/A converters.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2											2		
CO2	3	2	2		2							2		2
CO3	3	2	3											
CO4	3	2	2				2		2			2		2
CO5	2	2												

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**OPERATIONAL AMPLIFIER**	**9**
Design Aspects of Monolithic Op-Amps - Ideal Characteristics –AC and DC Characteristics - Data sheet Specifications - Offset Voltages and Currents-Frequency Compensation Techniques- Measurement of Op-Amp Parameters.		
Topic - 2	**APPLICATIONS OF OP-AMP**	**9**
Inverting and Non-inverting Amplifiers- Integrator- Differentiator- Comparator- Logarithmic and antilogarithmic Amplifiers- Instrumentation Amplifiers- Op-Amp Phase Shift- Voltage to Current and Current to Voltage Converters.-Analog Multiplexers.		
Topic - 3	**SIGNAL CONDITIONING CIRCUITS**	**9**
Rectifiers- Peak Detection and- Wave form Generators- Sample and Hold Circuits-Multivibrators - Square Wave Generators-Schmitt Trigger- Clippers and Clampers.		
Topic - 4	**SPECIAL IC's**	**9**
555 Timers- 556 Function Generator ICs and their Applications- Three Terminal IC Regulators- IC 1496 (Balanced Modulator)- IC 565 PLL and its Applications- Function Generators- Voltage to Frequency and Frequency to Voltage Converters- IC 566 Voltage Controlled oscillator.		
Topic - 5	**DIGITAL TO ANALOG AND ANALOG TO DIGITAL CONVERTERS**	**9**
DAC techniques- Weighted resistor DAC- R-2R ladder DAC- inverted R-2R DAC- Different types of ADCs-parallel Comparator type ADC-Flash type ADC- Successive approximation ADC and dual type ADC- Single slope ADC- DAC and ADC specifications.		

THEORY	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**

BOOK REFERENCES	
1	Ramakant A.Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, Prentice Hall, 2015.
2	David A. Bell, "Operational Amplifiers and Linear ICs", 3rd edition, OUP, 2013.
3	Bakshi, " Linear Integrated Circuits and Applications", Technical Publications, Chennai, 2016.
4	Roy Choudhury and Shail Jain, "Linear Integrated Circuits", 4th Edition, New Age International Publishers, 2014.
5	Robert F. Coughlin, Frederick F. Driscoll, "Operational-Amplifiers and Linear Integrated Circuits", 6th Edition, Prentice Hall, 2001.
6	Sergio Franco, "Design with operational amplifier and analog integrated circuits", McGraw Hill, 1997.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=Y1KE8eAC9Bk
2	https://www.youtube.com/watch?v=kiiA6WTCQn0
3	https://www.youtube.com/watch?v=Uc2R7GND0Dk
4	https://www.youtube.com/watch?v=icxvLWEOzEA
5	https://www.youtube.com/watch?v=PzbdTfUatIY

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EE4T3	TRANSMISSION AND DISTRIBUTION	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic concepts related to power transmission and distributed systems.	K2	1
CO2	Apply the rules for transmission line, insulator and cables in power systems.	K3	2
CO3	Compare electrical power systems to rate their performance.	K4	3
CO4	Analyze electrical power systems to infer their limitations.	K4	4
CO5	Evaluate a situation based on a set of criteria / applications and recommend suitable electrical power systems.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2			1	3	3		3		2
CO2	3	2						1	3	3		3		
CO3	2		2					1	3	3		3		
CO4	3			2				1	3	3		3		
CO5	3	2	3					1	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic – 1	**INTRODUCTION TO POWER SYSTEM**	**9**
Structure of electric power system- Types of AC and DC distributors – EHVAC and HVDC transmission - Introduction to FACTS- Methods of voltage control.		
Topic – 2	**TRANSMISSION LINE PARAMETERS**	**9**
Parameters of single and three phase transmission lines with single and double circuits - Resistance, inductance and capacitance - stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition - self and mutual GMD skin and proximity effects - corona discharges.		
Topic – 3	**MODELLING AND PERFORMANCE OF TRANSMISSION LINES**	**9**
Classification of lines - short line, medium line and long line - equivalent circuits, phase diagram-transmission efficiency and voltage regulation- real and reactive power flow in Transmission lines -surge impedance loading - Ferranti effect.		
Topic – 4	**INSULATORS AND CABLES**	**9**
Insulators - Types, voltage distribution, improvement of string efficiency- testing of insulators. Underground cables - Types of cables, Capacitance of Single-core cable-Grading of cables - D.C cables.		
Topic – 5	**MECHANICAL DESIGN OF LINES AND GROUNDING**	**9**
Mechanical design of transmission line – sag and tension calculations for different weather conditions, Tower spotting, Types of towers, Substation Layout (AIS, GIS), Methods of grounding.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	D.P.Kothari , I.J. Nagarath, 'Power System Engineering', Tata McGraw-Hill Publishing Company limited, New Delhi, Second Edition, 2008.
2	C.L.Wadhwa, 'Electrical Power Systems', New Academic Science Ltd, 2009.
3	S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, Second Edition, 2011.
4	B.R.Gupta, , S.Chand, 'Power System Analysis and Design'New Delhi, Fifth Edition, 2008.
5	Luces M.Fualken berry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 2007.

OTHER REFERENCES	
1	https://youtu.be/-ZBNNcczmDM
2	https://youtu.be/i7284FCMkXw
3	https://youtu.be/CLEptMD9-EI
4	https://youtu.be/4oXfaOw492o
5	https://youtu.be/w0ZaB8cTn2w

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	Common to B.E. EEE & CIVIL	20MA4T4	NUMERICAL METHODS	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify and apply various numerical techniques for solving non-linear equations and systems of linear equations.	K3	1
CO2	Categorize various types of interpolation with equal and unequal intervals and apply the concept of cubic spline, approximation of derivatives using interpolation polynomials.	K4	2
CO3	Analyse and apply the knowledge of interpolation and determine the integration and differentiation of the functions by using the numerical data.	K4	3
CO4	Determine the dynamic behaviour of the system through solution of ordinary differential equations by using numerical methods.	K5	4
CO5	Solve PDE models representing spatial and temporal variations in physical systems through numerical methods.	K3	5

PRE-REQUISITE	Engineering Mathematics I & Engineering Mathematics II

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		3				1	3	3		3		
CO2	3	3		3				1	3	3		3		
CO3	3	3		3				1	3	3		3		
CO4	3	3		3				1	3	3		3		
CO5	3	3		3				1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS**	**9 + 3**
Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method.		
Topic - 2	**INTERPOLATION AND APPROXIMATION**	**9 + 3**
Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae.		
Topic - 3	**NUMERICAL DIFFERENTIATION AND INTEGRATION**	**9 + 3**
Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.		
Topic - 4	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS**	**9 + 3**
Single step methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge - Kutta method for solving first order equations - Multi step methods - Milne's predictor corrector methods for solving first order equations.		
Topic - 5	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS**	**9 + 3**
Finite difference methods for solving second order two - point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) method.		

THEORY	**45**		**TUTORIAL**	**15**		**PRACTICAL**	**0**		**TOTAL**	**60**

BOOK REFERENCES	
1	Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education,Asia, 7th Edition, New Delhi, 2006.
2	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 9th Edition, New Delhi, 2010
3	Stevan C Chapra, "Applied Numerical Methods with MAT LAB for Engineers andScientist",Tata McGraw Hill Publishing Company Limited, 2nd Edition, 2007.
4	P.B Pasil, N P Varma.,"Numerical Computational Methods", Narosa Publishing House 2009
5	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.

OTHER REFERENCES	
1	https://www.sobtell.com/blog/38-real-life-applications-of-numerical-analysis
2	https://www.scienceabc.com/eyeopeners/why-do-we-need-numerical-analysis-in-everyday-life.html
3	https://leverageedu.com/blog/application-of-statistics/

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EE4T5	MEASUREMENTS AND INSTRUMENTATION	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic concepts related to measurement systems.	K2	1
CO2	Apply the method of variation of parameters in instruments.	K3	2
CO3	Compare measurements and instruments to rate their performance.	K4	3
CO4	Analyze the storage and display devices and infer their limitations.	K4	4
CO5	Evaluate equipment based on a set of criteria / applications and recommend a suitable instruments system.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2	2		1	3	3		3	2	
CO2	3				3	2		1	3	3		3		
CO3	3				2	3		1	3	3		3		
CO4	3	2	2	3	2	2		1	3	3		3		
CO5	3	3	2	2	2	3		1	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**MEASUREMENTS AND ITS CHARACTERISTICS**	**9**
Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement with types – Statistical evaluation – Standards and calibration.		
Topic - 2	**ELECTRICAL AND ELECTRONICS INSTRUMENTS**	**9**
Moving Coil & Moving Iron Instruments- Single phase, three phase Wattmeters and Energy meters – Digital Multimeter – Magnetic measurements – Determination of B-H curve and measurements of iron loss – CT & PT.		
Topic - 3	**BRIDGES AND INTERFERECE**	**9**
DC potentiometers, DC Bridge: (Wheat stone, Kelvin bridge) & AC bridges: (Maxwell, Anderson and Schering bridges), Interference & screening – Electrostatic and electromagnetic Interference – Grounding techniques.		
Topic - 4	**STORAGE AND DISPLAY DEVICES**	**9**
Magnetic tape Recorders, digital plotters and printers, CRT display, digital CRO, LED and LCD – Data Loggers.		
Topic - 5	**TRANSDUCERS AND DATA ACQUISTION SYSTEMS**	**9**
Classification & Selection of transducers – Resistive (Strain Gauge, RTD, Thermocouple)- Inductive (LVDT) & capacitive - Piezoelectric and optical transducers – Elements of data acquisition systems – Smart sensors.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2010.
2	J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria & Sons, Delhi, 2013.
3	H.S. Kalsi, 'Electronic Instrumentation', McGraw Hill, III Edition 2010.
4	D.V.S. Murthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2015.
5	David Bell, ' Electronic Instrumentation & Measurements', Oxford University Press,2013

OTHER REFERENCES	
1	https://youtu.be/78NpGnA1sX4
2	https://youtu.be/u1gAh0cznp4
3	https://youtu.be/G4WUNgPQERw
4	https://youtu.be/Lanpw4Ry8xc
5	https://youtu.be/anCnrtjNLQM

Semester	Programme	Course Code	Course Name	L	T	P	C
III – B.E. CIVIL IV – B.E. CSE, EEE, ECE, MECH & B.Tech. IT		20HSCT1	UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY	2	1	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand and aware of themselves, and their surroundings (family, society, nature)	K2	1,2
CO2	Build more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind	K3	2,3,5
CO3	Relate the critical ability and sensitive to their commitment towards what they have understood (human values, human relationship and human society).	K2	1,2,3
CO4	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.	K3	2,3,4
CO5	Appraise local, regional and a national culture in harmony with others	K5	2,3,4,5
CO6	Leading to the development of a holistic and humane world vision: Universal Human Values of truth, love and compassion	K6	3,4,5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3					2					2		
CO2		3					3		2					
CO3								3				2		
CO4		2				2	2							
CO5								3		2		2	3	
CO6								3		2		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**	**9**

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

Topic - 2	**Understanding Harmony in the Human Being - Harmony in Myself!**	**9**

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Health.

Topic - 3	**Understanding Harmony in the Family and Society- Harmony in Human Relationship**	**9**

13. 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
14. Understanding the meaning of Trust; Difference between intention and competence
15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Topic - 4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**	**9**

18. Understanding the harmony in the Nature
19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space 21. Holistic perception of harmony at all levels of existence.	
Topic - 5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** **9**
22. Natural acceptance of human values 23. Definitiveness of Ethical Human Conduct 24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order 25. 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. 26. Case studies of typical holistic technologies, management models and production systems 27. 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 28. Sum up	

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Jeevan Vidya: E.K. Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004
3	The Story of Stuff (Book)by Annie Leonard , 2011
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher.
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
3	India Wins Freedom - Maulana Abdul Kalam Azad
4	Vivekananda - Romain Rolland (English)
4	Gandhi - Romain Rolland (English)

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=XGxNCFjDGEg
2	https://www.c-span.org/video/?292709-1/the-story-stuff

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EE4L1	ELECTRICAL MACHINES LABORATORY – II	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Electrical Machines Laboratory II Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	ELECTRICAL MACHINES LABORATORY – I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				2
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Regulation of three phase alternator by EMF and MMF methods.
2	Regulation of three phase alternator by ZPF method.
3	Load test on three phase slip ring induction motor.
4	Load test on three-phase Squirrel cage induction motor.
5	No load and blocked rotor tests on three-phase induction motor.
6	Separation of No-load losses of three-phase induction motor.
7	Load test on single-phase induction motor.
8	No load and blocked rotor test on single-phase induction motor.
9	V and Inverted V curves of Three Phase Synchronous Motor.
10	Study of Induction Motor Starters.

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	Electrical Machines Laboratory - II Manual, Al-Ameen Publications, 2020.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=exfUnnxnGEw
2	https://www.youtube.com/watch?v=BVTJHXqQFxQ
3	https://www.youtube.com/watch?v=Vw_9D2IzTgY

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EE4L2	PRESENTATION SKILLS AND TECHNICAL SEMINAR	0	0	2	1

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	Develop the content to conduct the Seminar in the Presentation Skills And Technical Seminar Course	K3
CO2	Identify the skills at the level of precision in presenting the Technical Seminar	K3
CO3	Categorize the concepts, blocks and applications through the presentation	K4
CO4	Elaborate an approach at the level of valuing which means by expressing personal opinions through Seminar	K6

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PRE-REQUISITE	TECHNICAL ENGLISH

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3									3		1		
CO4						2		2	2	2		1	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENTS
During the seminar session each student is expected to prepare and present a topic on Engineering/ Technology for duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**30**		**TOTAL**	**30**

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=kZURUshBTG4
2	https://www.youtube.com/watch?v=tcj2BhhCMN4

Semester	Programme	Course Code	Course Name	L	T	P	C
IV	B.E. EEE	20EC4L3	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Linear Integrated Circuits And Applications Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Implementation of Boolean Functions, Adder and Subtractor circuits
2	Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
3	Parity generator and parity checking
4	Encoders and Decoders
5	Design and implementation of 3-bit modulo counters as synchronous using FF IC's and specific counter IC.
6	Design and implementation of 3-bit modulo counters as Asynchronous using FF IC's and specific counter IC.
7	Shift Registers: Design and implementation of 4-bit shift registers in SISO, SIPO modes using suitability IC's.
8	Design and implementation of 4-bit shift registers in PISO, PIPO modes using suitability IC's.
9	Study of Multiplexer and De multiplexer.
10	Timer IC application: Study of NE/SE 555 timer in Astable operation.
11	Study of NE/SE 555 timer in monostable operation.
12	Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
13	Voltage to frequency characteristics of NE/ SE 566 IC.

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	Robert F. Coughlin, Frederick F. Driscoll, "Operational-Amplifiers and Linear Integrated Circuits", 6th Edition, Prentice Hall, 2001.
2	Ramakant A.Gayakwad, "Op-Amps and Linear Integrated Circuits", 4th Edition, 2015
3	David A. Bell, "Operational Amplifiers and Linear ICs", 3rd edition, OUP, 2013.
4	Bakshi, " Linear Integrated Circuits and Applications", Technical Publications, Chennai, 2016.
5	Roy Choudhury and Shail Jain, "Linear Integrated Circuits", 4th Edition, New Age International Publishers, 2014.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=kgL5UaSVuro
2	https://www.youtube.com/watch?v=eeWkREuP55s
3	https://www.youtube.com/watch?v=dZEUQ-mpMOw
4	https://www.youtube.com/watch?v=BKLmY5AuyjI
5	https://www.youtube.com/watch?v=G0D7m3DzCto

SEMESTER V

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE5T2	Renewable Energy Systems	PC	40	60	3	0	0	3
2	20EE5T3	Power Electronics	PC	40	60	3	0	0	3
3	20CS5T1	Object Oriented Programming and Data Structures	ES	40	60	3	0	0	3
4		Professional Elective – I	PE	40	60	3	0	0	3
5		Open Elective – I	OE	40	60	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
6	20EE5LT1	Control Systems Engineering	PC	50	50	2	0	4	4
7	20EC5LT2	Microprocessors and Microcontrollers	PC	50	50	2	0	4	4
LABORATORY COURSE									
8	20CS5L1	Object Oriented Programming and Data Structures Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20PT5T1	Career Guidance - I	MC	100	--	2	0	0	0
Total						**22**	**0**	**7**	**24.5**

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. EEE	20EE5T2	RENEWABLE ENERGY SYSTEMS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate various renewable energy sources and their role in the recent technologies.	K2	1
CO2	Organize the various type input on a variety of issues in harnessing renewable Energy	K3	2
CO3	Discover recent and possible future role of renewable energy sources.	K4	3
CO4	Estimate the various renewable energy resources and technologies and their applications.	K5	4
CO5	Examine the basic knowledge about solar energy, wind energy and biomass energy.	K4	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2						1	3	3		3	2	
CO2	2	2						1	3	3		3		
CO3	2			2				1	3	3		3		2
CO4	2	2						1	3	3		3		
CO5	2				3			1	3	3		3		3

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO RENEWABLE ENERGY SOURCES**	**9**
Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources.		
Topic - 2	**WIND ENERGY**	**9**
Power in the Wind – Types of Wind Power Plants(WPPs)–Components of WPPs-Working of WPPs-Siting of WPPs-Grid integration issues of WPPs.		
Topic - 3	**SOLAR AND THERMAL SYSTEMS**	**9**
Solar Radiation, Radiation Measurement, Solar Thermal Power Plant - Solar Photovoltaic systems : Basic Principle of SPV conversion – Types of PV Systems- Types of Solar Cells, Photovoltaic cell concepts: Cell, module, array ,PV Module I-V Characteristics, series and parallel connections, maximum power point tracking, Applications.		
Topic - 4	**BIOMASS & GEOTHERMAL ENERGY**	**9**
Introduction-Bio mass resources –Energy from Bio mass: conversion processes-Biomass Cogeneration-Environmental Benefits. Geothermal Energy: Basics, Direct Use, Geothermal Electricity. Mini/micro hydro power: Classification of hydropower schemes, Classification of water turbine.		
Topic - 5	**OTHER ENERGY SOURCES**	**9**
Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)-Hydrogen Production and Storage- Fuel cell : Principle of working- various types - construction and applications.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Richard A. Dunlap," Sustainable Energy" Cengage Learning India Private Limited, Delhi, 2015.
2	D.P.Kothari, K.C Singal, Rakesh Ranjan "Renewable Energy Sources and Emerging Technologies", PHI Learning Pvt.Ltd, New Delhi, 2013.
3	Scott Grinnell, "Renewable Energy & Sustainable Design", CENGAGE Learning, USA, 2016
4	A.K.Mukerjee and Nivedita Thakur," Photovoltaic Systems: Analysis and Design", PHI Learning Private Limited, New Delhi, 2011

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=eiBiB4DaYOM
2	https://www.youtube.com/watch?v=S1P31EC0YsE
3	https://www.youtube.com/watch?v=mh51mAUexK4
4	https://www.youtube.com/watch?v=Ul1ZlxAKsh8

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. EEE	20EE5T3	POWER ELECTRONICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic concepts related to power semiconductor devices	K2	1
CO2	Apply the method of variation of parameters in converters.	K3	2
CO3	Compare converters and inverters to rate their performance.	K4	3
CO4	Analyze power semiconductor devices to infer their limitations.	K4	4
CO5	Evaluate a power semiconductor devices based on a set of criteria / applications and recommend suitable power electronics.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2	2		1	3	3		3		
CO2	3	2			3	2		1	3	3		3	2	
CO3	3	2			2	3		1	3	3		3		
CO4	3	2	2	3	2	2		1	3	3		3		2
CO5	3	3	2	2	2	3		1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**POWER SEMI CONDUCTOR DEVICES**	**9**
Study of switching devices, Power Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT- Static characteristics-Triggering and commutation circuit for SCR- Design of Driver and snubber circuits.		
Topic - 2	**PHASE CONTROLLED CONVERTERS**	**9**
2-pulse, 3-pulse and 6-pulseconverters with R, RL, RLE Load – performance parameters –Effect of source inductance in single phase converter – Firing Schemes for converter– single phase Dual converter, Applications-Solar PV systems.		
Topic - 3	**DC TO DC CONVERTERS**	**9**
Step-down and Step-up chopper-control strategy–Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction to Resonant Converters, Applications-Battery operated vehicles.		
Topic - 4	**INVERTERS**	**9**
Single phase and three phase voltage source inverters (both120 mode and 180 mode)– Voltage & harmonic control--PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation –Current source inverter, Applications-UPS.		
Topic - 5	**AC TO AC CONVERTERS**	**9**
Single phase and Three phase AC voltage controllers–Control strategy- Power Factor Control – Multistage sequence control -single phase cyclo converters – Introduction to Matrix converters, Applications – welding.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2	P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.
3	Ashfaq Ahmed 'Power Electronics for Technology', Pearson Education, Indian reprint, 2003.
4	JP Agarwal," Power Electronic Systems: Theory and Design" 1e, Pearson Education, 2002.
5	M.D. Singh and K.B. Khanchandani, "Power Electronics," Mc Graw Hill India, 2013.

OTHER REFERENCES	
1	https://youtu.be/A78yP8oApqk
2	http://eps-technology.blogspot.in/2011/02/online-video-courses

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. EEE	20CS5T1	OBJECT ORIENTED PROGRAMMING AND DATA STRUCTRUES	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyze a problem and identify classes, objects and the relationships among them	K4	1
CO2	Develop applications using various types of Inheritance and Interfaces	K3	2
CO3	Develop applications or programs using exception handling and multithreading.	K6	3
CO4	Analyze an application and make use of object oriented concepts for its implementation	K4	4
CO5	Conclude the programs using String operations and lists	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2							2		2	2	2
CO2			2							2		2		3
CO3		2								2		2		
CO4	3	3			2					2		2	2	2
CO5			2							2		2		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO OBJECT ORIENTED PROGRAMMING AND JAVA**	**7**
Introduction to OOP– Java Fundamentals - Data Types, Variables, and Arrays Operators - Control Statements – Classes – Methods –Constructors- Garbage Collection.		
Topic - 2	**INHERITANCE ANDEXCEPTIONHANDLING**	**10**
Inheritance –Packages and Interfaces - Exception Handling Fundamentals – Java's Built-in Exceptions-Creating new Exception subclasses.		
Topic - 3	**POLYMORPHISM AND MULTITHREADING IN JAVA**	**10**
Polymorphism- Abstract classes and methods-Overloading-Overriding-final methods and classes – Multithreaded programming –The Thread class and the Runnable Interface- Creating multiple threads-Synchronization-Auto boxing and Annotations (Metadata).		
Topic - 4	**STACKS AND QUEUES**	**11**
ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.		
Topic - 5	**LINKED LIST**	**7**
Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	HerbertSchildt, "Java the Complete Reference", Ninth edition Tata McGrawHills, 2014.
2	Paul Deitel and Harvey Deitel, —"Java How to Program (Early Objects)", TenthEdition, Pearson Prentice Hall2014.
3	Timothy Budd, —"An Introduction to Object-Oriented Programming", ThirdEdition, Pearson Education,2008.
4	E.Balaguruswamy,"Programming with Java", Sixth Edition, TMH,2019.
5	Dr.G.T Thambi, "Object-Oriented Programming with java", First Edition, Kogent Learning Solutins, 2009.

OTHER REFERENCES	
1	https://www.w3schools.com
2	https://www.javatpoint.com/java-oops-concepts
3	https://www.youtube.com/watch?v=l-yoxklZwfM

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. - EEE	20EE5LT1	CONTROL SYSTEMS ENGINEERING	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Develop various representations of system based on the knowledge of Mathematics, Science and Engineering fundamentals.	K3	1
CO2	Conclude time domain analysis of various models in linear system and analyzing various controllers in closed loop system.	K4	2
CO3	Conclude frequency domain analysis of various models in linear system.	K5	3
CO4	Examine the stability of a given system using various methods.	K4	4
CO5	Design a lag, lead and lag lead compensator and examine a system using state variables.	K6	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2							1	3	3		3		
CO2	3	2	2					1	3	3		3		2
CO3	2	2	3	2				1	3	3		3		
CO4	3	2	2	3	2			1	3	3		3	2	
CO5	3	3	3	3	3			1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Internal Assessment Tests
	2	Laboratory Record and Model Practical Examinations (Laboratory Component)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT										
Topic - 1	**SYSTEMS AND ITS REPRESENTATION**									**6**
Basic elements in control systems – Open and closed loop system – Electrical analogy of mechanical system – Transfer function of mechanical and electrical system – Block diagram reduction technique – Signal flow graph.										
Topic - 2	**TIME DOMAIN ANALYSIS**									**6**
Time response of first order and second order systems for unit step test signals – Time domain specifications – Steady state response – Root locus technique - Effects of P, D, PI systems.										
Topic - 3	**FREQUENCY DOMAIN ANALYSIS**									**6**
Frequency response - Frequency domain specifications - Correlation between frequency domain and time domain specifications - Bode plot, Polar plot.										
Topic - 4	**STABILITY ANALYSIS**									**6**
Concepts of stability - Necessary conditions for Stability - Characteristics equation - Location of roots in S plane for stability - Routh Hurwitz criterion - Nyquist stability criterion.										
Topic - 5	**COMPENSATORS AND STATE VARIABLES**									**6**
Compensator - Deign of Lag compensator - Lead compensator - Lag-lead compensator using Bode plot - Concept of state variables, state model, Controllability and observability.										
THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	P, PI and PID controllers
2	Stability Analysis
3	Modeling of Systems – Machines, Sensors and Transducers
4	Design of Lag, Lead and Lag-Lead Compensators
5	Position Control Systems
6	Synchro-Transmitter- Receiver and Characteristics
7	Bridge Networks –AC and DC Bridges
8	Dynamics of Sensors/Transducers a. Temperature b. Displacement c. Optical d. Strain e. Flow

9	Power and Energy Measurement
10	Signal Conditioning a. Instrumentation Amplifier b. Analog – Digital and Digital –Analog converters (ADC and DACs)
11	Simulation of first order system
12	Simulation of second order system

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age InternationalPublishers, 2017
2	Benjamin C. Kuo, "Automatic Control Systems", Wiley, 2014.
3	Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
4	Richard C.Dorf and Bishop, R.H., "Modern Control Systems", Pearson Education,2009.
5	Control and Instrumentation Manual, Al-Ameen Publications, 2020.

OTHER REFERENCES	
1	John J.D., Azzo Constantine, H. and Houpis Sttuart, N Sheldon, "Linear Control System Analysis and Design with MATLAB", CRC Taylor& Francis Reprint 2009.
2	M.Gopal, "Control System: Principle and design", McGraw Hill Education, 2012.
3	https://youtu.be/V09Ct3RYSWU
4	https://youtu.be/65GGqUZNi4s
5	https://youtu.be/NQAQkSyOnBY

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E -EEE	20EC5LT2	MICROPROCESSORS AND MICROCONTROLLERS	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Describe the basic concept of 8086 microprocessor architecture	K2	1
CO2	Generalize the system bus architecture of 8086 microprocessor	K3	2
CO3	Examine the I/O peripheral interface of 8086 microprocessor	K3	3
CO4	Describe the basic concept of 8051 microcontroller architecture	K2	4
CO5	Demonstrate the various interfacing of 8051 microcontroller.	K3	5

PRE-REQUISITE	

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2			2	2	3	3		3		2
CO2		2	3		2		2	2	3	3		3		2
CO3		2	3	2			2	2	3	3		3		
CO4	3		3	3			2	2	3	3		3		
CO5		2	3	3	2		2	2	3	3		3		
CO6	3			2			2	2	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Laboratory Record and Model Practical Examinations (Laboratory Component)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**THE 8086 MICROPROCESSOR**	**6**
Introduction to 8086 – Microprocessor Architecture – Addressing modes – Instruction set and assembler directives – Assembly language programming – Modular programming – Linking and routines		
Topic - 2	**8086 SYSTEM BUS STRUCTURE**	**6**
8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations.		
Topic - 3	**I/O INTERFACING**	6
Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller. Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface		
Topic - 4	**MICROCONTROLLER**	**6**
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.		
Topic - 5	**INTERFACING MICROCONTROLLER**	**6**
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
	8086 Programs using kits
1	Basic arithmetic and Logical operations
2	Move a data block without overlap
3	Code conversion, decimal arithmetic and Matrix operations
4	Floating point operations, string manipulations, sorting and searching
	Peripherals and Interfacing Experiments
5	Traffic light controller
6	Stepper motor control
7	Digital clock
8	Key board and Display
	8051 Experiments using kits and MASM
9	Basic arithmetic and Logical operations
10	Study on interface with A/D and D/A

11	Study on interface with DC and AC motors										
12	Mini project development with processors										
THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**	

BOOK REFERENCES	
1	Marilyn Wolf, "Computers as Components – Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2	K.V.Shibu, "Introduction to Embedded Systems", McGraw Hill,2nd Edition, 2017
3	Prasad.K.V.K.K, Embedded Real-Time Systems: Concepts, Design & Programming, Dreamtech
4	Microprocessor And Microcontroller Laboratory, Al-Ameen Publications, 2020.

OTHER REFERENCES	
1	https://youtu.be/1m-jgtGetl4
2	https://youtu.be/QP-4FlwNTvw
3	https://youtu.be/5fESTph5gA8
4	https://youtu.be/t3thKRqMK2M
5	https://youtu.be/TtAsMwhVcAs
6	https://youtu.be/QVBgKAZIvpI
7	https://youtu.be/98gmOUItrPk
8	https://youtu.be/0PLyBaZ6MCU

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. EEE	20CS5L1	OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Linear Integrated Circuits And Applications Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Write a program to find the factorial of a given number.
2	Write a program to print numbers in sorting order.
3	Create a class Odometer that displays the number of kilometers a vehicle run. Give samples as trip information like number of kilometers travelled, fuel consumption per litre. The task is to find the mileage of the vehicle running at different samples of trip information.
4	Create a class Day that represents day, month and year of the calendar day. The class Day should be able to accept the date, update the date, delete the date from a calendar list of activities. Create a class Time that represents hours, minutes, seconds of a clock. The class Time should accept the time, update the time, delete the time from a list of events created for a day using the Day Class.
5	Write a program on illustration of use of packages
6	Write a program to implement interfaces.
7	Write a program that implements a stack ADT that converts infix expression into postfix expression.
8	Write a program to read a file and displays the file on the screen within line number before each line.
9	Write a program to copy contents of a file into another file using File streams.
10	Write a program for handling Array Index Out of Bounds Exception and Divide-by- zero Exception.
11	Implementing stack using array and Linked List
12	Implementing stack applications (Balancing Parenthesis, Infix to post fix conversion)
13	Implementing queue applications (Job scheduling- FIFO, Round Robin)
14	Implementing priority queue
15	Implementing Binary Search trees.

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	Object Oriented Programming with Java Laboratory Manual,Al-AmeenPublications,2020
2	Herbert Schildt, “Java the Complete Reference”, Ninth edition Tata McGrawHills, 2014.
3	Paul Deitel and Harvey Deitel, —”Java How to Program (Early Objects)”, Tenth Edition, Pearson Prentice Hall2014.
4	Timothy Budd, —”An Introduction to Object-Oriented Programming”, Third Edition, Pearson Education,2008.
5	E.Balaguruswamy,“Programming with Java”, Sixth Edition, TMH,2019.

OTHER REFERENCES	
1	https://www.w3resource.com/java-exercises/
2	https://www.csie.ntu.edu.tw/~d00922011/java/320/java.html

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. / B. Tech. (CSE, EEE, ECE & IT)	20PT5T1	Career Guidance - I	2	0	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	excel in the complex reasoning	K3	1
CO2	be proficient to create and verify their own conjectures.	K5	2
CO3	Imbibe effective relevant knowledge in English	K3	3
CO4	develop skills in ideation, innovation in algorithmic thinking, and be able to apply them in problem solving	K4	4

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		2		
CO3						3			3	2		1		
CO4						2			3	3		2		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**LOGICAL REASONING**	**5**
LR 1: Series, Odd man out, Analogy LR 2: Coding and Decoding LR 3: Direction, Ranking and Ordering LR 4: Blood Relation LR 5: Venn Diagram, Decision Making LR 6: Syllogism		
Topic - 2	**QUANTITATIVE APTITUDE**	**12**
NR 1: Average NR 2: Percentage NR 3: Profit and Loss NR 4: Ages NR 5: Ratio and Proportion NR 6: Allegation and Mixture NR 7: Time and Work NR 8: Time, Speed and Distance NR 9: Trains, Boats and Streams		
Topic - 3	**VERBAL REASONING & BUSINESSES COMMUNICATION**	**3**
VR 1:Preposition & Conjunction VR 2: Synonyms, Antonyms & Tenses BS1: Art of Introduction, Communication Barriers, Personal Interview.		
Topic - 4	**TECHNICAL CODING**	**10**
TECH 1: I/O, Operaters TECH 2: Conditional statement (branching and jumping statement) TECH 3: Control statements and patterns programming TECH 4: 1D and pointers.		

THEORY	**20**		**TUTORIAL**	**10**		**PRACTICAL**	**0**		**TOTAL**	**30**

BOOK REFERENCES	
1	Logical Reasoning and Data Interpretation for CAT by Nishit K. Sinha
2	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
3	A Modern Approach To Verbal Reasoning by R S Aggarwal.
4	Computer Programming for Beginners: Fundamentals of Programming Terms and Concepts - Nathan Clark

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=x0WkptLF6oE&list=PLpyc33gOcbVADMKqylI_O_O_RMeHTyNK
2	https://www.youtube.com/watch?v=LMY7GoAMcDI
3	https://www.youtube.com/watch?v=K7sj1yzXzng
4	https://www.youtube.com/watch?v=fyzmCU931QE
5	https://www.youtube.com/c/TechnicalCoding

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. EEE	20EE5E1	ELECTRICAL MACHINE DESIGN	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate the basics of design considerations for rotating and static electrical machines.	K2	1
CO2	Construct the procedures for armature winding and field winding of DC machines.	K3	2
CO3	Analyze single and three phase transformers characteristics and also the designing of transformer tanks.	K4	3
CO4	Develop the stator and rotor designing of Induction motor with its performance characteristics.	K3	4
CO5	Examine synchronous machines performance characteristics and also its winding features.	K4	5

PRE-REQUISITE	Electrical Machines I & Electrical Machines II

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2			1	3	3		3	2	
CO2	2		2					1	3	3		3		
CO3	2	3		2				1	3	3		3		2
CO4	2		3		2			1	3	3		3	2	
CO5	2	2	2					1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Major considerations in Electrical Machine Design – Materials for Electrical apparatus – Design of Magnetic circuits – Magnetising current – Flux leakage –Design of lap winding and wave winding.		
Topic - 2	**DC MACHINES**	**9**
Construction - Output Equations – Main Dimensions – Choice of specific loadings – Selection of number of poles – Design of Armature – Design of commutator and brushes –Design of Armature main dimensions		
Topic - 3	**TRANSFORMERS**	**9**
Construction - KVA output for single and three phase transformers – Overall dimensions – Estimation of No load current – Temperature rise in Transformers – Design of Tank and cooling tubes of Transformers.		
Topic - 4	**INDUCTION MOTORS**	**9**
Construction - Output equation of Induction motor – Main dimensions – choice of specific loadings– Operating characteristics: Magnetizing current - Short circuit current.		
Topic - 5	**SYNCHRONOUS MACHINES**	**9**
Output equations – choice of specific loadings – Design of salient pole machines – Short circuit ratio – Armature design – Estimation of air gap length – Design of rotor –Design of damper winding.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai& Sons, New Delhi, Fifth Edition, 1984.
2	V Rajini, V.S Nagarajan, 'Electrical Machine Design', Pearson, 2017.
3	M V Deshpande 'Design and Testing of Electrical Machines' PHI learning Pvt Ltd. 2011.
4	K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications,2008

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=65pGmYm904Q
2	https://www.youtube.com/watch?v=WgpmOR5jcVQ
3	https://www.youtube.com/watch?v=eeG9Cmx5S2M
4	https://www.youtube.com/watch?v=krNH7-wDnZk

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. - EEE	20EE5E2	MODERN POWER CONVERTERS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Ability to suggest converters for AC-DC conversion and SMPS	K3	1
CO2	Analyse the harmonic distortion to DC –AC converters	K4	2
CO3	Ability to understand the various modes of operation(K3)	K3	3
CO4	Discuss the wave form of with and without link AC-AC converters(K3)	K4	4
CO5	Compute the level of soft switching power converters	K3	5

PRE-REQUISITE	POWER ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	2	2	2	2	1	1	-	1	-	-
CO2	3	2	-	-	3	2	2	2	1	1	-	1	2	2
CO3	3	2	-	-	2	3	2	2	1	1	-	1	-	-
CO4	3	2	2	3	2	2	2	2	1	1	-	1	-	2
CO5	3	2	2	2	2	3	2	2	1	1	-	1	2	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Internal Assessment Examinations
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**SWITCHED MODE POWER SUPPLIES (SMPS)**	**9**
DC Power supplies and Classification; Switched mode dc power supplies - with and without isolation, single and multiple outputs; Closed loop control and regulation; Design examples on converter		
Topic - 2	**AC-DC CONVERTERS**	**9**
Switched mode AC-DC converters. Synchronous rectification - single and three phase topologies-switching techniques - high input power factor. Reduced input current harmonic distortion. Improved efficiency. With and without input-output isolation. Performance indices design examples		
Topic - 3	**DC-AC CONVERTERS**	**9**
Multi-level Inversion - concept, classification of multilevel inverters, Principle of operation, main features and analysis of Diode clamped, Flying capacitor and cascaded multilevel inverters.		
Topic - 4	**AC-AC CONVERTERS WITH AND WITHOUT DC LINK**	**9**
Matrix converters. Basic topology of matrix converter-Modulation techniques - scalar modulation, indirect modulation; Matrix converter as only AC-DC converter; AC-AC converter with DC link - topologies and operation - with and without resonance link - Performance comparison with matrix converter with DC link converters		
Topic - 5	**SOFT-SWITCHING POWER CONVERTERS**	**9**
Soft switching techniques. ZVS, ZCS, quasi resonance operation; Performance comparison hard switched and soft switched converters.AC-DC converter, DC-DC converter, DC-AC converter. Resonant DC power supplies.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Power Electronic Circuits, Issa Batarseh, John Wiley and Sons, Inc.2004
2	Power Electronics for Modern Wind Turbines, Frede Blaabjerg and Zhe Chen, Morgan &Claypool Publishers series, United States of America, 2006
3	Krein Philip T, Elements of Power Electronics, Oxford University press, 2008
4	Agarwal ,Power Electronics: Converters, Applications, and Design, 3rd edition, Jai P, PrenticeHall,2000

OTHER REFERENCES	
1	https://youtu.be/9OcFBJEr4Xg
2	https://youtu.be/kNfr-Kia76M

Semester	Programme	Course Code	Course Name	L	T	P	C
V	B.E. EEE	20EC5T1	DIGITAL SIGNAL PROCESSING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Analyze the frequency domain behaviour of a given Discrete Time signal using Discrete Fourier Transform	K2	1
CO2	Construction of Realization structures and design for IIR filters	K3	2
CO3	Construction of Realization structures and design for FIR filters	K3	3
CO4	Analyze the effect of finite word length for fixed & floating point number representation.	K4	4
CO5	Develop an algorithm using TSM320C6X Processor for simple signal processing applications.	K5	5

PRE-REQUISITE	Signals and Systems

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2					1	3	3		3	2	
CO2	2	3	2		2			1	3	3		3	2	
CO3	2	3	2		2			1	3	3		3	2	
CO4	2	2	2		2			1	3	3		3	2	
CO5	2	1		3				1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**DISCRETE AND FAST FOURIER TRANSFORM**	**9**
Introduction to DFT – Efficient computation of DFT – Properties of DFT – FFT Algorithms – Decimation in Time (DIT) and Decimation in Frequency (DIF) Algorithms – Linear and Circular Convolution.		
Topic - 2	**IIR FILTER DESIGN**	**9**
Analog filter design – Discrete time IIR filter from analog filter – IIR filter design: Impulse Invariance, Bilinear transformation technique – Realization using Direct form I, Direct form II and Cascade forms.		
Topic - 3	**FIR FILTER DESIGN**	**9**
Linear phase FIR filters – Filter design: windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency Sampling method.		
Topic - 4	**FINITE WORD LENGTH EFFECTS**	**9**
Fixed point and floating point number representations – Quantization – Truncation and Rounding errors – Quantization noise – coefficient quantization error – Product quantization error – Overflow error – Round-off noise power – limit cycle oscillations due to product round-off and Overflow errors – Principle of scaling.		
Topic - 5	**MULTIRATE SIGNAL PROCESSING AND DSP APPLICATIONS**	**9**
Introduction to Multirate signal processing – Decimation – Interpolation – Sampling rate conversion by a rational factor – Adaptive Filters: Introduction – Applications of adaptive filtering to equalization- Introduction to DSP Processor (TMS320C50).		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	John G. Proakis &Dimitris G. Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Pearson Education / Prentice Hall, Fourth Edition, 2007.
2	Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", McGraw Hill, 4th edition 2013.
3	A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", Pearson, 8th Indian Reprint, 2004.
OTHER REFERENCES	
1	http://www.nptelvideos.in/2012/12/digital-signal-processing.html, "Digital Signal Processing", Prof. S.C Dutta Roy, IIT Delhi.
2	http://www.nptelvideos.in/2012/11/digital-signal-processing.html, "Digital Signal Processing", Prof.T.K.Basu, IIT Kharagpur.
3	https://www.youtube.com/watch?v=W1cTpqM9DaU
4	https://www.youtube.com/watch?v=FtEShPAFpek&list=PL_mruqjnuVd87sjSDVS9wuit9CSpgIIfx
5	https://www.youtube.com/watch?v=8kcvyoHsXrw

Semester	Programme	Course Code	Course Name	L	T	P	C
IV - B.E. CSE, B.Tech. IT V – B.E. EEE		20CS4T3	DATABASE MANAGEMENT SYSTEMS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Compare File Processing System with Database Systems in terms of performance, scalability and data storage for efficient access of data.	K4	1
CO2	Design a Database scheme using E-R model, Relational model and apply relational algebra operations.	K6	2
CO3	Estimate SQL queries using aggregate functions, nested sub queries, joins and views for the given problem.	K5	3
CO4	Apply suitable normalization and query optimization techniques to optimize the query for efficient access of data.	K3	4
CO5	Discuss serialization and concurrency control mechanisms to avoid deadlock problem in transaction processing.	K6	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2												2
CO2	3	3	2	2								2		2
CO3	3	2	3	2								3	2	
CO4	3	3	2	2								2		
CO5	3	2												

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

Topic - 1	DATABASE SYSTEM	9
Overview of File Processing System – Purpose of Database System – view of data – Data Models-Database Languages – Database System Architecture – Database users and Administrator.		
Topic - 2	**DATABASE DESIGN**	**9**
Database design & E-R Model : Entity-Relationship model (E-R Model)-E-R Diagram-Constraints-Extended E-R features. Introduction to Relational Model: Database schema-Keys-Schema Diagrams-Relational Query Languages –Relational Operations.		
Topic - 3	**SQL**	**9**
SQL Standards-Data types- Structure of SQL queries-Additional basic operations –set operation-null values-aggregate function- nested sub queries-modification of the database. Intermediate SQL: Joins-Views -Transactions-Integrity constraints-Authorization-Advanced SQL		
Topic - 4	**NORMALIZATION AND QUERY OPTIMIZATION**	**9**
Relational database design: Functional Dependencies - Normalization and its normal forms-Denormalization-Data Storage:RAID - Tertiary Storage - File organization - Organization of records in files.Query processing-Query optimization.		
Topic - 5	**TRANSATION MANAGEMENT**	**9**
Transaction concepts - Transaction recovery - Properties of Transaction-Serializability - Concurrency Control - Locking Mechanisms - Two Phase Commit Protocol - Dead lock .Case study: Database connectivity using SQL.		

THEORY	45	TUTORIAL	0	PRACTICAL	0	TOTAL	45

BOOK REFERENCES	
1	Abraham silberschatz, Henry F.Korth, S.Sundharshan,"Database system concepts", sixth edition, Tata McGraw hill,2011
2	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database System", Eighth Edition, pearson Education,2006
3	RamezElmasri and Shamkant B.Navathe, "Fundamentals of Database Systems", Fourth Edition, Pearson Addisionwesley, 2007
4	Atul Kahate, "Introduction to database Management system", Pearson Education, New Delhi,2006

OTHER REFERENCES	
1	https://onlinecourses.nptel.ac.in/noc17_cs33/course
2	http://www.db-book.com
3	http://nptel.ac.in/courses/IIT-MADRAS/Intro_to_Database_Systems_Design
4	http://www.iitg.ernet.in/awekar/teaching/cs344fall11/
5	www.w3schools.com/sql/

SEMESTER VI

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20EE6T1	Power System Analysis	PC	40	60	3	1	0	4
2	20EE6T2	Protection and Switchgear	PC	40	60	3	0	0	3
3	20CSCT5	Python Programming	ES	40	60	3	0	0	3
4		Professional Elective – II	PE	40	60	3	0	0	3
5		Open Elective – II	OE	40	60	3	0	0	3
THEORY COURSES WITH LABORATORY COMPONENTS									
6	20EE6LT2	Solid State Drives	PC	50	50	2	0	4	4
7	20ECCLT1	Embedded Systems	PC	50	50	2	0	4	4
LABORATORY COURSE									
8	20CS2L3	Python Programming Laboratory	ES	60	40	0	0	3	1.5
MANDATORY COURSE									
9	20PT6T1	Career Guidance - II	EEC	100	-	2	0	0	0
Total						**23**	**1**	**7**	**25.5**

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. EEE	20EE6T1	POWER SYSTEM ANALYSIS	3	1	0	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Build the model power system under steady state operating condition	K3	1
CO2	Apply iterative techniques to understand the power flow analysis	K3	2
CO3	Relate the model to carry out short circuit studies on power system	K2	3
CO4	Elaborate the knowledge on Fault analysis and analyze the problems	K6	4
CO5	Conclude the various power system components and carry out power flow, short circuit and stability studies	K5	5

PRE-REQUISITE	TRANSMISSION AND DISTRIBUTION

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2			1	3	3		3	2	
CO2	2		2					1	3	3		3		
CO3	2	3		2				1	3	3		3		2
CO4	2		3		2			1	3	3		3	2	
CO5	2	2	2					1	3	3		3		
CO6	3		2		2			1	3	3		3	2	

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO POWER SYSTEM**	**9**
Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters.		
Topic - 2	**POWER FLOW ANALYSIS**	**9**
Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.		
Topic - 3	**SYMMETRICAL FAULT ANALYSIS**	**9**
Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level.		
Topic - 4	**UNSYMMETRICAL FAULT ANALYSIS**	**9**
Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.		
Topic - 5	**STABILITY ANALYSIS**	**9**
Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time Classical step-by-step solution of the swing equation – modified Euler method.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Kothari D.P. and Nagrath I.J., 'Power System Engineering', Tata McGraw-Hill Education, Second Edition, 2008.
2	Gupta B.R., 'Power System - Analysis and Design', S. Chand Publishing, 2001.
3	John J. Grainger, William D. Stevenson, Jr, 'Power System Analysis', Mc Graw Hill Education (India) Private Limited, New Delhi, 2015.
4	Kundur P., 'Power System Stability and Control', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010

OTHER REFERENCES	
1	https://youtu.be/IOprzZJ4ARc , https://youtu.be/3vaKJq6MwYs

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. - EEE	20EE6T2	PROTECTION AND SWITCHGEAR	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the causes of abnormal operating conditions of the apparatus and system.	K3	1
CO2	Analyze the various functions of Electromagnetic relays.	K4	2
CO3	Estimate the apparatus protection, various relays.	K5	3
CO4	Analyze the various functions of Static and Numerical relays.	K4	4
CO5	Design and construct suitable circuit breaker and formulate their functions.	K6	5

PRE-REQUISITE	POWER ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2					1	3	3		3	2	2
CO2	3	3			2			1	3	3		3		
CO3	3	2	2			2		1	3	3		3		2
CO4	3	2		2		2		1	3	3		3	2	
CO5	3	2	3		3			1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Internal Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**PROTECTION SCHEMES**	**9**
Principles and need for protective schemes – nature and causes of faults – types of faults – Methods of Grounding - Zones of protection and essential qualities of protection –Protection scheme.		
Topic - 2	**ELECTROMAGNETIC RELAYS**	**9**
Operating principles of relays - the Universal relay – Torque equation – Electromagnetic Relays – Over current, Directional, Distance, Differential, Negative sequence and Under frequency relays.		
Topic - 3	**APPARATUS PROTECTION**	**9**
Current transformers and Potential transformers and their applications in protection schemes Protection of transformer, generator, motor, bus bars and transmission line.		
Topic - 4	**STATIC RELAYS AND NUMERICAL PROTECTION**	**9**
Physics of arcing phenomenon and arc interruption - DC and AC circuit breaking – re-striking voltage and recovery voltage - rate of rise of recovery voltage (RRRV) - resistance switching - current chopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil, SF6, MCBs, MCCBs and vacuum circuit breakers – Rating and selection of Circuit breakers.		
Topic - 5	**CIRCUIT BREAKERS**	**9**
Constructional features – Principle of operation and Characteristics of Hysteresis motor - Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Sunil S.Rao, 'Switchgear and Protection', Khanna Publishers, New Delhi, 2008.
2	B.Rabindranath and N.Chander, 'Power System Protection and Switchgear', New Age International (P) Ltd., First Edition 2011.
3	BadriRam ,B.H. Vishwakarma, 'Power System Protection and Switchgear', New Age InternationalPvt Ltd Publishers, Second Edition 2011.
4	C.L.Wadhwa, 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd., 2010
5	VK Metha," Principles of Power Systems" S. Chand, 2005.

OTHER REFERENCES	
1	https://youtu.be/NEXWcOgqZOI
2	https://youtu.be/8OVyLscA4fs
3	https://youtu.be/OELeIdA7o94
4	https://youtu.be/nFU8ZDxXkbs
5	https://youtu.be/K0xnOVx82sU

Semester	Programme	Course Code	Course Name	L	T	P	C
II – B.E. CSE, B.Tech. IT IV – B.E. MECH, VI – B.E. EEE		20CSCT5	PYTHON PROGRAMMING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Classify and make use of python programming elements to solve and debug simple logical problems.	K2	1
CO2	Experiment with the various control statements in Python.	K3	2
CO3	Develop python programs using functions and strings.	K3	3
CO4	Experiment with the usage of pointers and functions.	K3	4
CO5	Analyze a problem and use appropriate packages and modules to solve it.	K4	5

PRE-REQUISITE	C PROGRAMMING

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		3			2	3	2	3	3	3	3	3		
CO2			2			3	2	3	3	3	3	3		
CO3			2			3	2	3	3	3	3	3		2
CO4			2		2	3	2	3	3	3	3	3	2	2
CO5	3	3	2			3	2	3	3	3	3	3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**BASICS OF PYTHON PROGRAMMING**	**9**
Introduction - Python Interpreter - Interactive and script mode -Values and types, operators, expressions, statements, precedence of operators, Multiple assignments, comments.		
Topic - 2	**CONTROL STATEMENTS AND FUNCTIONS IN PYTHON**	**9**
Conditional (if), alternative (if-else), chained conditional (if-elif-else) – Iteration - while, for, break, continue, pass – Functions - Introduction, inbuilt functions, user defined functions, passing parameters, return values, recursion, Lambda functions.		
Topic - 3	**DATA STRUCTURES: STRINGS,LISTSAND SETS**	**9**
Strings - String slices, immutability, string methods and operations –Lists - creating lists, list operations, list methods, mutability, aliasing, cloning lists, list and strings, list and functions - list processing - list comprehension, searching and sorting, Sets - creating sets, set operations		
Topic - 4	**DATA STRUCTURE STUPLES, DICTIONARIES**	**9**
Tuples - Tuple assignment, Operations on Tuples, lists and tuples, Tuple as return value – Dictionaries - operations and methods, Nested Dictionaries.		
Topic - 5	**FILES, MODULES, PACKAGES**	**9**
Double integrals: Double integration in Cartesian co-ordinates– change of order of integration – area as a double integration in Cartesian– volume as a triple integral in Cartesian co-ordinates (simple problems)		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Ashok Namdev Kamthane, Amit Ashok Kamthane, “Programming and Problem Solving with Python”, Mc-Graw Hill Education,2018.
2	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, Second edition, Updated for Python 3, Shroff / O’Reilly Publishers,2016.
3	Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach”, Pearson India Education Services Pvt. Ltd.,2016.
4	Timothy A. Budd,” Exploring Python”, Mc-Graw Hill Education (India) Private Ltd.,2015.
5	Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning,2012.

OTHER REFERENCES	
1	https://www.coursera.org/specializations/python
2	https://www.youtube.com/watch?v=rfscVS0vtbw
3	https://nptel.ac.in/courses/106/106/106106212/

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. - EEE	20EE6LT2	SOLID STATE DRIVES	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Categorize to select suitability drive for the given application.	K3	1
CO2	Examine the operation of the rectifier and chopper fed dc drive.	K4	2
CO3	Illustrate the operation and performance of Induction motor drives.	K4	3
CO4	Interpret the operation and performance of Synchronous motor drives.	K2	4
CO5	Analyse the operation of current and speed controllers for a closed loop solid state DC motor drive.	K4	5

PRE-REQUISITE	POWER ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	-	2	2	1	3	3	-	3	2	2
CO2	3	2	-	-	2	2	-	1	3	3	-	3	-	-
CO3	3	2	2	-	-	2	2	1	3	3	-	3	-	-
CO4	3	2	2	-	-	2	-	1	3	3	-	3	-	-
CO5	3	2	2	-	2	2	-	1	3	3	-	3	-	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Laboratory Record and Model Practical Examinations (Laboratory Component)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**FUNDAMENTALS OF ELECTRIC DRIVES**	**6**
Development of electric drive – Drive classifications- Advantage of Electric Drives -Equations governing motor load dynamics – steady state stability – multi quadrant operation – Classification of load torque– Selection of motor.		
Topic - 2	**CONVERTER / CHOPPER FED DC MOTOR DRIVE**	**6**
Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous and discontinuous conduction mode – Time ratio and current limit control – 4 quadrant operation of converter /chopper fed drive		
Topic - 3	**INDUCTION MOTOR DRIVES**	**6**
Stator voltage control -V/f control– Rotor Resistance control-qualitative treatment of slip power recovery rives-closed loop control– vector control		
Topic - 4	**SYNCHRONOUS MOTOR DRIVES**	**6**
V/f control and self-control of synchronous motor: Margin angle control and power factor control-Three phase voltage/current source fed synchronous motor		
Topic - 5	**DESIGN OF CONTROLLERS FOR DRIVES**	**6**
Transfer function for DC motor / load and converter – Closed loop control with Current and speed feedback–Armature voltage control and field weakening mode – Design of controllers; current controller and speed controller		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

LIST OF EXPERIMENTS	
1	Gate Pulse Generation using R, RC and UJT
2	Static Characteristics of SCR and TRIAC
3	Static Characteristics of MOSFET and IGBT
4	AC to DC half controlled converter
5	AC to DC fully controlled Converter
6	Step down and step up MOSFET based choppers
7	IGBT based single phase PWM inverter
8	IGBT based three phase PWM inverter
9	AC Voltage controller (using SCR & TRIAC)
10	Switched mode power converter
11	Simulation of single phase and three phase semi converters
12	Simulation of single phase and three phase full converters

THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Gopal K.Dubey, " Fundamentals of Electrical Drives" , Narosa Publishing House,2016
2	Vedam Subramanyam, " Electric Drives Concepts and Applications ", Tata McGraw Hill, 2016
3	Shaahin Felizadeh, "Electric Machines and Drives", CRC Press (Taylor and Francis Group),2013.
4	John Hindmarsh and Alasdain Renfrew, "Electrical Machines and Drives System," Elsevier 2012.
5	Theodore Wildi, " Electrical Machines ,Drives and power systems ,6th edition, Pearson Education ,2015
6	Power Electronics and Drives Manual, Al-Ameen Publications, 2020.

OTHER REFERENCES	
1	http://nptel.ac.in/courses/108104011/ "Advanced Electric drives", Prof. S.P. Das, IIT Kanpur
2	http://eps-technology.blogspot.in/2011/02/online-video-courses-electric-drives,Prof.K.Gopakumar, IISC Bangalore
3	https://youtu.be/iZhPjFo8MrY
4	https://youtu.be/rQqb3vcr7KY
5	https://youtu.be/c2YYJ0KHIa8

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. EEE	20ECCLT1	EMBEDDED SYSTEMS	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Evaluate the major tools of abstraction in the embedded system design process.	K2	1
CO2	Elaborate the working functionality of LPC 214X Family Peripherals based on the hardware architecture, memory organization and otherattributes of ARM processor.	K3	2
CO3	Analyze the hardware and software platform used for embeddedcomputing.	K3	3
CO4	Explain how the process and the operating system used to build applications with more complex functionality and much greater flexibility to satisfy timing requirements.	K4	4
CO5	Classify the important features that are essential for the successful completion of large embedded system projects.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1		1		2	1			1	3	3		3	2	
CO2		1		2	2			1	3	3		3	1	
CO3		1		2	2			1	3	3		3	1	2
CO4		2		2	2			1	3	3		3	1	1
CO5		2		2				1	3	3		3	2	1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests & Model Practical Examinations
	2	Laboratory Record and Model Practical Examinations (Laboratory Component)
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS**	**6**
Introduction – Embedded system design process –Design example: Model train controller- Design methodologies- Design flows – Requirement Analysis -System analysis and architecture design – Quality Assurance techniques. .		
Topic - 2	**ARM PROCESSOR AND PERIPHERALS**	**6**
Instruction sets preliminaries – ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps - Memory system mechanisms – CPU performance- CPU power consumption-.		
Topic - 3	**EMBEDDED COMPUTING PLATFORM DESIGN**	6
Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization –		
Topic - 4	**PROCESSES AND OPERATING SYSTEMS**	**6**
Introduction – Multiple tasks and multiple processes – Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms –- Power optimization strategies for processes		
Topic - 5	**SYSTEM DESIGN TECHNIQUES AND NETWORKS**	**6**
Multi processors-CPUs and Accelerators -Distributed embedded systems – Networks for Embedded Systems:-I2C, -Internet enabled systems-Elevator controller.		

THEORY	**30**		**TUTORIAL**			**PRACTICAL**	**0**		**TOTAL**	**30**

COURSE CONTENT		
Experiment - 1	Interfacing interrupt.	**3**
Experiment - 2	Interfacing ADC	**3**
Experiment - 3	Interfacing LED and PWM.	**3**
Experiment - 4	Interfacing real time clock	**3**
Experiment - 5	Interfacing keyboard and LCD.	**3**
Experiment - 6	Interfacing EPROM and interrupt.	**3**
Experiment - 7	Mailbox.	**3**
Experiment - 8	Interfacing serial port	**3**

Experiment - 9	Flashing of LEDS.									**3**
Experiment - 10	Interfacing temperature sensor.									**3**
Experiment - 11	Interfacing PWM.									**3**
THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Marilyn Wolf, "Computers as Components – Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.
2	K.V.Shibu, "Introduction to Embedded Systems", McGraw Hill,2nd Edition, 2017
3	Prasad.K.V.K.K, Embedded Real-Time Systems: Concepts, Design & Programming, Dreamtech
4	Embedded & Real Time System : - Al-Ameen Publication, 2020

OTHER REFERENCES	
1	Nptel video https://nptel.ac.in/courses/106/105/106105159/, "Introduction to Embedded Systems", Dr.AnubamBasu, Computer Science Engineering, IIT Kharagpur.
2	Nptel video https://nptel.ac.in/courses/108/102/108102169/ , "Introduction to Embedded System Design", Prof.Badri N Subudhi& Prof. Dhananjay V. Gadre, Electrical Engineering, IIT, Jammu.
3	https://youtu.be/d5duBWX71M4
4	https://youtu.be/JO4AEkOVF2M
5	https://www.youtube.com/watch?v=xHjuhLu9Tzg&list=PLrjkTql3jnm-lZMoUb1xMCp0HgxvJ7ocx&index=20

Semester	Programme	Course Code	Course Name	L	T	P	C
II – B.E. CSE, B.Tech. IT IV – B.E. MECH, VI – B.E. EEE		20CSCL3	PYTHON PROGRAMMING LABORATORY	0	0	3	1.5

COURSE LEARNING OUTCOMES (COs)		
After Successful completion of the course, the students should be able to		RBT Level
CO1	State the aim and develop the procedure to conduct the experiment / exercise in the Python Programming Laboratory Course	K3
CO2	Demonstrate skills at the level of precision (reliably, quickly, smoothly, and accurately with negligible guidance) in performing the experiment / exercise	K3
CO3	Draw inferences from the experiment / exercise conducted and present it professionally	K4
CO4	Demonstrate professionally the results obtained through the experiment / exercise and present conclusions	K4
CO5	Demonstrate an understanding of the concepts, procedures, and applications through verbal and written communication	K3
CO6	Demonstrating an attitude at the level of valuing (attaching values and expressing personal opinions by showing some definite involvement and commitment)	K3

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								3	3				
CO2	3				3			2	3		1			
CO3	3	2		2		1				3				
CO4	3									3				
CO5	3									3		1		
CO6						2		2	2	2		1		

COURSE ASSESSMENT METHODS		
DIRECT	1	Laboratory Record
	2	Model Practical Examinations
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

LIST OF EXPERIMENTS	
1	Implement simple python programs using interactive and script mode.
2	Develop python programs using id( ) and type( )functions
3	Implement range ( ) function in python
4	Implement various control statements in python.
5	Develop python programs to perform various string operations like concatenation, slicing, indexing.
6	Demonstrate string functions using python.
7	Implement user defined functions using python.
8	Develop python programs to perform operations on list
9	Implement dictionary and set in python
10	Develop programs to work with Tuples.
11	Create programs to solve problems using various data structures in python.
12	Implement python program to perform file operations.
13	Implement python programs using modules and packages

THEORY	0		TUTORIAL	0		PRACTICAL	30		TOTAL	30

BOOK REFERENCES	
1	Mr.K.Devarajsamy "Python Programming Laboratory Manual",Al-AmeenPublications,2020
2.	Ashok Namdev Kamthane, Amit Ashok Kamthane, "Programming and Problem Solving with Python" , Mc-Graw Hill Education,2018.
3.	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second edition, Updated for Python 3, Shroff / O'Reilly Publishers,2016.
4.	Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt.Ltd.,2016.
5.	Timothy A. Budd," Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,2015.

OTHER REFERENCES	
1	https://www.coursera.org/specializations/python

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. / B. Tech. Common to all Branches	20PT6T1	SOFTSKILL COURSE - II	2	0	0	0

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	excel in the complex reasoning	K3	1
CO2	be proficient to create and verify their own conjectures.	K5	2
CO3	Imbibe effective relevant knowledge in English	K3	3
CO4	develop skills in ideation, innovation in algorithmic thinking, and be able to apply them in problem solving	K4	4

PRE-REQUISITE	SOFTSKILL COURSE - I

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3			3	3		3		
CO2						2			3	3		2		
CO3						3			3	2		1		
CO4						2			3	3		2		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**LOGICAL REASONING**	**5**
LR 1: Seating Arrangement LR 2: Critical Reasoning LR 3: Coded Inequality and Condition Grouping LR 4: Cubes and Verbal Reasoning LR 5: Clocks and Calendars		
Topic - 2	**QUANTITATIVE APTITUDE**	**12**
NR 1: Simple Interest and Compound Interest NR 2: Logarithms NR 3: Permutation NR 4: Combination NR 5: Probability NR 6: Number System NR 7: HCF and LCM		
Topic - 3	**VERBAL REASONING & BUSINESSES COMMUNICATION**	**3**
VR 1: Voices & Speech, Parajumbles, Error Spotting VR 2: Reading Comprehension BS1: Effective Communication, Personal Etiquettes,Group Discussion, Resume Writing.		
Topic - 4	**TECHNICAL CODING**	**10**
TECH 1: 2D array TECH 2: String functions and functions TECH 3: structure and union, DS intro TECH 4 : Array list, linked list and it's implementation		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

BOOK REFERENCES	
1	Logical Reasoning and Data Interpretation for CAT by Nishit K. Sinha
2	Quantitative Aptitude for Competitive Examinations (5th Edition) - Abhjit Guha
3	A Modern Approach To Verbal Reasoning by R S Aggarwal.
4	Computer Programming for Beginners: Fundamentals of Programming Terms and Concepts - Nathan Clark

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=4WCq6leqnHs
2	https://www.youtube.com/watch?v=tnc9ojITRg4&list=PLpyc33gOcbVA4qXMoQ5vmhefTruk5t9lt
3	https://www.youtube.com/watch?v=tWN_-ieZVZU
4	https://www.youtube.com/watch?v=HAnw168huqA
5	https://www.youtube.com/watch?v=HIj8wU_rGIU

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. EEE	20EE6E1	HIGH VOLTAGE ENGINEERING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic concepts related to high voltages.	K2	1
CO2	Apply the method of variation of parameters in electrical breakdown.	K3	2
CO3	Compare generation and measurements to rate their performance.	K4	3
CO4	Analyze the generation of high voltages to infer their limitations.	K4	4
CO5	Evaluate high voltage equipment based on a set of criteria / applications and recommend a suitable over voltages.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2	2		1	3	3		3	2	
CO2	3	2			3	2		1	3	3		3	2	
CO3	3	2			2	3		1	3	3		3		2
CO4	3	2	2	3	2	2		1	3	3		3		2
CO5	3	2	2	2	2	3		1	3	3		3		
CO6	3	2				2		1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS**	**9**
Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Protection against over voltages-insulation co ordination.		
Topic - 2	**DIELECTRIC BREAKDOWN**	**9**
Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids– Breakdown mechanisms in solid and composite dielectrics.		
Topic - 3	**GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS**	**9**
Generation of High DC voltages- voltage multiplier circuits, van de graff generator- – generation of high AC voltages: cascaded transformers - generation of high impulse voltage: multistage Marx circuit generation of switching surges – generation of impulse currents – Triggering and control of impulse generators.		
Topic - 4	**MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS**	**9**
HVDC measurement techniques–measurement of power frequency AC voltages- Sphere Gaps – High current shunts- measurement of impulse currents - Digital techniques in high voltage measurement.		
Topic - 5	**HIGH VOLTAGE TESTING OF ELECTRICAL POWER APPARATUS**	**9**
Testing of Insulators-Testing of bushing- Testing of isolators and circuit breakers- Testing of transformers- Testing of surge arrester- High voltage testing of electrical power apparatus as per International and Indian standards.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	S.Naidu and V. Kamaraju, ‘High Voltage Engineering’, Tata McGraw Hill, Fifth Edition, 2013.
2	E. Kuffel and W.S. Zaengl, J.Kuffel, ‘High voltage Engineering fundamentals’, Newnes Second Edition Elsevier , New Delhi, 2005.
3	C.L. Wadhwa, ‘High voltage Engineering’, New Age International Publishers, Third Edition, 2010.
4	L.L. Alston, ‘High Voltage Technology’, Oxford University Press, First Indian Edition, 2011.
5	Mazen Abdel – Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering – Theory &Practice, Second Edition Marcel Dekker, Inc., 2010.

OTHER REFERENCES	
1	https://youtu.be/vVfLRM2DgLY
2	https://youtu.be/0as-VQq9igA

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. - EEE	20EE6E2	SPECIAL ELECTRICAL MACHINES	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Build the knowledge on construction and operation of stepper motor.	K3	1
CO2	Analyze the construction, principle of operation, switched reluctance motors.	K4	2
CO3	Conclude the knowledge on construction and operation of permanent magnet brushless D.C. motors.	K4	3
CO4	Explain the construction and operation of permanent magnet synchronous motors.	K5	4
CO5	Design and develop the controllers for Special Electrical Machines	K6	5

PRE-REQUISITE	POWER ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3						1	3	3		3	2	
CO2	3	2	2	2				1	3	3		3		
CO3	3	2						1	3	3		3		2
CO4	3	2						1	3	3		3	2	
CO5	3	2	3	2	3			1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Internal Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**STEPPER MOTORS**	**9**
Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis – Characteristics – Drive circuits – Closed loop control – Concept of lead angle - Applications.		
Topic - 2	**SWITCHED RELUCTANCE MOTORS (SRM)**	**9**
Constructional features –Principle of operation- Torque prediction–Characteristics Steady state performance prediction – Analytical Method – Power controllers – Control of SRM drive- Sensor less operation of SRM – Applications.		
Topic - 3	**PERMANENT MAGNET BRUSHLESS D.C. MOTORS**	**9**
Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis EMF and Torque equations- Power Converter Circuits and their controllers - Characteristics and control- Applications.		
Topic - 4	**PERMANENT MAGNET SYNCHRONOUS MOTORS (PMSM)**	**9**
Constructional features -Principle of operation – EMF and Torque equations - Sine wave motor with practical windings - Phasor diagram - Power controllers – performance characteristics -Digital controllers – Applications.		
Topic - 5	**OTHER SPECIAL MACHINES**	**9**
Constructional features – Principle of operation and Characteristics of Hysteresis motor- Synchronous Reluctance Motor–Linear Induction motor-Repulsion motor- Applications.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	K.Venkataratnam, ‘Special Electrical Machines’, Universities Press (India) Private Limited, 2008.
2	T. Kenjo, ‘Stepping Motors and Their Microprocessor Controls’, Clarendon PressLondon, 1984
3	E.G. Janardanan, ‘Special electrical machines’, PHI learning Private Limited, Delhi,2014.
4	R.Krishnan, ‘Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application’, CRC Press, New York, 2001.

OTHER REFERENCES	
1	T. Kenjo and S. Nagamori, ‘Permanent Magnet and Brushless DC Motors’,Clarendon Press, London, 1988.
2	R.Srinivasan, ‘Special Electrical Machines’, Lakshmi Publications, 2013.

Semester	Programme	Course Code	Course Name	L	T	P	C
VI	B.E. EEE	20EE6E3	COMMUNICATION ENGINEERING	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Interpret gain knowledge of various Analog Modulation	K2	1
CO2	Describe the concepts of Pulse Modulation	K2	2
CO3	Understand the concept of various digital modulation and transmission.	K3	3
CO4	Analyze Source and Error control coding.	K3	4
CO5	Ability to Understand the concepts of Multiple Access.	K3	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3	2		2	2	3	3		3		
CO2	3	2	2	3	2		2	2	3	3		3		2
CO3	3	2	1	3	1		2	2	3	3		3		
CO4	3	2	2	2	1		2	2	3	3		3	2	
CO5	3	2	2	2	1		2	2	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**ANALOG MODULATION**	**9**
Amplitude Modulation – AM, DSBSC, SSBSC, VSB – PSD, modulators and demodulators – Angle modulation – PM and FM – PSD, modulators and demodulators – Superheterodyne receivers		
Topic - 2	**PULSE MODULATION**	**9**
Low pass sampling theorem – Quantization – PAM – Line coding – PCM, DPCM, DM, and ADPCM And ADM, Channel Vocoder - Time Division Multiplexing, Frequency Division Multiplexing		
Topic - 3	**DIGITAL MODULATION AND TRANSMISSION**	**9**
Phase shift keying – BPSK, DPSK, QPSK – Principles of M-ary signaling M-ary PSK & QAM – Comparison, ISI – Pulse shaping – Duo binary encoding – Cosine filters – Eye pattern, equalizers		
Topic - 4	**INFORMATION THEORY AND CODING**	**9**
Measure of information – Entropy – Source coding theorem – Shannon–Fano coding, Huffman Coding, LZ Coding – Channel capacity – Shannon-Hartley law – Shannon's limit – Error control codes – Cyclic codes, Syndrome calculation – Convolution Coding, Sequential and Viterbi decoding		
Topic - 5	**SPREAD SPECTRUM AND MULTIPLE ACCESS**	**9**
Sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation and tracking – Multiple Access – FDMA, TDMA, CDMA,		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	H Taub, D L Schilling, G Saha, “Principles of Communication Systems” 3/e, TMH 2007
2	S. Haykin “Digital Communications” John Wiley 2005

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=mHvV_Tv8HDQ
2	https://www.youtube.com/watch?v=_gJPYgQQ01c&list=PLbMVogVj5nJQoZqyLxx-cg_dYE-Dt2UMH
3	https://www.youtube.com/watch?v=jUHi1aPcrFg&list=PLXnsjPD8-xutVH9OHMzeBHFc-PYaEZ6AV
4	https://www.youtube.com/watch?v=xltpukBncs8

SEMESTER VII

Sl. No.	Course Code	Course Title	Category	CIA	ESE	L	T	P	C
THEORY COURSES									
1	20HSCT2	Professional Ethics	HS	40	60	3	0	0	3
2		Professional Elective – III	PE	40	60	3	0	0	3
3		Professional Elective – IV	PE	40	60	3	0	0	3
4		Open Elective – III	OE	40	60	3	0	0	3
5		Open Elective – IV	OE	40	60	3	0	0	3
THEORY COURSE WITH LABORATORY COMPONENTS									
6	20EE7LT1	Power System Operation and Control	PC	50	50	2	0	4	4
LABORATORY COURSE									
7	20EE7L1	Mini Project	EEC	60	40	0	0	4	2
Total						**18**	**1**	**6**	**21**

Semester	Programme	Course Code	Course Name	L	T	P	C
VII - B.E. CIVIL, EEE & ECE		20HSCT2	PROFESSIONAL ETHICS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Develop awareness on Engineering Ethics and Human Values.	K3	1
CO2	Discuss the ethical issues related to Engineering field.	K6	2
CO3	Conclude the code of Ethics in Engineering as Social Experimentation.	K5	3
CO4	Examine the human safety and realize the responsibilities and rights in the society.	K4	4
CO5	Justify the responsibility and rights in hazardous environments, ethics in global context.	K5	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2			1	3	3		3		
CO2	3		2	2	2			1	3	3		3		
CO3	3	2	2					1	3	3		3		
CO4	3							1	3	3		3	2	
CO5	3	2						1	3	3		3		2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**HUMAN VALUES**	**9**
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.		
Topic - 2	**ENGINEERING ETHICS**	**9**
Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.		
Topic - 3	**ENGINEERING AS SOCIAL EXPERIMENTATION**	**9**
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.		
Topic - 4	**SAFETY, RESPONSIBILITIES AND RIGHTS**	**9**
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.		
Topic - 5	**GLOBAL ISSUES**	**9**
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, McGraw Hill Education, New Delhi, 2016.
2	Govindarajan M, Natarajan S and Senthil Kumar V. S, ―Engineering Ethics‖, PHI Learning Pvt. Ltd, New Delhi, 2017.
3	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2017.

OTHER REFERENCES	
1	https://nptel.ac.in/courses/109/106/109106117/
2	https://nptel.ac.in/courses/110/105/110105097/
3	https://www.digimat.in/nptel/courses/video/110105097/L33.html
4	https://www.youtube.com/watch?v=ag1fHF7aL0A
5	https://nptel.ac.in/courses/110105079

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. - EEE	20EE7LT1	POWER SYSTEM OPERATION & CONTROL	2	0	4	4

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Demonstrate and articulate the basic concepts of of electric power system and modeling of speed governing mechanisms	K2	1
CO2	Analyze the load curve and load duration curve based problems and the real power-frequency control.	K4	2
CO3	Realistic the reactive power-voltage control.	K3	3
CO4	Analyze the control actions to be implemented on the system to meet the System load demand, unit commitment & economic Dispatch	K4	4
CO5	Understand the computer control techniques for real time operations.	K2	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1						1	3	3		3	1	3
CO2	3	1						1	3	3		3	1	2
CO3	3	1	1					1	3	3		3	1	1
CO4	3	2	2					1	3	3		3		2
CO5	2							1	3	3		3	3	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Laboratory Record and Model Practical Examinations (Laboratory Component)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**6**
Power scenario in Indian grid – National and Regional load dispatching centers – requirements of good power system - necessity of voltage and frequency regulation – real power vs frequency and reactive power vs voltage control loops - system load variation, load curves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms.		
Topic - 2	**REAL POWER - FREQUENCY CONTROL**	**6**
Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling – block diagram representation of two area system - static and dynamic analysis - tie line with frequency bias control – state variability model - integration of economic dispatch control with LFC.		
Topic - 3	**REACTIVE POWER – VOLTAGE CONTROL**	**6**
Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representation of AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmission line - methods of reactive power injection - tap changing transformer, SVC (TCR + TSC) and STATCOM for voltage control.		
Topic - 4	**ECONOMIC OPERATION OF POWER SYSTEM**	**6**
Statement of economic dispatch problem - input and output characteristics of thermal plant - incremental cost curve - optimal operation of thermal units without and with transmission losses (no derivation of transmission loss coefficients) - base point and participation factors method - statement of unit commitment (UC) problem - constraints on UC problem – solution of UC problem using priority list – special aspects of short term and long term hydrothermal problems.		
Topic - 5	**COMPUTER CONTROL OF POWER SYSTEMS**	**6**
Need of computer control of power systems-concept of energy control centers and functions – PMU - system monitoring, data acquisition and controls - System hardware configurations - SCADA and EMS functions – need for power system security- weighted least square estimation - various operating states - state transition diagram.		

THEORY	**30**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**30**

COURSE CONTENT		
Experiment - 1	Computation of Transmission Line Parameters	
Experiment - 2	Formation of Bus Admittance and Impedance Matrices and Solution of Networks	
Experiment - 3	Power Flow Analysis using Gauss-Seidel Method	
Experiment - 4	Power Flow Analysis using Newton Raphson Method	
Experiment - 5	Symmetric and unsymmetrical fault analysis	

Experiment - 6	Transient stability analysis of SMIB System									
Experiment - 7	Economic Dispatch in Power Systems									
Experiment - 8	Load – Frequency Dynamics of Single- Area and Two-Area Power									
Experiment - 9	State estimation: Weighted least square estimation									
Experiment - 10	Electromagnetic Transients in Power Systems : Transmission Line Energization									
Experiment - 11	Power Flow Analysis using Fast Decoupled Method									
THEORY	**0**		**TUTORIAL**	**0**		**PRACTICAL**	**60**		**TOTAL**	**60**

BOOK REFERENCES	
1	Olle.I.Elgerd, 'Electric Energy Systems theory - An introduction', McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
2	Kundur P., 'Power System Stability and Control, McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=9WIwlljva_s
2	https://www.youtube.com/watch?v=PNgsqO7w9Nk

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. EEE	20EE7E1	POWER QUALITY	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Identify the various sources, causes and effects of power quality issues, electrical systems and their measures and mitigation.	K3	1
CO2	Solve the causes & mitigation techniques of various PQ events and to study the various Active & Passive power filters.	K3	2
CO3	Examine the concepts about voltage and current distortions, harmonics and design the passive filters	K4	3
CO4	Interpret the basic knowledge about the compensation techniques in power systems and the applications of DVR.	K5	4
CO5	Analyze and diagnostic various techniques for practical power quality problems	K4	5

PRE-REQUISITE	TRANSMISSION AND DISTRIBUTION

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2		2		1	3	3		3	2	
CO2	2	2	2					1	3	3		3		2
CO3	2	3		2		2		1	3	3		3	2	
CO4		2		2	3			1	3	3		3		
CO5	2		3					1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells – Computer Business Equipment Manufacturers Associations (CBEMA) curve		
Topic - 2	**VOLTAGE SAG AND SWELL**	**9**
Estimating voltage sag performance - Thevenin's equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltage sag, Static transfer switches and fast transfer switches.		
Topic - 3	**HARMONICS**	**9**
Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions.		
Topic - 4	**PASSIVE POWER COMPENSATORS**	**9**
Principle of Operation of Passive Shunt and Series Compensators, Analysis and Design of Passive Shunt Compensators Simulation and Performance of Passive Power Filters- Limitations of Passive Filters Parallel Resonance of Passive Filters with the Supply System.		
Topic - 5	**POWER QUALITY MONITORING**	**9**
Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer – Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. .		

THEORY	**45**	**TUTORIAL**	**0**	**PRACTICAL**	**0**	**TOTAL**	**45**

BOOK REFERENCES	
1	Bhim Singh, Ambrish Chandra, Kamal Al-Haddad," Power Quality Problems & Mitigation Techniques" Wiley, 2015.
2	Roger. C. Dugan, Mark. F. Mc Granagham, Surya Santoso, H.WayneBeaty, "Electrical Power Systems Quality", McGraw Hill,2003
3	J. Arrillaga, N.R. Watson, S. Chen, "Power System Quality Assessment", (New York :Wiley),2000
4	M.H.J Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", (New York: IEEE Press), 2000.

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=q4VjsHq4LOk
2	https://www.youtube.com/watch?v=JLY0Pehkgug
3	https://www.youtube.com/watch?v=X6k9fOfxlyg
4	https://www.youtube.com/watch?v=z_E8uvhTrwY

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. - EEE	20EE7E3	POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Categorize to Provide knowledge about the stand alone and grid connected renewable energy systems.	K3	1
CO2	Examine the required skills to derive the criteria for the design of power converters for renewable energy applications.	K4	2
CO3	Illustrate the analyse and comprehend the various operating modes of wind electrical generators and solar energy systems.	K4	3
CO4	Interpret the design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems	K2	4
CO5	Analyse the develop maximum power point tracking algorithms	K4	5

PRE-REQUISITE	POWER ELECTRONICS

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	-	-	2	2	1	3	3	-	3	2	2
CO2	3	3	3	-	2	1	-	1	3	3	-	3	-	-
CO3	3	3	2	-	-	2	2	1	3	3	-	3	-	-
CO4	3	2	2	-	-	2	-	1	3	3	-	3	-	-
CO5	3	2	2	-	2	1	-	1	3	3	-	3	-	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.		
Topic - 2	**ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION**	**9**
Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.		
Topic - 3	**POWER CONVERTERS**	**9**
Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters.		
Topic - 4	**ANALYSIS OF WIND AND PV SYSTEMS**	**9**
Stand alone operation of fixed and variable speed wind energy conversion systems and solar system Grid connection Issues -Grid integrated PMSG, SCIG Based WECS.		
Topic - 5	**HYBRID RENEWABLE ENERGY SYSTEMS**	**9**
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	S. N. Bhadra, D.Kastha, S.Banerjee, “Wind Electrical Systems”, Oxford University Press, 2005.
2	B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi,2009.
3	Rashid .M. H “power electronics Hand book”, Academic press, 2001.
4	Ion Boldea, “Variable speed generators”, Taylor & Francis group, 2006.

OTHER REFERENCES	
1	https://youtu.be/gCFOadY0b-4
2	https://youtu.be/kioydzXXTDY

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	BE & EEE	20EC6T2	VLSI DESIGN	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Develop digital logic circuits and VLSI systems using Verilog Hardware Description Language Programming	K3	1
CO2	Illustrate the components in the logic synthesis-based design flow	K3	2
CO3	Elaborate the characteristics of MOS transistor and techniques used for VLSI fabrication	K2	3
CO4	Make use of layout design rules to draw layout of logic functions and to design circuits using various logic styles	K3	4
CO5	Apply various testing techniques/algorithms to test circuits	K3	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		1			3				1	1	3
CO2	3	2	2		1			3				1	1	3
CO3	3				1							1		2
CO4	3	2	2		1			3				1	1	3
CO5	3	2						2				2		1

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**Verilog HDL**	**9**
Data flow Modelling- Behavioural modelling – Structured Procedures- Blocking and non blocking statements- delay control- event control, conditional statements- multiway branching-loops- Switch level modelling - Tasks and Function		
Topic - 2	**Logic Synthesis and RTL Design**	**9**
Logic Synthesis- Impact of Logic Synthesis- Verilog HDL Synthesis- Synthesis Design Flow- Modelling Tips for Logic Synthesis- RTL Design- 4-bit full adder subtractor- ALU Design – Booth Multiplication- GCD Computation.		
Topic - 3	**MOS Transistor**	**9**
CMOS Logic- MOS Transistor Theory- Long Channel I-V characteristics- C-V characteristics- Nonideal I-V effects DC characteristics-- Power dissipation – Switching Characteristics		
Topic - 4	**MOS Fabrication**	**9**
An overview of silicon semiconductor technology - Basic CMOS technology: N well- P well, Twin tub and SOI Process- Latch up and prevention- Layout Design rules- Stick diagram- Layout diagram for basic logic gates Introduction to Static CMOS- Pseudo nMOS logic -Dynamic CMOS-Cascade Voltage Switch Logic.		
Topic - 5	**CMOS Testing**	**9**
Introduction to testing- Logic Verification Principles- Test Vectors-Manufacturing test principles- - Fault Models observability, controllability –Fault coverage- DFT-Ad-Hoc Testing- Scan Design- BIST- D-Algorithm and Boolean Difference Method		

THEORY	**45**		**TUTORIAL**			**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Neil Weste & David Harris , "CMOS VLSI Design-A circuits & System Perspective", 4th Edition, Pearson education, New Delhi, 2017.
2	Palnitkar Samir, "Verilog HDL: Guide to Digital Design and synthesis", 2nd Edition, Pearson Education, New Delhi, 2017.

OTHER REFERENCES	
1	Pucknell, Douglas A & Eshragian K, "Basic VLSI Design", 3rd Edition, PHI Learning, New Delhi, 2012
2	Rabaey J. M, Chandrakasan A & Nikolic B, "Digital integrated circuits: a design perspective", 2nd Edition, PHI Learning, New Delhi, 2003.

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. EEE	20EE7E5	ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Summarize the various concepts behind renewable energy resources.	K2	1
CO2	Identify the energy efficient equipments and applying in electric traction systems.	K3	2
CO3	Classify the illumination methodologies with energy saving concepts.	K4	3
CO4	Explain the various methods of electric heating and electric welding.	K5	4
CO5	Discuss the utilization of electrical energy in various domestic appliances.	K6	5

PRE-REQUISITE	Power Plant Engineering

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		2			1	3	3		3	2	
CO2	2		2					1	3	3		3		
CO3	2	3		2				1	3	3		3		2
CO4	2		3		2			1	3	3		3	2	
CO5	2	2	2					1	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course End Survey

COURSE CONTENT		
Topic - 1	**SOLAR AND WIND ENERGY**	**9**
Introduction - solar constant - solar radiation estimation - physical principles of the conversion of solar radiation into heat – types of collectors. Introduction - basic principles of wind energy conversion - components of Wind Energy Conversion System (WECS) - types of wind turbines.		
Topic - 2	**ENERGY EFFICIENT MOTORS AND ELECTRIC TRACTION**	**9**
Fundamentals of electric drive – energy efficient motors - standard motor efficiency, necessity - Motor life cycle - efficiency evaluation factor. Traction motors – merits, characteristics and requirements of electric traction system – supply systems – mechanics of train movement – braking – recent trends in electric traction.		
Topic - 3	**ILLUMINATION**	**9**
Introduction - light sources - incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps – design of illumination systems - indoor lighting schemes - outdoor lighting schemes - flood lighting – factory lighting - street lighting - energy efficient lamps, LED.		
Topic - 4	**HEATING AND WELDING**	**9**
Introduction - advantages of electric heating – types - resistance heating – induction heating – dielectric heating - electric arc furnaces. Introduction to electric welding – types - resistance welding - arc welding - power supply for arc welding - radiation welding.		
Topic - 5	**DOMESTIC UTILIZATION OF ELECTRICAL ENERGY**	**9**
Domestic utilization of electrical energy – house wiring. induction based appliances, online and offline UPS – batteries - refrigeration - domestic refrigerator and water coolers – air conditioning – types.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Wadhwa, C.L. “Generation, Distribution and Utilization of Electrical Energy”, New Age International Pvt. Ltd, 2003.
2	Gupta.J.B, “Utilization of Electric Power and Electric Traction”, S.K.Kataria and Sons, 2002.
3	Openshaw Taylor.E, “Utilization of Electrical Energy in SI Units”, Orient Longman Pvt. Ltd, 2003.
4	G.D.Rai, “Non-Conventional Energy Sources”, Khanna Publications Ltd., New Delhi, 1997.
5	Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.

OTHER REFERENCES	
1	https://youtu.be/M7Uqc-EnO9M
2	https://youtu.be/PW44aMos2YA
3	https://youtu.be/kEP6S6RGstE

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. EEE	20EE7E6	MICROCONTROLLER BASED SYSTEM DESIGN	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Understand and apply computing platform and software for engineering problems.	K2	1
CO2	understand the concepts of Architecture of PIC microcontroller	K2	2
CO3	Acquire knowledge on Interrupts and timers.	K3	3
CO4	Understand the importance of Peripheral devices for data communication.	K3	4
CO5	understand the basics of sensor interfacing	K3	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	3	2		2	2	3	3		3		2
CO2	3	2	2	3	2		2	2	3	3		3		
CO3	3	2	1	3	1		2	2	3	3		3		
CO4	3	2	2	2	1		2	2	3	3		3	2	
CO5	3	2	2	2	1		2	2	3	3		3		

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO PIC MICROCONTROLLER**	**9**
Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx–- Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.		
Topic - 2	**INTERRUPTS AND TIMER**	**9**
PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variability strings.		
Topic - 3	**PERIPHERALS AND INTERFACING**	**9**
I2C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.		
Topic - 4	**INTRODUCTION TO ARM PROCESSOR**	**9**
Architecture –ARM programmer's model –ARM Development tools- Memory Hierarchy – ARM Assembly Language Programming–Simple Examples–Architectural Support for Operating systems.		
Topic - 5	**ARM ORGANIZATION**	**9**
3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution-ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	H Taub, D L Schilling, G Saha, "Principles of Communication Systems" 3/e, TMH 2007
2	S. Haykin "Digital Communications" John Wiley 2005

OTHER REFERENCES	
1	https://www.youtube.com/watch?v=mHvV_Tv8HDQ
2	https://www.youtube.com/watch?v=_gJPYgQQ01c&list=PLbMVogVj5nJQoZqyLxx-cg_dYE-Dt2UMH
3	https://www.youtube.com/watch?v=jUHi1aPcrFg&list=PLXnsjPD8-xutVH9OHMzeBHFc-PYaEZ6AV
4	https://www.youtube.com/watch?v=xltpukBncs8

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. - EEE	20EE7E7	FLEXIBLE AC TRANSMISSION SYSTEMS	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Construct the basic concepts of FACTS controllers	K3	1
CO2	Examine the operation of Thyristor controlled reactors, Thyristor switched capacitors and static VAR compensators	K4	2
CO3	Illustrate the operation of Thyristor controlled series compensators	K4	3
CO4	Interpret the operation of STATCOM and Static Synchronous Series Compensator	K2	4
CO5	Analyse the operation of Unified Power Flow Controllers.	K4	5
PRE-REQUISITE	TRANSMISSION AND DISTRIBUTION		

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)

COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	-	2	2	1	3	3	-	3	2	2
CO2	3	2	2	-	2	2	-	1	3	3	-	3	-	-
CO3	3	2	2	-	-	2	2	1	3	3	-	3	-	-
CO4	3	2	2	-	-	2	-	1	3	3	-	3	-	-
CO5	3	2	2	-	2	2	-	1	3	3	-	3	-	-

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION**	**9**
Introduction to FACTS controllers – Reactive power control – Reactive power, uncompensated Transmission line, reactive power compensation – Principles of conventional reactive power compensators – Synchronous condensers , saturated reactor , phase angle controllers		
Topic - 2	**THYRISTORCONTROLLEDSHUNTCOMPENSATOR**	**9**
Objective of shunt compensation Principle and operating characteristics of Thyristor Controlled Reactor(TCR) – Thyristor Switched Capacitor(TSC) – Static VAR Compensators(SVC) –SVC control system – SVC voltage regulator model – Transfer function and dynamic performance of SVC – Transient stability enhancement and power oscillation damping		
Topic - 3	**THYRISTORCONTROLLEDSERIESCOMPENSATOR(TCSC)**	**9**
Principle of operation of TCSC – Capability characteristics of TCSC- Modeling of TCSC-TCSC control system-Applications : Improvement of the system stability limit-Enhancement of system damping		
Topic - 4	**VSCBASEDSHUNTANDSERIESCOMPENSATOR**	**9**
Static Synchronous Compensator(STATCOM)-Principle of operation- VI Characteristics-Harmonic performance Static Synchronous Series Compensator (SSSC)-Principle of operation and characteristics of SSSC-control range and VA rating-capability to provide real power compensation-control scheme for SSSC.		
Topic - 5	**UNIFIEDPOWERFLOWCONTROLLER**	**9**
Basic operating principles- conventional transmission control capability of UPFC Independent Real and reactive power flow control-control scheme for UPFC-Basic control System for P and Q control-dynamic performance		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	R.Mohan Mathur and Rajiv K.Varma, "Thyristor-Based FACTS Controllers for Electrical Transmission Systems",first edition,Wiley India Pvt.Ltd, New Delhi.
2	Narain G. Hingorani and Laszlo Gyugyi."Understanding FACTS concepts and technology of Flexible AC transmissions ystems",first edition,Wiley-IEEE Press UK 2014.
3	K.R.Padiyar,"FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited,NewDelhi,2014
4	AT.John,"Flexible AC Transmission Systems ,Institution of Electrical and Electronic Engineers (IEEE),1999.

OTHER REFERENCES	
1	http://www.mediafire.com/file/Flexible Power Transmission, J.Arrillaga, University of Canterbury, New Zealand
2	http://eeekits.blogspot.in/2011/09/Flexible AC Transmission Systems : Modeling and Control by Dr.Xiao-Ping Zhang, University Warwick, United Kingdom

Semester	Programme	Course Code	Course Name	L	T	P	C
VII	B.E. - EEE	20EE7E8	ELECTRIC & HYBRID VEHICLES	3	0	0	3

COURSE LEARNING OUTCOMES (COs)			
After Successful completion of the course, the students should be able to		RBT Level	Topics Covered
CO1	Interpret the electric components used in Hybrid and Electric vehicles	K2	1
CO2	Demonstrate and articulate the basic components used in electric traction system	K4	2
CO3	Select the suitable electric motors used in Electric vehicles	K4	3
CO4	Choose proper energy storage systems for vehicle applications.	K3	4
CO5	Design a component or a product applying all the relevant standards with realistic constraints.	K6	5

PRE-REQUISITE	NIL

CO / PO MAPPING (1 – Weak, 2 – Medium, 3 – Strong)														
COs	Programme Learning Outcomes (POs)												PSOs	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2		2			1	3	3		3	3	3
CO2	3	3	2					1	3	3		3	2	2
CO3	3	3						1	3	3		3		2
CO4	3	3						1	3	3		3		2
CO5	3	2	3		2			1	3	3		3	3	2

COURSE ASSESSMENT METHODS		
DIRECT	1	Continuous Assessment Tests
	2	Other Assessments (Assignment, Quiz etc.)
	3	End Semester Examinations
INDIRECT	1	Course Exit Survey

COURSE CONTENT		
Topic - 1	**INTRODUCTION TO ELECTRICAL VEHICLES**	**9**
History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, future of electric vehicles, comparison with IC engine drive vehicles, Vehicle specifications, Architecture of Electrical vehicle system(two, three and four wheelers)		
Topic - 2	**ELECTRIC VEHICLE DRIVE TRAIN**	**9**
Transmission configuration, Components, gears, clutch, brakes, regenerative braking, motor sizing. Basic concept of electric traction, Power flow control in electric drive topologies, fuel efficiency analysis.		
Topic - 3	**ELECTRIC PROPULSION UNIT**	**9**
Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC motor drives, configuration and control of induction motor drives, configuration and control of Permanent Magnet Motor Drives, Configuration and control of switch reluctance motor drives, drive system efficiency.		
Topic - 4	**ENERGY STORAGE**	**9**
Introduction to energy storage requirements in hybrid and electric vehicles, Battery based energy storage and its analysis, fuel cell based and super capacitor based energy storage and its analysis, Hybridization of different energy storage devices.		
Topic - 5	**ENERGY MANAGEMENT STRATEGIES AND PASSENGER SAFETY**	**9**
Introduction to energy management strategies used in hybrid and electric vehicle, classification of different energy management strategies, comparison of different energy management strategies- Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV)-Safety components of electric vehicles – Passenger safety system – ARAI Regulations.		

THEORY	**45**		**TUTORIAL**	**0**		**PRACTICAL**	**0**		**TOTAL**	**45**

BOOK REFERENCES	
1	Iqbal Hussain, “Electric and Hybrid Vehicles- Design fundamentals”, CRC Press, Second Edition,2011
2	Mehrdad Ehsani, Yimin Gao, and Ali Emadi, “Modern Electric, Hybrid and Fuel cell vehicles: Fundamentals”, CRC Press,2010

OTHER REFERENCES	
1	https://youtu.be/OoGg6RdOMgI
2	https://youtu.be/q8gWKrK5RWg